DEWESoft PCM Plug-In User's Manual

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1. System Overview

1.1 Overview

The PCM Plug-in is a software plug-in for the DEWESoft data acquisition and analysis software. The plug-in requires a system to have the Ulyssix PCM card and drivers properly installed in it. The combination of the Ulyssix PCM hardware, PCM Plug-in, and DEWESoft software provides a powerful, complete solution for acquiring, analyzing, and recording PCM data.

The Ulyssix PCM processor boards are multimode circuit board that contains a DSP implemented digital bit synchronizer, frame synchronizer, IRIG Class II PCM decommutator, PCM simulator, and IRIG Time Code Generator/Reader. The bit synchronizer accepts all of the IRIG106 code types and has Eb/N0 rejection of better than 1 dB to the theoretical BER published curve. The input AGC accepts inputs from 75 mVpp to 10 Vpp.

The PCM Plug-in allows the user to set up each channel with an easy to use GUI interface; providing indicators for bit sync lock, frame lock, sub-frame lock, as well as, soft scope outputs for the AGC data, eye pattern lock representation, and a full frame preview display. The output of the frame synchronizer can also be dumped to the host computer hard drive for archiving and data reduction applications.

The decommutator allows the user to setup parameters from 4-bits to 64-bits with easy to enter data processing (engineering unit conversion) algorithms. Asynchronous embedded formats and frame format identifier format changeovers are supported. All decom processed data may be displayed in tabular, strip chart, oscilloscope, FFT spectral form, dials, time digital formats, bar graphs, and other easy to interpret widgets.

1.2 Scope of this document

This help file and manual is intended to serve as an adjunct to the DEWESoft user's manual. It's not a replacement for that document - which is quite voluminous and highly detailed, especially in the area of analog inputs, CAN, GPS, and most standard operational aspects of DEWESoft and Dewetron systems in general. Please refer to their manuals for information regarding the general operational aspects of DEWESoft.

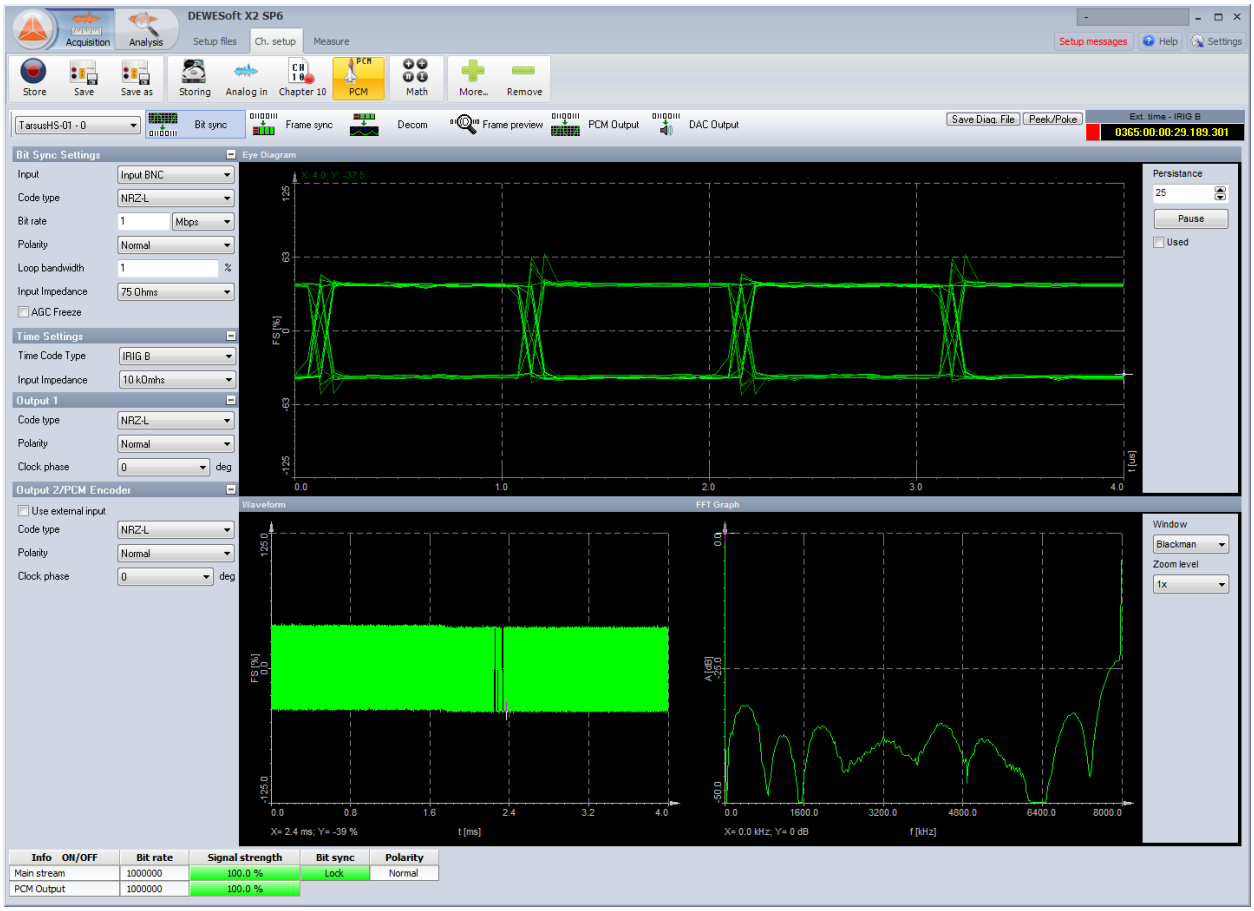
This manual covers information specific to the Ulyssix PCM hardware and the software plug-in referred to as the *PCM Plug-in*. Software plug-ins are specialized applications, usually created as a DLL, which can "plug in" to the master DEWESoft data acquisition software application and add new features and capabilities. Plug-ins vary from small and simple applications that perform a single basic function to complex application that contain lots of features and functions requiring extensive interaction with the hardware (such as the PCM Plug-in).

DEWESoft sells Plug-ins separately from the main software package. Many DEWESoft Plug-ins require hardware for data acquisition. Please use this add-on manual as a reference when using the PCM Plug-in within your system.

1.3 What is the PCM Plug-in?

The PCM Plug-in provides the software interface to the Ulyssix PCM hardware. It allows easy access and use of the bit sync, frame sync, simulator, and decom hardware in a graphical, easy to use manner. Users can define parameters for display and recording; create their own screens; save the screens; and much more.

In this document we will review how to set up and use the Ulyssix PCM hardware installed within a system using the DEWESoft PCM Plug-In.



2. Hardware and Software Installation or Upgrades

2.1 DEWESoft Installation and Setup

Please see ***Ulyssix Driver, Firmware, and DEWESoft Installation and Upgrade Manual*** for detailed instructions about installing the Ulyssix driver and installing/upgrading DEWESoft as well as configuring the DEWESoft License and enabling Plug-ins.

The Ulyssix driver and DEWESoft software should be installed before proceeding to the Hardware installation.

2.2 Hardware Installation

The TarsusHS PCI card requires a PC chassis with an available full-length PCI slot. Please be aware, to work properly, all software applications must be installed before installing any hardware. To install a TarsusHS PCI card, carefully follow the instructions below:

WARNING: SERIOUS DAMAGE WILL RESULT IF YOU DO NOT TURN THE SYSTEMS POWER OFF BEFORE INSTALLING A TARSUSHS-PCI CARD.

1. Make certain all software applications have been properly installed before installing any hardware.
2. Turn off power to the computer.
3. Remove the cover of the computer to expose the available PCI slot.
4. Remove the blank bracket on the back of the computer that's covering the opening to the available PCI slot. Retain the screw which will later be used to secure the TarsusHS PCI card.
5. Install the TarsusHS PCI card into the prepared PCI slot and secure it with the screw from the bracket.
6. Return the cover to the computer.
7. Turn computer On.

The Bald Eagle cPCI card requires an available cPCI slot. Please be aware, to work properly, all software applications must be installed before installing any hardware. To install a BaldEagle cPCI card, carefully follow the instructions below:

1. Make certain all software applications have been properly installed before installing any hardware.
2. Turn off power to the computer.
3. Remove the slot cover to expose the available cPCI slot.
4. Install the Bald Eagle cPCI card into the cPCI slot. Engage the latch at the bottom of the face plate and tighten the screw at the top of the face plate.
5. Turn computer On.

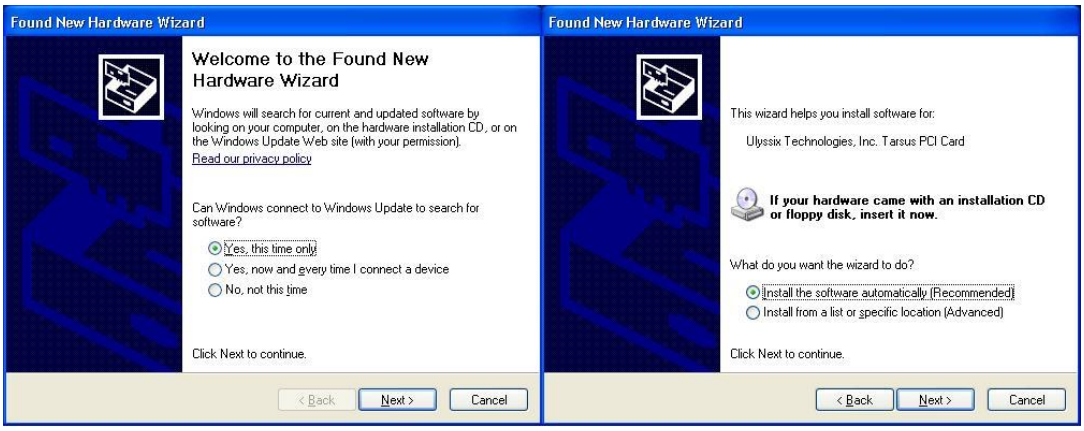
2.2.1 Plug and Play – Window's Hardware Configuration

The Ulyssix PCM cards are plug and play devices. After installing an Ulyssix PCM card in to a system and starting the computer for the first time, Window's will automatically detect the hardware and begin installing all the necessary drivers, update the system, and allocate resources. To explain the process, please review the steps below:

1. At the opening window of the Found New Hardware Wizard, select "Yes, this time only" and click "Next."

2. The next step will ask, "what do you want the wizard to do" – select "Install the software automatically." Click "Next."

3. After the wizard has finished installing the software for the Tarsus PCI Card, click "Finish."



2.2.2 Adding Additional Cards to a System

Additional Ulyssix cards can be installed into any available slot (full length PCI for the TarsusHS card and cPCI for the Bald Eagle card). Please follow the installation instructions described in Section 2Hardware and Software Installation or Upgrades. Before adding any additional cards, verify that the host computer's power supply has adequate power for the total number of cards being installed. To calculate the total amount of power required by the PCI cards, add the individual card's power requirements together. The power requirements are found on the product data sheets. Please contact the factory if further assistance is needed.

When additional cards are installed in a system, the PCI bus may assign new ID numbers for existing or new cards depending on the slot used and the configuration of the PCI bus on the computer. If this happens, the configuration files will be corrupted and will not program the hardware properly.

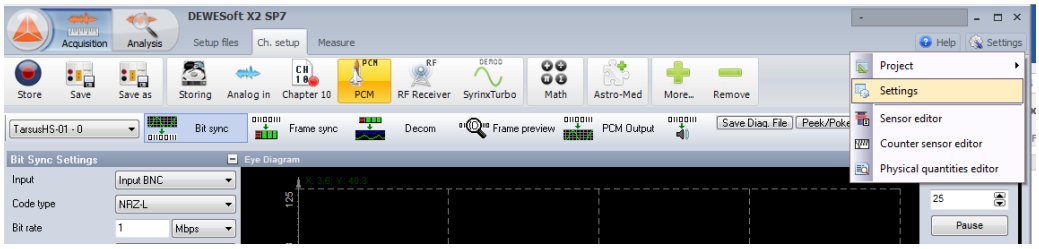
2.3 DEWESoft Configuration

Before using your system, some settings in DEWESoft should be changed. The changes are discussed below. Details about the software settings are also included. Please refer to the DEWESoft software manual for more information.

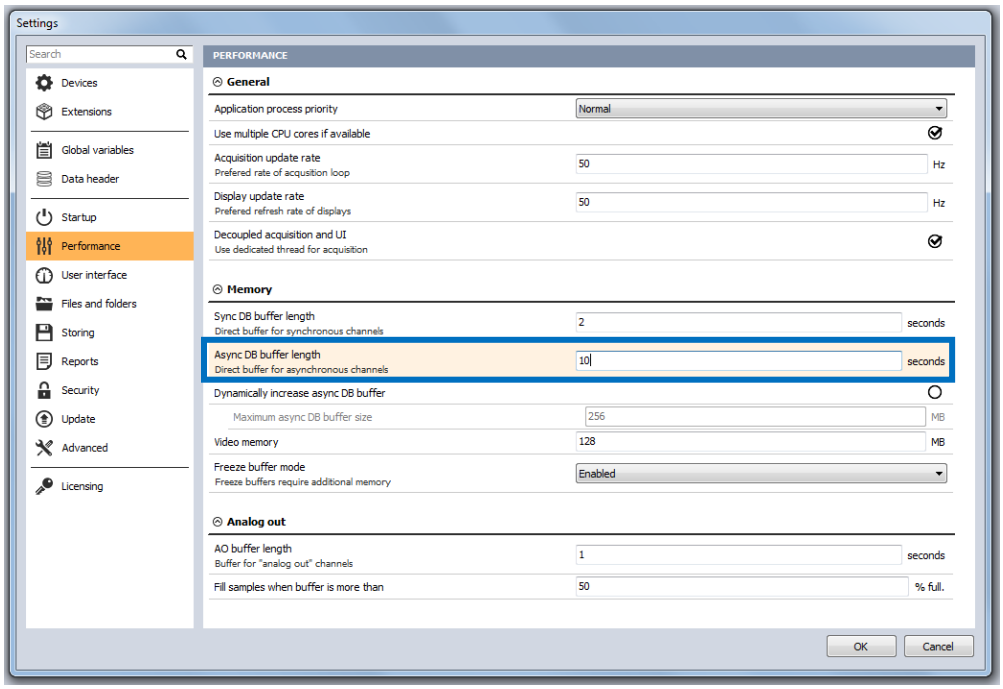
2.3.1 DEWESoft Settings

1. **Memory Buffer Size:**

a. Click the “Setup” button in the upper right-hand corner of DEWESoft. Select “Setup” from the menu.

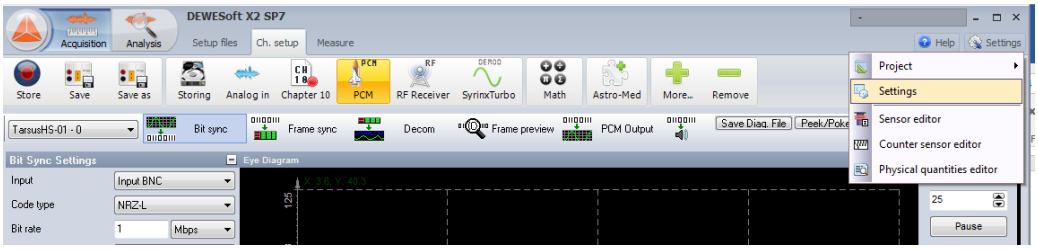


b. On the left side of the “Settings” window, select “Performance.” Change the setting for the “Async DB Buffer Length” to 10 seconds. The default setting is 50 seconds.

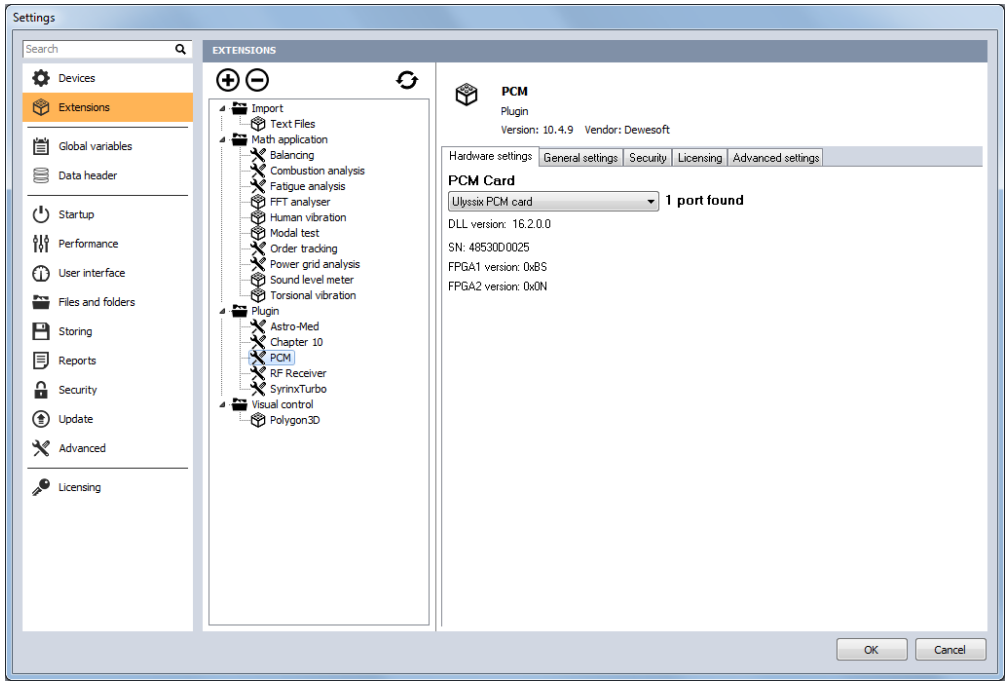


2.3.2 PCM Plug-In Settings

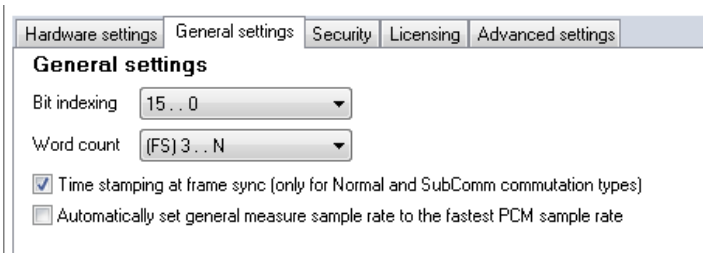
1. Click the “Setup” menu in the upper right-hand corner of DEWESoft. Select “Setup” from the menu.



2. In the Settings window, select “Extensions” on the upper left-hand side. From the Plug-In list, select “PCM.” The settings for the PCM Plug-in will appear in the right part of the Settings window.

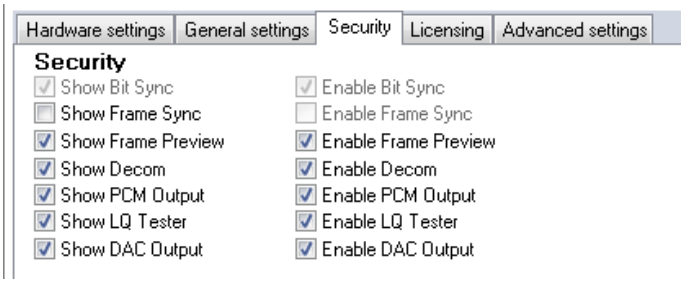


3. In the Hardware Settings tab, the PCM Card combo box has the following options:
    a. **No device** – allows the user to still see the PCM Plug-In settings (Bit Sync, Frame Sync, Decom, PCM Output, etc.) without hardware installed in the computer.
    b. **Test Mode (Replay Mode)** – allows the playback and processing of a .tad file without any hardware. DEWESoft will replay the file through the PCM plug-in, which allows PCM data processing without an Ulyssix card installed.
    c. **Ulyssix PCM Card** – selects the installed Ulyssix hardware to process PCM data.
4. In the General Settings tab, there are four controls:

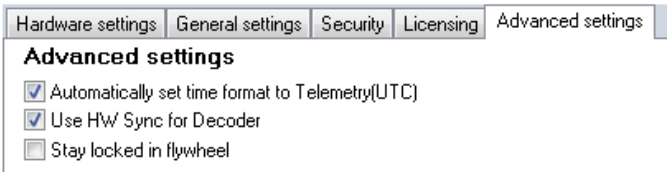


a. **Bit Indexing** determines the bit counting scheme (Ulyssix recommends "15…0"):
    i. **15…0** – The left most bit in the word is the number of bits in the word minus one. The bits count down from left to right. The right most bit is always bit zero.
    ii. **0…15** – The left most bit in the word is always zero. The bits count up from left to right. The right most bit is the number of bits in the word minus one.
    iii. **1…16** – The left most bit in the word is always one. The bits count up from left to right. The right most bit is the number of bits in the word.
b. **Word Count** determines the word counting scheme (Ulyssix recommends "(FS) 1…N"):
    i. **(FS) 3…N** – The Frame Sync Pattern is included in the word count. If the common word size is 16-bits and the Frame Sync Pattern is 32-bits, then the first word after the frame sync would be word three. The following words count up from three.
    ii. **(FS) 1…N** – The Frame Sync Pattern is not included in the word count. The first word is word one.
c. **Time Stamping at Frame Sync (only for Normal and SubComm commutation types)**:
    i. When checked, all Normal and SubComm words are time stamped with the time of the start of the minor frame.
    ii. When unchecked, all Normal and SubComm words are time stamped with an interpolated time calculated from the time of the minor frame, the bit rate, and the number of bits that word is away from the start of the minor frame.
d. **Automatically Set General Measure Sample Rate to the Fastest PCM Sample Rate**:
    i. When checked, the DEWESoft data acquisition rate is automatically set to the fastest channel rate of the PCM Decom Words.
    ii. When unchecked, the DEWESoft data acquisition rate is set in "Ch. Setup" mode in the "Analog In" tab in the Dynamic Acquisition Rate text box.

5. The Security tab has two columns of check boxes. The left most column determines if the PCM Plug-In controls are displayed in the tool bar. The right most column determines if the PCM Plug-in controls are disabled in the tool bar



6. The Licensing tab shows which Ulyssix Licensed Features were purchased for the Ulyssix hardware. Please note that not all Licensed Features are available for all cards. Please see the Ulyssix card manual for more details.
7. The Advanced Settings tab has three check boxes



   a. **Automatically Set Time Format to Telemetry (UTC)** (Ulyssix recommends checked):
      i. When checked, ensures that the DEWESoft Settings\User Interface\Time Format setting is Telemetry (UTC). Telemetry (UTC) has two major characteristics. First, time is stored in UTC format; without local time zone bias. Second, Telemetry Time uses the format: Day of Year: Hour : Minute : Second . Millisecond . Microsecond while Standard Time uses the format: Day / Month / Year – Hour : Minute: Second . Millisecond . Microsecond.
      ii. When unchecked, the DEWESoft time format is set in Settings\User Interface\Time Format.
   b. **Use HW Sync Decoder** (Ulyssix recommends unchecked):
      i. When checked, DEWESoft uses hardware synchronization for time between different data acquisition sources.
      ii. When unchecked, DEWESoft uses software synchronization for time between different data acquisition sources.
   c. **Stay Locked in Flywheel**:
      i. When checked, the Ulyssix hardware will continue to provide IRIG time to DEWESoft by interpolating time in the event that IRIG Time lock is lost.
      ii. When unchecked, DEWESoft displays will freeze if IRIG Time lock is lost.

2.3.3 DEWESoft Security Settings

Starting with DEWESoft X2 Service Pack 9, there is an optional Security Plug-In that encrypts. The Security Plug-In has two modes: Protect Setup and Data File from Opening and Protect Setup File with Permission Scheme. Both methods encrypt the DXS setup file and any DXD data files recorded from the encrypted DXS setup file.

The first security mode, Protect Setup and Data File from Opening, requires the encryption password to open a protected DXS setup file or a DXD data file. This security mode prevents unauthorized people from accessing DXS setup files and DXD data files. Once the password is entered and the DEWESoft file is opened, this security mode does not protect any parts of DEWESoft software package.

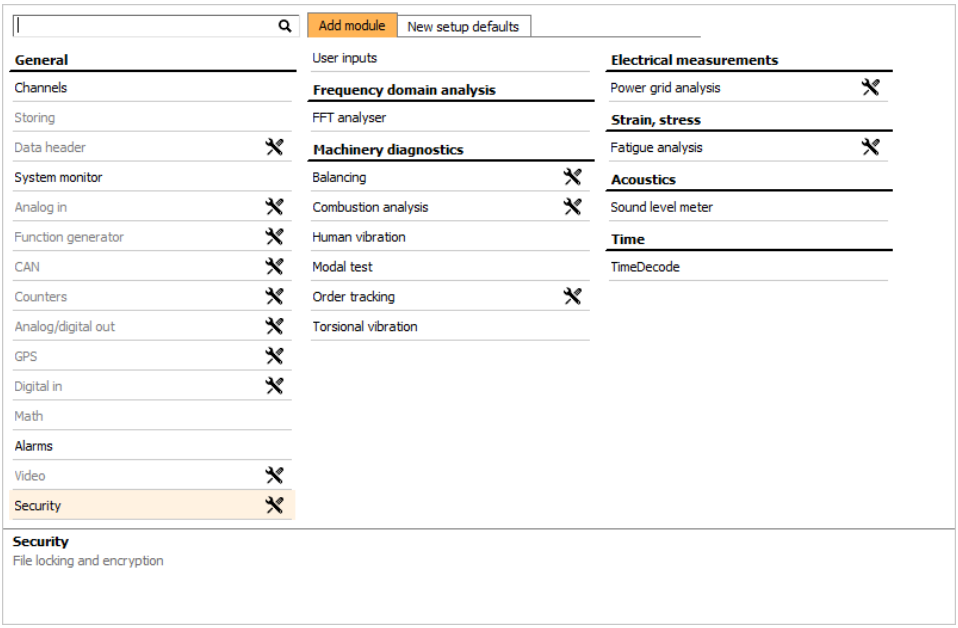
The second security mode, Protect Setup File with Permission Scheme, does not require a password to open a protected DXS setup file or a DXD data file. This security mode encrypts the DXS setup file and any DXD files created from an encrypted DSX setup file. Also, this security mode allows the creator of the DXS setup file to set specific parts of the DEWESoft interface to Read Only or Hidden. Read Only

mode allows the user to see the specific part of the DEWESoft interface, but the user cannot change any of the parameters. Hidden mode prevents the user from accessing the specified part of the DEWESoft interface. This security mode allows anyone to open the DXS setup file or DXD data file, but protects specified parts of the DEWESoft interface.

Add the Security Plug-In

1. In the Channel Setup tab in DEWESoft, click the Plus Sign icon (yellow rectangle below) in the toolbar to launch the Add Module window.

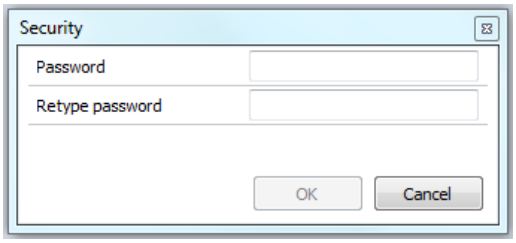
2. In the Add Module window at the bottom of the first column, labeled General, click on "Security." The Security Plug-In will appear in the toolbar.



3. Click on the Security icon in the toolbar and the Security Plug-In appears below.

Using Protect Setup and Data File from Opening

1. To activate this Security mode, click on the Enable Disable button under "Protect Setup and Data File from Opening." This will launch the Security Password window.



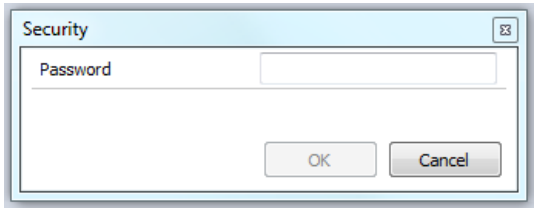
2. Enter the password to encrypt the file once in the Password text box and once in the Retype Password text box. Click OK.

Note: Do not forget or lose the password. Once the file is encrypted, it cannot be opened without the password.

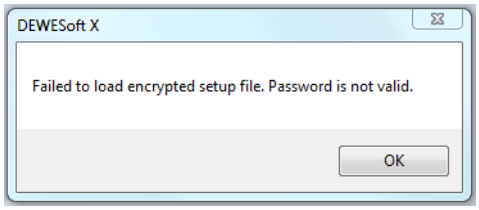
3. Click "Save As" and save the DEWESoft setup as a new DXS file.

Note: Opening any DXD data file created from a DXS setup with the security mode "Protect Setup and Data File from Opening" will require the same password as opening the original DXD file.

4. To test if the file was saved encrypted:
    a. Create a new DXS setup file to ensure that the encrypted DXS is no longer loaded.
    b. Load the encrypted DXS file. The Security window will appear and ask for the password.



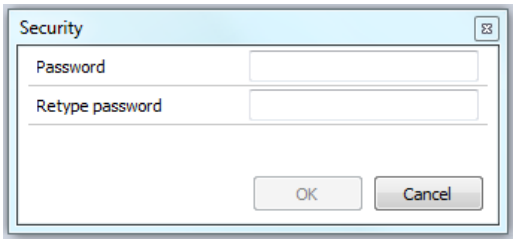
    c. Enter the password and click OK.
    d. If the password is incorrect or the Cancel button is clicked, a warning window appears with the notification that the encrypted setup file failed to open.



    e. If the password is correct, DEWESoft opens the DXS file and the software is ready to use as normal.

Using Protect Setup File with Permission Scheme

1. To activate this Security mode, click on the Enable Disable button under “Protect Setup File with Permission Scheme.” This will launch the Security Password window.

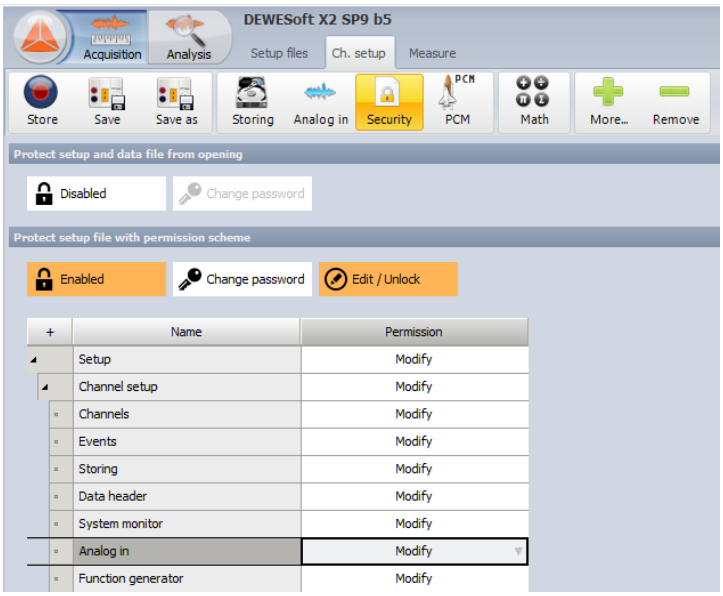


2. Enter the password to encrypt the file once in the Password text box and once in the Retype Password text box. Click OK.

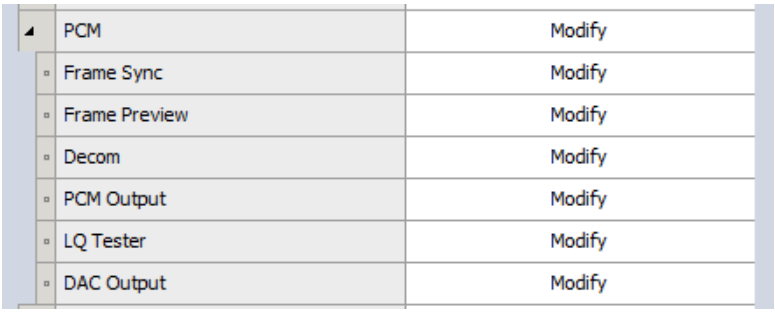
Note: Do not forget or lose the password. Once the file is encrypted, it cannot be opened without the password.

Note: This password is only used to change settings in the Security Plug-In. The DSX setup file and any DXD data file created from it do not require a password to open.

3. In the Security Plug-In tab, a table with two columns appears. This is the Feature Permission table. The first column in the table has the header Name. This column holds the Name of the feature in DEWESoft. The second column in the table has the header Permission. This column set the security permission for feature listed in the name column. Any DEWESoft feature can have it security permission changed, including the Math Plug-In.
    a. The options for the Permission column are: Modify, Read Only, and Hidden. By default, all features begin with the security permission set to Modify.
    b. Modify – Allows the user to see the feature and change parameters inside the feature.
    c. Read Only – Allows the user to see the feature but they cannot change any parameters.
    d. Hidden – Does not allow the user to see the feature or change any parameters.



4. Scroll down the list of DEWESoft features and locate the PCM feature and expand it to show the subset of features that include Frame Sync, Frame Preview, Decom, PCM Output, LQ Tester, and DAC Output.



5. Set any of the PCM features to Read Only or Hidden to limit the user's access.
6. Click "Save As" and save the DEWESoft setup as a new DXS file.
7. To test if the file was saved encrypted:
    a. Create a new DXS setup file to ensure that the encrypted DXS is no longer loaded.
    b. Load the encrypted DXS file. The DXS setup file will load as normal.
    c. In the toolbar, the PCM Plug-In will have a padlock in the upper right-hand corner of the icon. This indicates that some features of the plug-in have security permissions applied.
    d. Click on the PCM Plug-In and verify that the features have the requested security permissions. Features with their security permissions set to Read Only are visible, but the user cannot access the controls or change the parameters. Features with their security permissions set to Hidden are not visible in DEWESoft.
8. To change additional DEWESoft feature security permissions, click on the Security icon in the toolbar.
    a. Click on the Edit / Unlock button to allow changes to the Feature Permission table.
    b. The Security window appears asking for the password. Enter the password and click OK.

c. If the password is incorrect or if Cancel is clicked, the Security window closes as normal and the Edit / Unlock button remains gray. The Feature Permission table cannot be changed.
d. If the password is correct, the Edit / Unlock button turns orange and the Feature Permission table can be changed.
e. After all of the changes to the Feature Permission table are complete, click the Edit /Unlock button to end editing. The Edit / Unlock button will turn gray.
f. Click Save to save the changes to the DXS file.

2.4 Locating the PCM Plug-in Icon

The PCM Plug-In is located on the toolbar inside the Channel Setup tab in DEWESoft. To access the PCM Plug-In, select the Channel Setup tab and then click on the PCM Plug-in icon. The shortcut key F2 will also select the Channel Setup tab.

The PCM Plug-In has five standard controls: Bit Sync, Frame Sync, Decom, Frame Preview, PCM Output, and DAC Output. Configuration for each is described in the next section.

3. Configuring the PCM Plug-In

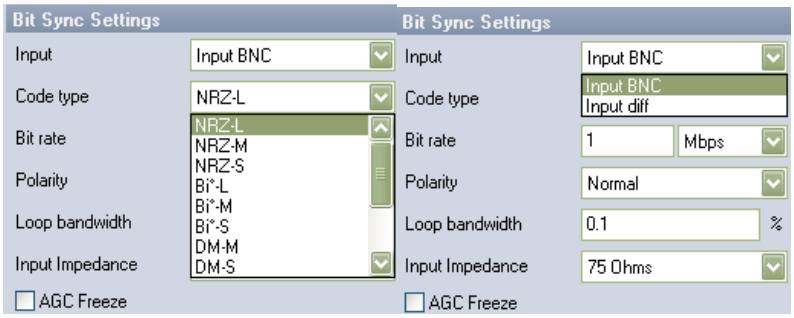
3.1 Configuring the Bit Sync

Go to the Channel Setup tab and select the Bit Sync from the PCM Plug-In toolbar. The Bit Sync has controls for setting up the front-end of the system. by selecting the input, code type, bitrate, loop bandwidth and more. There are several displays to evaluate the incoming PCM signal: the "eye diagram", the direct view of the incoming PCM data, and FFT (frequency spectrum) of the incoming PCM signal.

If the system has multiple Ulyssix card, each card can be selected by using the drop-down menu shown in the image below. To change Ulyssix cards, click on the drop-down box and select a different card. Each card is set up independently.

3.1.1 Bit Sync Input Settings

Input: Use this to select between the two inputs on the Ulyssix PCM card:



1. **Input:**
    a. **Input BNC**: Selects the Input BNC as the input for the Ulyssix PCM card Bit Sync.
    b. **Input Diff**: Selects the Input Trompeter differential connector as the input for the Ulyssix PCM card Bit Sync.
2. **Code Type**: Select the appropriate code type for the incoming PCM stream. The codes supported by the hardware include: NRZ-L, NRZ-M, NRZ-S, Bi*-L, Bi*-M, Bi*-S, DM-M, DM-S, RZ, RNRZ(11)-Forward, RNRZ(11)-Reverse, RNRZ(15)-Forward, and RNRZ(15)-Reverse.
3. **Bit Rate**: Enter the bit rate of the incoming PCM stream. The TarsusHS card can handle bit rates up to 33 Mbps and the Bald Eagle can handle bit rates up to 40 Mbps. Bit rate can be entered in bits per second (bps), kilobits per second (Kbps) or megabits per second (Mbps) by selecting the appropriate units from the drop-down selection box.
4. **Polarity**: Select Normal, Inverted, or Automatic polarity (detection) for the output PCM data stream. If the polarity is unknown, select Automatic polarity and the software will determine the setting. The only drawback to the Automatic setting is that it slows down the acquisition of Bit Lock by a couple of minor frames.
5. **Loop Bandwidth**: The Loop Bandwidth should bebetween0.01 to 3.00 percent. A smaller Loop Bandwidth setting will achieve better Bit Sync bit error performance. However, a larger Loop Bandwidth has a higher tolerance for variation of the incoming PCM signal's data rate.
6. **Input Impedance**: Select the desired Impedance setting based on the device driving the input. The available selections are 10 kOhms, 50 Ohms, and 75 Ohms.
7. **AGC Freeze**: Enabling AGC Freeze locks the Auto Gain Control value. This will decrease re-sync acquisition time in the event bit lock is lost.

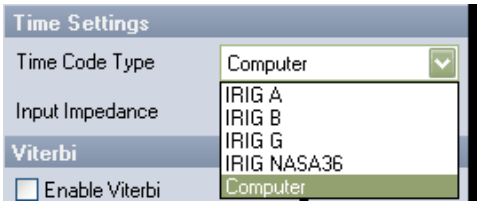
3.1.2 Bit Sync Time Settings

1. **Time Code Type**: The Ulyssix PCM cards provide time stamping of PCM data and offers two main methods for acquiring time described below:

    a. **Computer Time** – Time stamps the header of the data packets transferred from the Ulyssix PCM card to the computer using the computer clock. The Ulyssix PCM card is initialized with computer time during the configuration of the card. The time is then

maintained by the Ulyssix PCM card using an internal clock oscillator that is stable to ± 25 ppm.

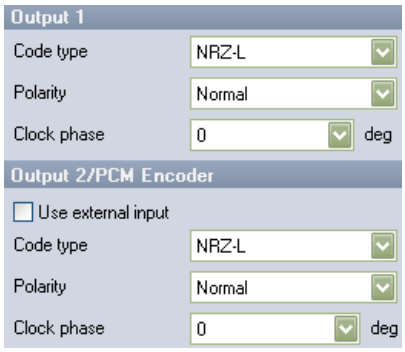
b. **Time Code Reader** – The time code reader in the Ulyssix PCM card will read IRIG-A, IRIG-B, IRIG-G and NASA 36 from an independent input, demodulate the time, and insert the time into the header of the data packets that are transferred to the PC



Note: IRIG Time is sampled at the 1st bit in the Frame Sync Pattern of each minor frame.

3.1.3 Bit Sync Outputs

Ulyssix PCM cards have two independent sets of outputs (clock and data) with the second being a PCM code converter. To configure the output settings:



1. **Code Type**: Select the appropriate code type for the output PCM stream. The codes supported by the hardware include: NRZ-L, NRZ-M, NRZ-S, Bi*-L, Bi*-M, Bi*-S, DM-M, DM-S, RZ, RNRZ 11, and RNRZ 15.
2. **Polarity**: Select Normal or Inverted polarity for the output PCM data stream.
3. **Clock Phase**: Set the output clock phase by an offset of 0, 90, 180, or 270 degrees. This setting will change the relationship of the data with respect to the PCM clock rising edge. The proper setting here will depend entirely on the type of external equipment being attached.

Output 2 / PCM Encoder has an additional option of "Use External Input."

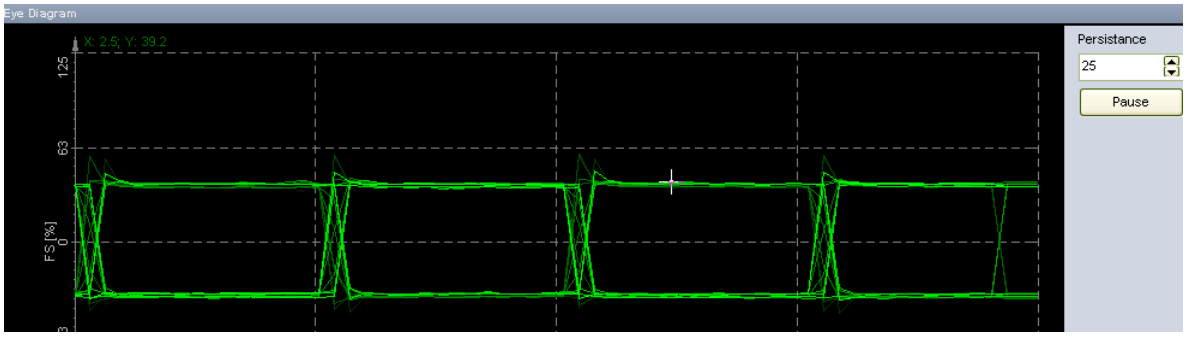
1. **External Input**:
   a. When checked, the input signal used for the code conversion is from a BNC clock and data pair labeled B1 Extern In and B1 Extern Clock. The input code type must be NRZL.
   b. When unchecked, the input signal used for the code conversion is from the Bit Sync

The rest of the settings for Output 2 / Encoder are the same as Output 1.

3.2 Bit Sync Graphical Displays

3.2.1 The Eye Diagram

This display shows the incoming PCM stream in the classic "eye diagram" graph.

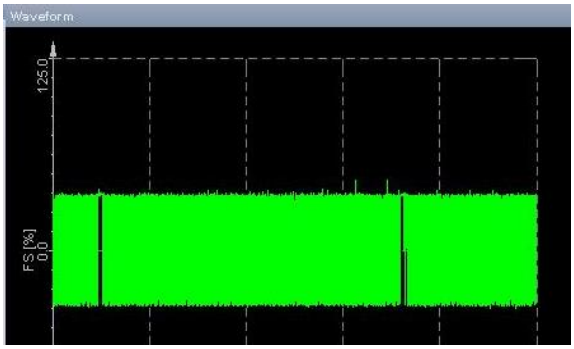


Use the Persistence selector to set how many plots are kept on the screen at once. The default setting is 25 and generally provides the best visual reference. Persistence can be increased to 50 or 100, but it takes more computer memory and time to update the display. The recommended setting for most applications is 25.

Use the Pause button to temporarily freeze the eye diagram for visual study. Press Pause again to resume the display updates.

3.2.2 The Waveform Diagram

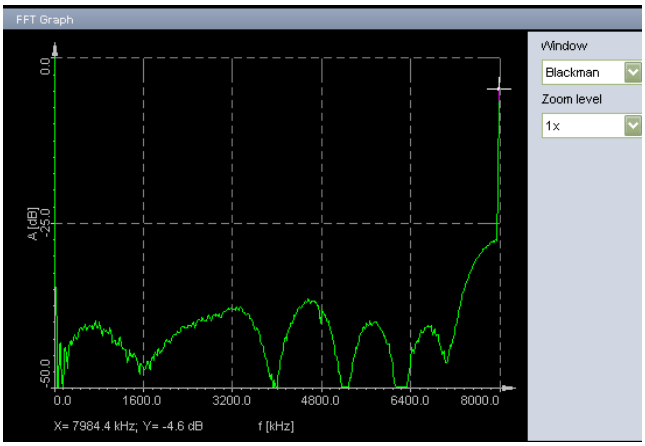
This display shows the incoming PCM stream in a conventional Y/T (amplitude versus time or oscilloscope type) graph, where the amplitude is shown in percentage and time is shown in milliseconds:



Move the mouse over the waveform and the display will calculate the amplitude (vertical Y axis) and time (horizontal X axis), displaying them numerically at the bottom of the graph. The Zoom Level drop down box sets the X-axis zoom. The default value is 1x, but increasing the zoom will show more detail of the PCM input.

3.2.3 The FFT Diagram

This display shows the incoming PCM stream in a FFT (magnitude versus frequency, i.e., FFT/spectral) graph, where the magnitude is shown in decibels (dB) and the frequency is shown in Hertz (Hz, kHz, or MHz).



Move the mouse over the waveform and the display calculates the magnitude in dB (vertical Y axis) and frequency (horizontal X axis) while displaying them numerically at the bottom of the graph.

Select the Window type for the FFT display and the Zoom level from the drop-down menu.

Rectangular does not influence FFT decomposition. The other selections are industry standard algorithms used for biasing the lobes of the FFT analysis in order to improve the calculations based on different signal types. It is beyond the scope of this manual to describe the different FFT windowing types and their purposes. The DEWESoft manual does include such an overview in the appendix section for reference. Please refer to that manual for more information.

3.2.4 The Reference Bar

The Reference Bar is located in the bottom left hand corner of the bit sync setup screen. The Reference Bar is also shown in other setup screens related to the Ulyssix PCM card.

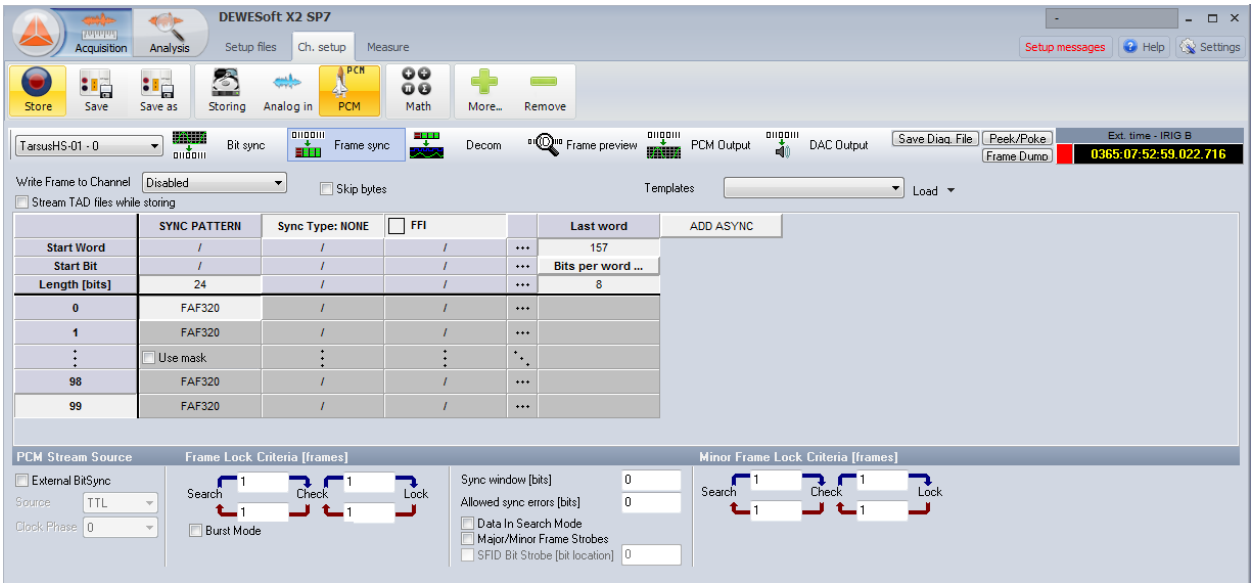
1. **Info ON/OFF** – Indicates which stream is being monitored.
2. **Bit Rate**– Shows the bit rate for the selected stream.
3. **Signal Strength**– Shows the strength as a percentage for the selected stream.
4. **Bit Sync**– Shows the selected stream signal status - Lock or Loss.
5. **Polarity**– Shows the current polarity (Normal or Inverted) for the selected stream.

Info ON/OFF	Bit rate	Signal strength	Bit sync	Polarity	Bit slips	Frame	Sub frame	SFID	FFI
Main stream	2304000	100.0 %	Lock	Normal	0	Lock	/	/	/

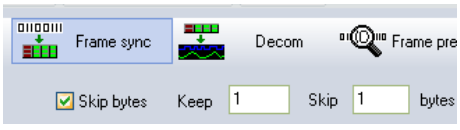
The headers in the Reference Bar are selected by left clicking. The background of a selected header changes from light gray to dark gray. Selected channels are available for use in the Measure screen in a digital meter, status display, tabular display, or recorder window. Please see Section4Configuring Widgets and Storing Data for more details.

3.3 Configuring the Frame Sync

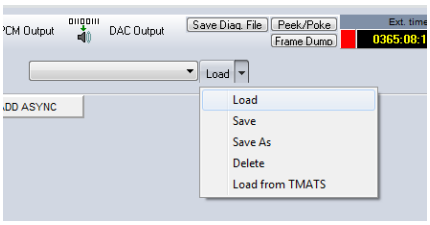
Go to the Channel Setup tab and select the Frame Sync from the PCM Plug-In toolbar. Use this screen to define the framing of data within the PCM stream. The settings for the Frame Format Indicators (FFI) and Asynchronous Embedded Frames are also included on this screen.



1. **Write Frame to Channel**–Used in conjunction with the Chapter 10 Plug-In. There are three formats are available to record PCM data to Chapter 10. (Chapter 10 recording capability requires an additional license):
    a. **Disabled**– Select if not using Chapter 10 or Chapter 10 is inactivated.
    b. **Unpacked Mode**– To save Chapter 10 in unpacked mode.
    c. **Packed Mode** – To save Chapter 10 in packed mode.
    d. **Throughput Mode**– To save Chapter 10 in throughput mode.
2. **Stream TAD Files While Storing** – Archive data to the hard drive in a TAD (Tarsus Archive Data format) format file while DEWESoft is storing data. This is commonly used to create raw TAD files from incoming data for playback out of the Archive Simulator.
3. **Skip Bytes** – Check the Skip Bytes box if a section of the PCM data should be ignored. Set the number of bytes to Keep and Skip. The byte count starts at the first byte in the frame sync pattern.

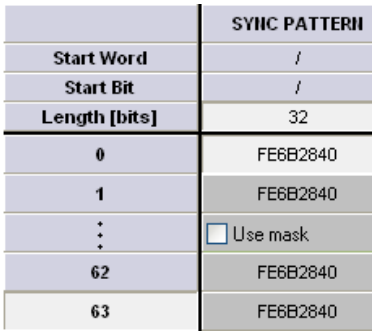


4. **Templates** – Commonly used frame configurations for the frame sync. If a template is available under the selector, simply choose it and click Load to make it active. New templates can also be added.



To find another template to load, click the down arrow connected to the Load button and a submenu will appear to Load, Save, Save As, or Load from TMATS (Telemetry Attributes Transfer Standard).

3.3.1 Configuring the Major Frame

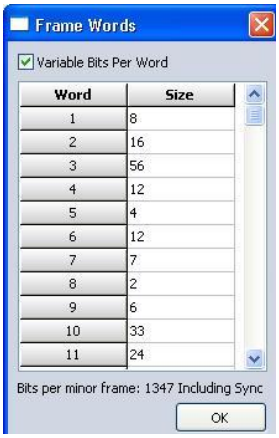


This section describe show to set-up the major frame:

1. **Sync Pattern Length [bits]** – Defines the total number of bits in the Frame Sync Pattern. Valid range is 16-bits to 64-bits. In the example to the right, the Frame Sync Pattern Length is 32-bits. To change this value:
    a. If using IRIG Standard Frame Sync Patterns, the hexadecimal value automatically fills in when the Length [bits] field is changed. For example, enter 20into Length [bits] and when you click into another field, the Frame Sync Pattern will update to EDE20.
    b. If using non-IRIG Standard Frame Sync Pattern, enter the Frame Sync Pattern Length [bits] first and then enter the correct Frame Sync Pattern.
2. **Use Mask** – When checked, the Ulyssix PCM card frame sync ignores certain bits of the Frame Sync Pattern. To use mask, follow below:
    a. Enter a mask value using the following logic rules: Logic low, or '0,' bits are kept and logic high, or '1,' bits are ignored. For example:
    Sync word size: 32-bits
    Sync Pattern: FE6B2840 (in hexadecimal)
    Mask Value: 0000F000 (in hexadecimal)
    Result: FE6Bx840 where the bits in 'x' are ignored.
    b. This example will cause the Frame Sync circuit to ignore bits twelve through fifteen during sync detection. Any value in the PCM stream located where the "2" in the FE6B2840 pattern will cause a valid frame lock.
3. **Number of Minor Frames** – At the bottom of the first column there is entry for the number of minor frames per major frame. This entry assumes that the minor frame starts counting at zero. In the image above, the number of minor frames per major frame is 64 and the entry is 63.
4. **Last Word** – Enter the word number of last word in the minor frame. The example to the right shows 160. The value of the Last Word is based on the on the configuration of the PCM Plug-In. Please see Word Count in Section 2.3.2PCM Plug-In Settings

for more details.

5. **Bits Per Word** – Enter the common word size in Bits Per Word. This is the typical number of bits in a word in the frame. In the example above, the Bits Per Word is 8.
6. **Variable Bits Per Word**– Allows each word to have a different bit length. To enter Variable Bits Per Word, double click on the label "Bits per word…" and the Frame Words window will open. Select the Variable Bits Per Word checkbox and then enter the Size for each Word Number. At the bottom of the Frame Words window there is a running total of total bits using in the frame. When complete click OK.



3.3.2 Configuring the Sub-Frame Sync

A sub-frame synchronization pattern is added to the minor frame so the decommutator can distinguish subcommutated words. The Ulyssix PCM hardware has three different Sub-Frame synchronization methods: Sub-Frame ID counter (SFID), Frame Code Complement (FCC) or No Minor Frame Sync (None).

The Frame Code Complement (FCC) pattern inverts the frame sync pattern of the first minor frame in a sub-frame. The pattern exhibits the same correlation properties as the true pattern. Therefore, minor frame sync lock is not compromised.

The most common sub-frame sync method is Sub-Frame ID counter (SFID). The SFID occupies a word in each minor frame. Typically, the SFID is first word and the Frame Sync Pattern. The SFID counts minor frames. The SFID counts between a starting value and an ending value. The counting can be ascending or descending. The SFID value allows the decom to identify the minor frame number and decommutate subcommutated words.

To configure the Sub-Frame Sync using SFID, follow the steps below:

	SYNC PATTERN	Sync Type: SFID	☐ FFI
Start Word	/	3	/
Start Bit	/	15	/
Length [bits]	32	16	/
0	FE6B2840	0 Up	/
1	FE6B2840	1	/
⋮	☐ Use mask	☑ MSB bit ord	⋮
98	FE6B2840	98	/
99	FE6B2840	99	/

1. **Sync Type** – The first row in the third column contains the selection for the Sync Type:
   a. **None** – no Sub-Frame Sync is used.
   b. **SFID** – a sub-frame counter is used as the Sub-Frame Sync.
   c. **FCC** – Frame Code Complement is used for the Sub-Frame Sync.

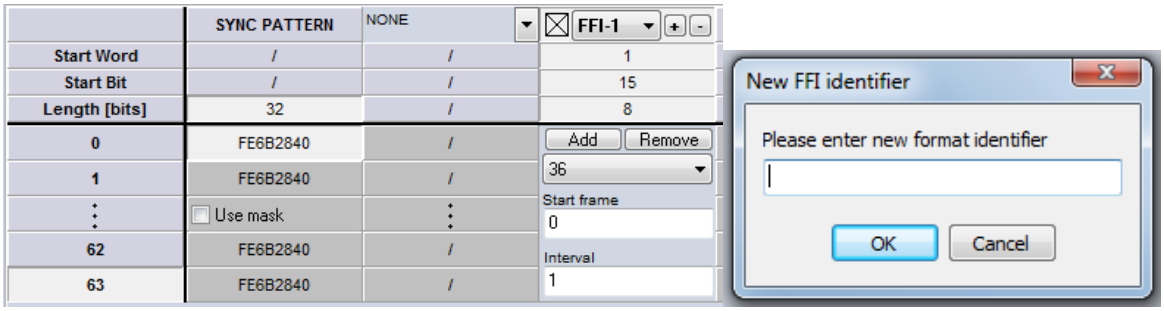
2. **SFID Start Word** – The word location of the SFID in the frame. For example, if you have a 32-bit frame sync pattern with 16-bit words and the SFID is the first word after sync, then the start word is 3. Please see Word Count in2.3.2PCM Plug-In Settings for a reference on how to configure DEWESoft's counting words in the frame.
3. **Start Bit** – Enter the bit where the SFID starts in the SFID word. Please see Bit Index in 2.3.2PCM Plug-In Settings on how to configure DEWESoft's counting bits in a word.
4. **Length [bits]**– Total number of bits in the SFID word.
5. **Start Minor Frame Number** – The Start Minor Frame Number is located directly below the Length [bits]. This defines the beginning of the minor frame counter. The Start Minor Frame Number is typically 0.
6. **SFID Word Order** – The SFID Word Order is controlled by a button next to the Start Minor Frame Number. The button will display either "Up" or "Down." Clicking on the button toggles between the two values. Up counts from the Start Minor Frame number to the Number of Minor Frames plus the Start Minor Frame Number. Down counts from the Number of Minor Frames plus the Start Minor Frame Number to the Start Minor Frame Number. In the example above, Up would count from 0 to 99 and Down would count from 99 to 0.
7. **MSB Bit Order** – When checked the SFID is expected to be in Most Significant Bit (MSB) first order. When uncheck, the SFID is expected to be in Least Significant Bit (LSB) first order. In the example above, MSB would count 0000, 0001, 0002, etc. (in hexadecimal) and LSB would count 0000, 8000, 4000, etc. (in hexadecimal).

3.3.3 Frame Format Identifier

A Frame Format Identifier (FFI) word allows the decom hardware to identify a unique pattern in the PCM stream and perform a format switch. A good explanation of this feature is defined by IRIG as: *"…change with regard to frame structure, word length or location, commutation sequence, sample interval, or change in measurement list. Format changes shall occur only on minor frame boundaries. Bit synchronization shall be maintained, and fill bits used instead of intentional dead periods. Format changes are inherently disruptive to test data processing; fixed format methods are preferred*." **IRIG 106-04 Part I, page 4-6**

DEWESoft supports multiple FFI in a minor frame. Each FFI has multiple FFI values. If the PCM frame has one or more FFIs, click the FFI box to mark it with an X. The New FFI Identifier window will appear. Enter the first FFI value for the FFI. On the top line of the display, there is the FFI Drop Down Box to select which FFI to edit. The plus and minus buttons add new FFIs for the PCM Frame. To add values to a FFI, select the desired FFI in the FFI Drop Down box and then click the Add button.

Note: In this document a FFI is a frame location of the frame format identifier. A FFI Value is the specific value of a FFI that causes the parameter to change.

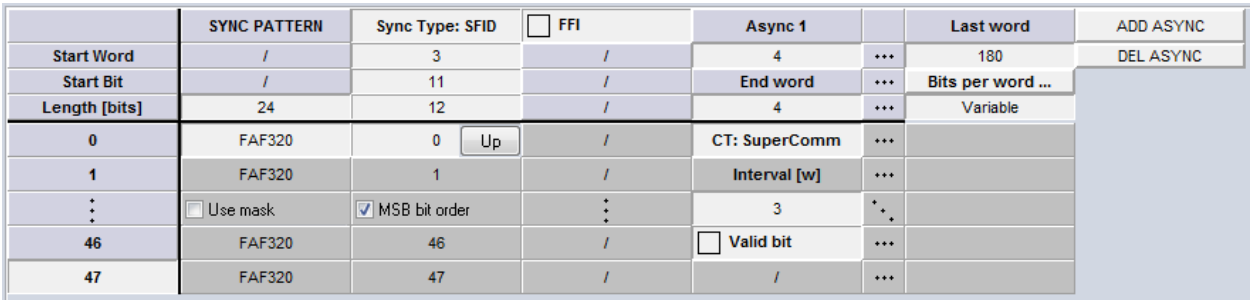


1. **FFI Checkbox**– Enables and disables the FFI. When checked, the New FFI Identifier window appears requesting the new FFI value. The FFI value is the value of the FFI word in the frame. Enter the integer value of the FFI, 36in the example above, and click OK to set the FFI value.
2. **FFI Drop Down Box** – If there are multiple FFIs, allows the selection of the list of FFIs.
3. **+ Button** – Adds a new FFI location in the frame. This is used with the multiple FFI feature.
4. **– Button** – Removes the selected FFI location. This is used with the multiple FFI feature.
5. **Start Word** – The word number for the FFI. In the example above the value is 3. Please see Word Count in 2.3.2PCM Plug-In Settings for a reference on how to configure DEWESoft's counting words in the frame.
6. **Start Bit** – Enter the first bit of the FFI in the Start Word. In the example above the value is 7. Please see Bit Index in 2.3.2PCM Plug-In Settings on how to configure DEWESoft's counting bits in a word.
7. **Length [bits]** – Enter the length, in bits, of the FFI. In the example above the value is 8.
8. **Add** – Adds a new value for the selected FFI. The new FFI Identifier window will appear for the entry of the new the FFI value. When more than one FFI value exist, use the drop-down box to choose among them and edit their properties.
9. **Remove** – Removes the value for the selected FFI currently selected in the FFI Value Drop Down Box.
10. **FFI Value Drop Down Box** – Selects the FFI value for the Start Frame and Interval properties.
11. **Start Frame** – Enter the minor frame in which the FFI starts. In the example above, FFI starts in the first minor frame so the value entered is 0.
12. **Interval** – Enter the number of minor frames that before we see FFI again. In the example above the Interval is 1. The FFI is in every minor frame. If the Interval is 100, the FFI would be in every 100^{th} minor frame.

3.3.4 Configuring an Asynchronous Embedded PCM Stream

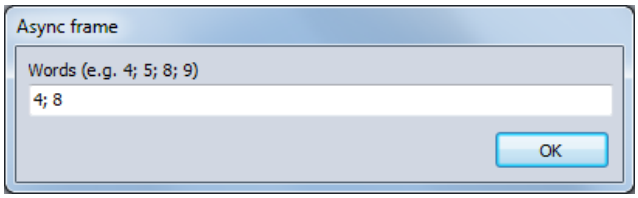
An Asynchronous Embedded PCM stream is a unique PCM stream contained in words in the main PCM stream. The embedded stream has no defined correlation to the main stream. The embedded stream frame sync pattern could appear in the main PCM stream word that is part of the Asynchronous Embedded Data Stream. DEWESoft collects these words from the main PCM stream and concatenates them into a data stream that is fed into a software frame synchronizer. The Asynchronous Embedded PCM stream has its own Frame Sync settings.

1. **Add Async** – Adds a new Asynchronous Embedded Data Stream to the Frame Sync Controls button.
2. **Del Async** – Removes the last added Async Embedded Data Stream. Note, DEWESoft only allows removal of the last Async Embedded Data Stream.

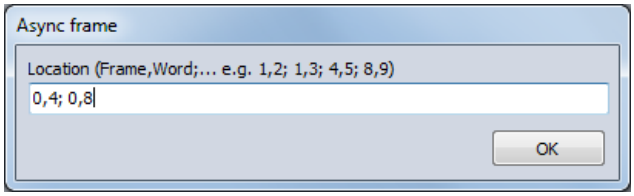


To add an Asynchronous Embedded Data Stream to the main PCM data stream, click the Add Async button in at the end of the Frame Sync controls. A new column of controls appears next to the FFI. The Asynchronous Embedded Data Stream is defined by a Start Word, an End Word, a Commutation Type, and an Interval. There are typically three categories of Asynchronous Embedded Data Streams: Block, Sample, and Hybrid. In Block Asynchronous Embedded Data Streams, the Asynchronous Embedded data occupies consecutive words. In Sample Asynchronous Embedded Data Streams, the Asynchronous Embedded data is defined by a start word but is commutated using standard telemetry commutation schemes. In Hybrid Asynchronous Embedded Data Streams, the Asynchronous Embedded data is a block but is also commutated like a Sample Asynchronous Embedded Data Stream.

1. **Start Word**– Defines the first word in the Asynchronous Embedded Data Stream. This control located under the "Async" heading. In the example above, the value is 4.
2. **End Word** – Defines the last word in the Asynchronous Embedded Data Stream.
3. **CT (Commutation Type)** – Selects the commutation type for the Asynchronous Embedded. The options are Normal, SuperComm, SubComm, Random Normal, or Random. Selecting SuperComm or SubComm requires entering the Interval. Selecting Random Normal or Random requires entering the word locations.
4. **Interval** – Only appears for SuperComm and SubComm. For SuperComm, the Interval defines the number space between the super commutated words. If the Async Start Word is 4 and the Async interval is 4, then the Asynchronous Embedded words in each frame would be 4, 8, 12, etc. For SubComm, the Interval defines the number of minor frames between sub commutated words. If the Async Start Word is 4 and the Async interval is 4, then the Asynchronous Embedded words would be in Word 4 in minor frames 0, 4, 8, etc.
5. **Setup** – Only appears for Random Normal and Random. Clicking the Setup button launches the Async Frame window. The Async Frame windows expects the input of the minor frame and word locations of the Asynchronous Embedded Data Stream.
    a. For Random Normal the Async Frame windows expects each entry to be a Word Number followed by a semicolon. The last value does not have a semicolon after it.



b. For Normal the Async Frame windows expects each entry to be a Minor Frame Number and Word pair. The Word Number is followed by a comma and the Minor Frame Number is followed by a semicolon. The last Minor Frame Number does not have a semicolon after it.

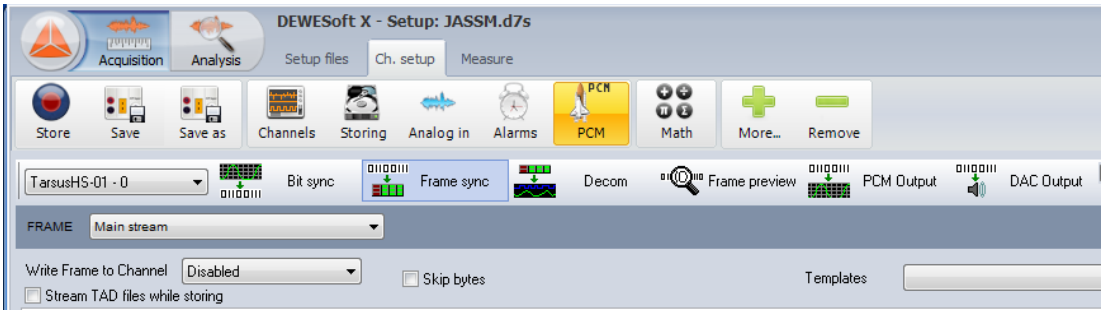


6. **Valid Bit**– When checked box, TTC Sync Valid bit is enabled.

Note: When an Asynchronous Stream is created, a row of Sync indicators for that stream will be added below Main Stream in the Hardware Status bar (shown below).

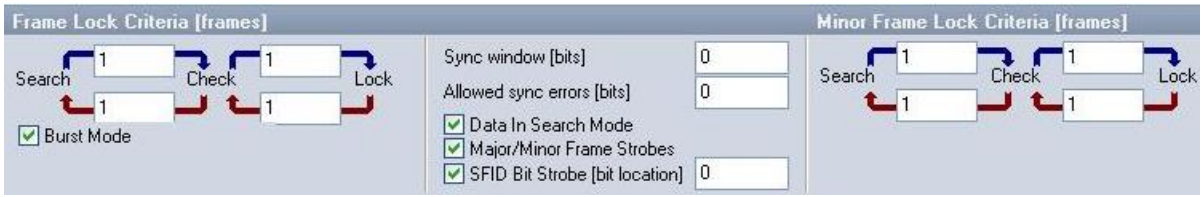
Info ON/OFF	Bit rate	Signal strength	Bit sync	Polarity	Bit slips	Frame	Sub frame	SFID	FFI	Overload
Main stream	0	0.0 %	Loss	Normal	0	Search	/	/	/	OVL
Async 1					0	Search	/	/	/	OVL
Async 2					0	Search	Search	0	/	OVL
Async 3					0	Search	/	/	/	OVL

Note: To setup each Asynchronous Embedded PCM Frame Sync, select the desired Async in the drop-down box located next to Frame (shown below).



3.3.5 Frame Lock Criteria

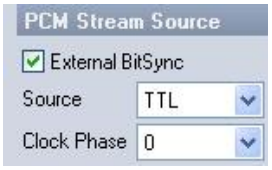
The Frame Lock Criteria sets the required number of successful consecutive frame sync patterns that the hardware finds before changing the frame sync status. There are settings for both the Frame lock and Minor Frame Lock. There are settings for Search →Check then from Check →Lock and the allowed transitions the hardware requires before changing the frame status from Lock →Check and Check →Search. These must be integers representing a number of frames and normally low values are used. The default value for each transition is one. Additional frame lock criteria configuration settings include:



1. **Sync Window [bits]**- The number of allowed bit errors in the total number of bits per minor frame. This setting is also called Bit Slips.
2. **Allowed Sync Error [bits]** – The number of bit errors allowed in the frame sync pattern while the frame sync remains locked to the data.
3. **Data in Search Mode** – Forces the Ulyssix PCM card to process frame synced data regardless of Frame Lock Status.
4. **Major/Minor Frame Strobes**– When selected, a strobe comes out of the B1 Out2 BNC on the pigtail connector at the beginning of each minor frame. A strobe comes out the B1 CLK2 BNC at the beginning of each major frame.
5. **SSFID Bit Strobe [bit location]**– Sets the bit location within the minor frame to output the minor frame strobe.
6. **Burst Mode**– Burst Mode is used when expecting a limited number of minor frames. This allows quicker archiving of frame data to the hard drive than normal mode. Burst Mode begins archiving data directly after the minor frame sync pattern is recognized. The number of bits in the minor frame is ignored and data will continue to archive as long as the minor frame sync pattern is detected. (This is the same as setting the Frame Sync Criteria to 0 for Search to Check and 0 for Check to Lock, as well as, going out of Lock through Check and Search.)

3.3.6 PCM Stream Source

PCM Stream Source selects the source of clock and data going into the frame sync. To use the Ulyssix PCM card's internal bit sync, uncheck the External Bit Sync box. To use bit synced PCM data from an external source (where clock and data come externally through the input BNC's), check the External Bit Sync checkbox, select the Source from the drop-down box (TTL or RS422), and Clock Phase (0 degrees or 180 degrees).



3.4 Configuring the Decom

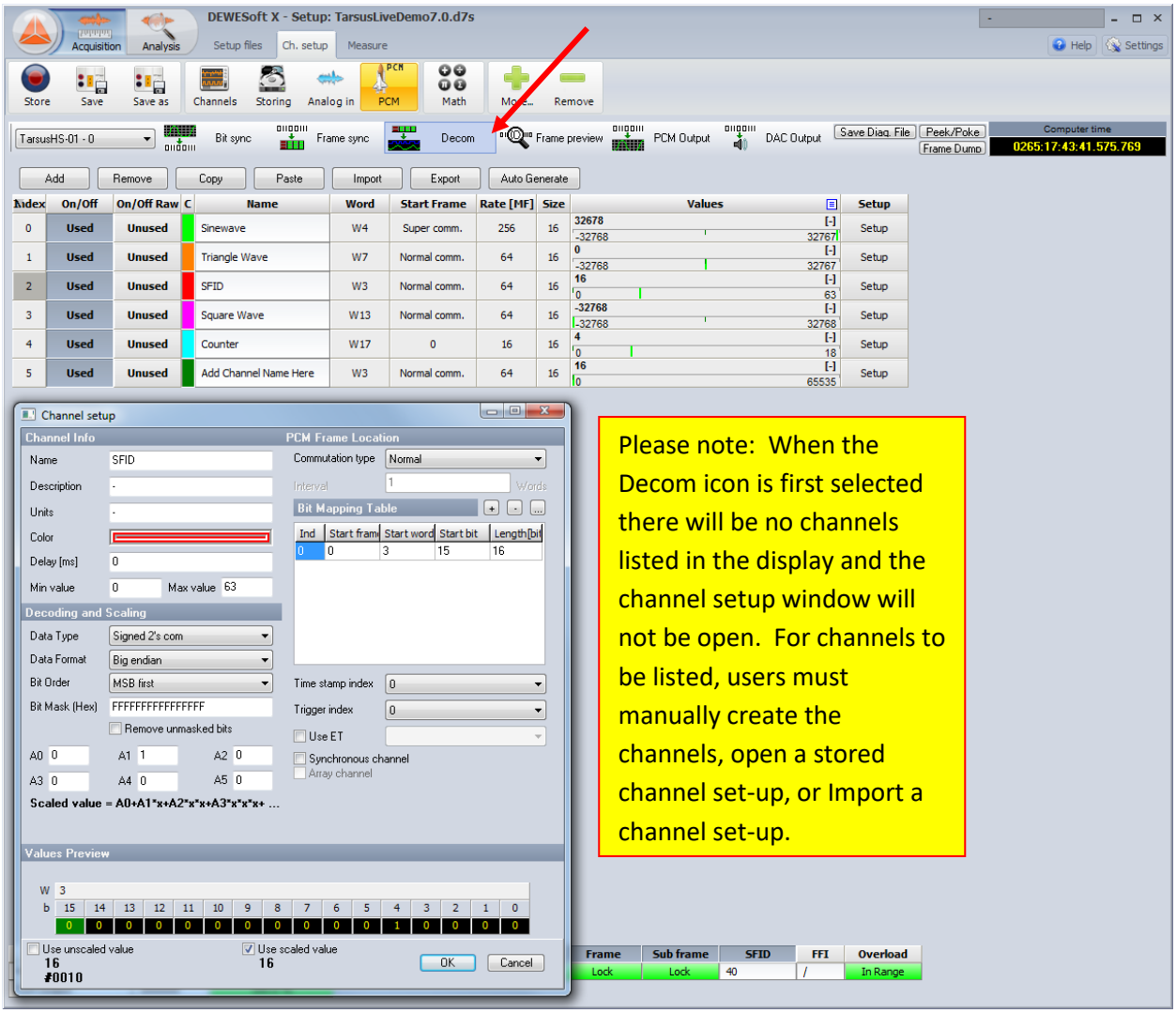
Decommutating PCM data is a combined effort of the Ulyssix PCM hardware and the DEWESoft PCM Plug-In. This section describes how to setup the software to extract decom parameters from a PCM stream so that they can be identified, combined, and processed for visualization and analysis.

If the system has multiple Ulyssix card, each card can be selected by using the drop-down menu in the upper left-hand corner of the Decom display. Each card is set up independently. In the image above, "TarsusHS-01 0" is selected.

Add or Edit channels using the following buttons:

1. **Add** – Creates a new decom parameter.
2. **Remove** – Deletes the selected decom parameter

3. **Copy** – Copies the selected parameter to the Windows clip board. Copy is often used to copy parameters to the Decom setup of other Ulyssix PCM cards in the system.
4. **Paste** – If the Windows clipboard contains a decom parameter, paste will add this parameter to the parameter list.
5. **Import** – Adds decom parameters from a file. Multiple input formats are available. For more information on importing parameter lists, go to 3.4.1Importing Parameter Lists.
6. **Export**– Saves the current parameters to a CSV file. The export does not contain FFI information for the parameters.
7. **Auto Generate** – Creates normally commutated parameters for every word in a minor frame using the Bits Per Word or Variable Bits Per Word information from the Frame Sync tab. For specific channel configurations, the user must enter the channel setup to make changes.

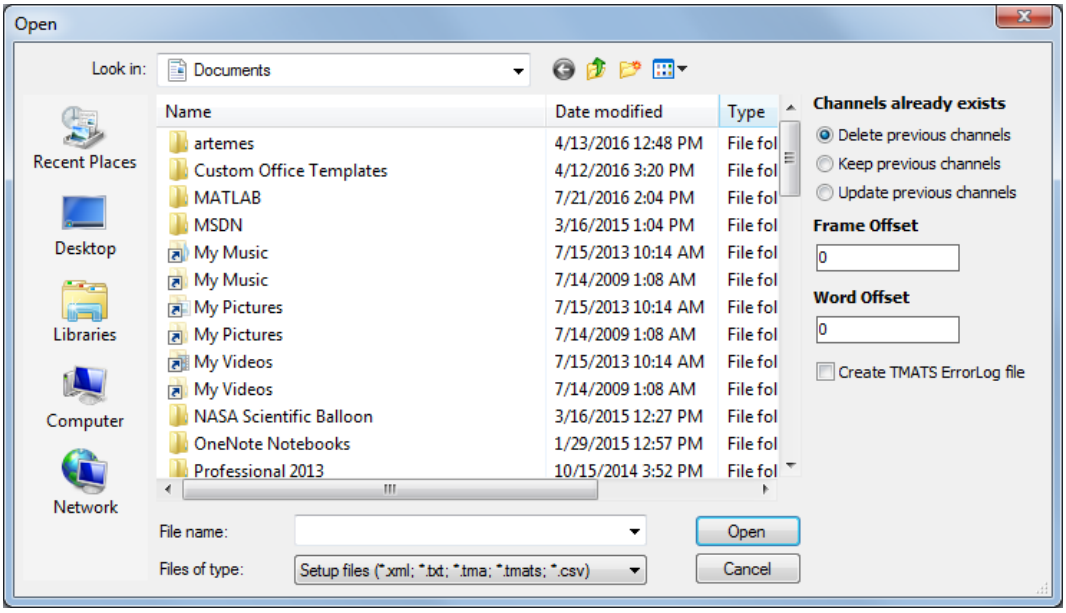


Please note: When the Decom icon is first selected there will be no channels listed in the display and the channel setup window will not be open. For channels to be listed, users must manually create the channels, open a stored channel set-up, or Import a channel set-up.

3.4.1 Importing Parameter Lists

The DEWESoft PCM Plug-in supports importing of decom parameter from a file for easy channel setup and configuration. To import a parameter setup file, follow the steps below:

1. Go to Channel Setup, press the PCM icon, and then select the Decom icon.
2. Press the Import button and the Open window will appear. The following setup files types are supported:
    a. **XML files** (*.xml) – Ulyssix TarsusPCM / Altair software suite .xml setup files.
    b. **Text files** (*.txt) – NASA specific text files (contact Ulyssix for file format).
    c. **TMATS files** (*.tma, *.tmats) – Chapter 10 TMATS files.
    d. **CSV files** (*.csv) – DEWESoft decom export .csv files.
3. DEWESoft has three options for conflicts between existing decom parameters and decom parameters in the import file:
    a. **Delete Previous Channels**– Overwrite duplicate decom parameters with the parameters from the import file.
    b. **Keep Previous Channels** – Duplicate decom parameters from the import file will not be added. The original parameter will remain.
    c. **Update Previous Channels** – Update previous decom parameters with the changes from the import file.
4. The import has the following options:
    a. **Frame Offset**– This number is added to the frame number for each parameter in the import file. This is useful to correct issues like if the first minor frame is considered Frame 0 or Frame 1.
    b. **Word Offset** – This number is added to the word number for each parameter in the import file. This is useful to correct issues like if the first word after the frame sync pattern is considered Word 1 or Word 4.
    c. **Create TMATS Error Log File**– Created a log file following the TMATS standard.
    d.



Note: After an import, press the Frame Preview icon to view where the start word is located. This may be different than the Word Count setting located in Settings, Extension, Plug-In, PCM, and General Settings tab. If the start word is not correct, press the Index button in the Decom window to select all channels and press Remove. This will clear all parameters. Then re-import the parameter list adjusting the Word Offset value to obtain appropriate word alignment.

3.4.2 Decom Parameter Configuration

Defining decom parameters, often called channels, is one of the most impressive features of DEWESoft. Decom parameters define how raw data is extracted out of the PCM frame, scaled or processed, and visualized. The first step to display PCM using DEWESoft's visualization and analysis tools is to define the decom parameters.

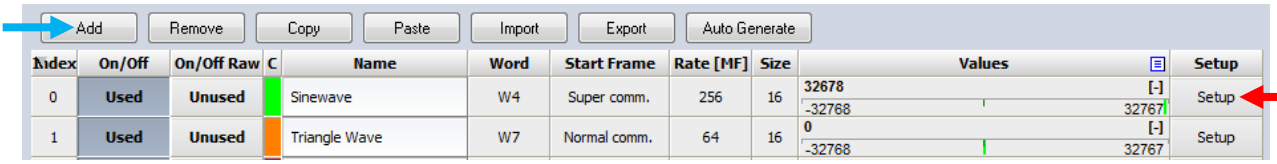
The Decom Parameter Table includes column headers and a row for each decom parameter. To sort the rows, left click on the column header. For example, to sort the decom parameters by their name, left click on the "Name" column header. Please note that DEWESoft only sorts from ascending order, starting with the lowest value at the top of the display. The Columns in the Decom Parameter Table:

Index	On/Off	On/Off Raw	C	Name	Word	Start Frame	Rate [MF]	Size	Values	Setup
0	Used	Unused		Sinewave	W4	Super comm.	256	16	-26789 [-] -32768 32767	Setup
1	Used	Unused		Triangle Wave	W7	Normal comm.	64	16	14335 [-] -32768 32767	Setup
2	Used	Unused		SFID	W3	Normal comm.	64	16	41 [-] 0 63	Setup
3	Used	Unused		Square Wave	W13	Normal comm.	64	16	32767 [-] -32768 32768	Setup
4	Used	Unused		Counter	W17	0	16	16	10 [-] 0 18	Setup
5	Used	Unused		New1	W3/B-1	Normal comm.	64	8	0 [-] 0 255	Setup
6	Used	Unused		New2	W10/B-1	Normal comm.	64	8	19 [-] 0 255	Setup

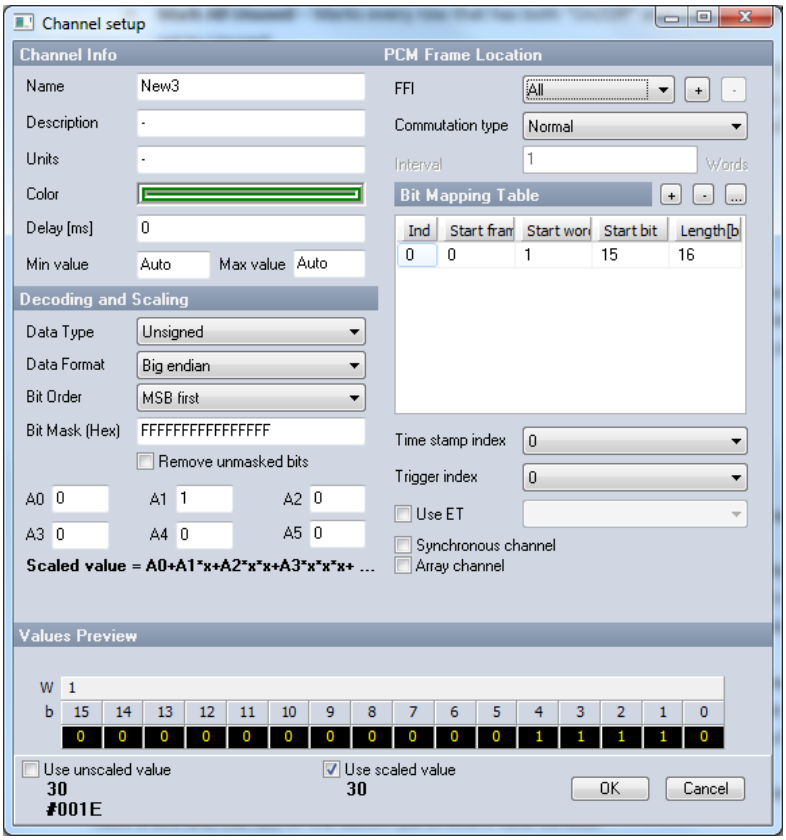
1. **Index** – A number assigned to the decom channel when it is added. The index starts with channel 0 and counts up. The index values are always consecutive. When a decom parameter is removed, the indexes of the flowing decom parameters are updated to fill the missing number. Right clicking on the Index column header brings up a menu that allows different selections of rows:
    a. **Mark All** – Selects every row.
    b. **Unmark All** – Deselects every row.
    c. **Invert Markings** – Changes selected rows to deselected and deselected rows to selected.
    d. **Mark All Used** – Marks every row that has either the "On/Off" or "On/Off Raw" column set to Used.
    e. **Mark All Unused** – Marks every row that has both "On/Off" and "On/Off Raw" columns set to Unused.
2. **On/Off** – Defines if the decom parameter is enabled for use in the Measure screen. This column toggles between "Used" and "Unused." To change the value of the "On/Off" column, left click on the cell. Right clicking on the On/Off Column brings up a menu to change the "On/Off" status:
    a. **Select All** – Sets all of the rows to Used.
    b. **Deselect All** – Sets all of the rows to Unused.
    c. **Select** – Sets the marked (selected) rows to Used.
    d. **Deselect** – Sets the marked (selected) rows to Unused.
3. **On/Off Raw** – Same function as the On/Off column, except this controls if the raw decom parameter is enable for use in the Measure screen. The raw decom parameter is value extracted from the PCM stream before any scaling factors are applied. Right clicking on the On/Off Column brings up a menu to change the "On/Off" status:
    a. **Select All** – Sets all of the rows to Used.
    b. **Deselect All** – Sets all of the rows to Unused.
    c. **Select** – Sets the marked (selected) rows to Used.
    d. **Deselect** – Sets the marked (selected) rows to Unused.
4. **Name** – The name assigned to the parameter. Each parameter must have a unique name. Left clicking on the Name cell allows the user to edit the name.
5. **Word** – The Word Number assigned for the decom parameter. If the value for the Word ends with "B/-1" that indicates that the decom parameter is not using the exact bits in the word. The decom parameter is either a subset of the bits in the word or includes bits in other words. In the image above, Index 5 and Index 6 are examples.
6. **Rate [MF]** – The number of times that the decom parameter occurs in the major frame. A normal commutation word will have the value of the number of minor frames. In the image above, SFID is a normal commutated word and there are 64 minor frames. The value for Rate [MF] is 64.
7. **Size** – The number of bits in the decom parameter. In the image above, Index 5 and Index 6 have 8-bits and the rest of the decom parameters have 16-bits.

8. **Values** – This is a display showing the sampled values for the decom parameter. The range of the display is set by the Max Value and Min Value of the decom parameter. See below about the Channel Setup window for more details.
9. **Setup** – This button launches the Channel Setup window for the decom parameter.

Note: To select a group of consecutive decom parameters, left click on the Index number of the first parameter, hold the Shift key, and then click on the last decom parameter. To select a group of non-consecutive decom parameters, hold down the Control and left click on each desired decom parameter. Once the decom parameters are selected, right mouse click on the Index, On/Off, or On/Off Raw column heading box and choose either Select or Deselect.



To add a new decom parameter, click the Add button (shown in picture below with light blue arrow). This will launch the Channel Setup window. If a channel already exists, press the Setup button on the main form (shown below with red arrow) to launch the Channel Setup window. Many of the entries in the Channel Setup window are options. These entries are marked as Optional below:



Channel Info

1. **Name** – The name can be made up of any combination of characters or symbols. The length of the name can be as long as desired; however, it should be kept small as possible due to screen space limitations when displaying multiple decom parameters in a widget on the Measure screen.

Caution: Decom parameter names cannot be duplicated. The DEWESoft will not allow the decom parameter to be saved with a duplicate name.

2. **Description** – Optional. Enter additional info about the channel.
3. **Units** – Optional. The engineering units for the channel (V, A, degrees, PSI, etc.)
4. **Color** – Color used to display data in a widget on the Measure screen. This will be the color of the line in strip chart or of the text in a digital widget. DEWESoft provides a default color.
5. **Delay (mS)** – The amount of time channel is delayed by the software. The default value is 0mS.
6. **Min Value** – The minimum value for widget in the Measure screen. The default value is Auto and will auto scale the widget in the Measure screen.
7. **Max Value** – The maximum value for widget in the Measure screen. The default value is Auto and will auto scale the widget in the Measure screen.

Note – Min and Max value have no effect on the data being recorded. They only set the default widget scaling.

PCM Frame Location:

1. **FFI** – Defines how the FFI affects the decom parameter. The
    a. **Drop Down** – Selects the FFI to apply the rest of the PCM Frame Location parameters. The FFI and FFI Value pair is added to the drop-down box by using the + Button. Commutation, Interval, and Bit Map / Location Table, etc. can be different for each FFI and FFI Value.
    b. **+ Button** – Launches the New FFI Identifier window. Use this window to select the FFI and FFI value to add to the drop-down box in the PCM Frame Location section of the Channel Setup window.
    c. **– Button** – Removes the selected FFI and FFI value from the drop-down box.
2. **Commutation** – Select one of the following options to set the commutation type for all words used to build the decom parameter:
    a. **Normal** – The decom parameter appears once per minor frame.
    b. **SuperComm** – The decom parameter appears multiple times per minor frame and are uniformly spaced by the Interval.
    c. **SubComm** – The decom parameter occurs once in a minor frame but not in every minor frame. The minor frame spacing is the Interval.
    d. **Random**– The decom parameter can occur in any word in any minor frame.
    e. **Random Normal** – The decom parameter can occur in any word in the minor frame, but the word locations are the same in every minor frame.
3. **Interval**:
    a. For SuperComm channels, the Interval is the number of words between samples.

b. For SubComm channels, the Interval is the number of minor frames between samples.

Bit Mapping Table / Location Table:

Defines how to extract data from the PCM stream and how the data is built into the decom parameter. The name of the table is "Bit Mapping Table" for Normal, SuperComm, and SubComm commutation types. The name of the table is "Location Table" for Random and Random Normal commutation types. The tale can contain one or more entries. Depending on the Commutation Type, each entry has different meaning:

1. For Normal, SuperComm, and SubComm each entry in the Bit Mapping Table is a concatenated into a single decom parameter. This allows bits in separate parts of the frame to be combined into one decom parameter.
2. For Random and Random Normal each entry in the Location Table is an occurrence of the decom parameter. If there are six entries for a Random commutated decom parameter, then that decom parameter occurs six times per major frame. If there are five entries for a Random Normal commutated decom parameter, then that decom parameter occurs five times per minor frame.

Note – Some of the definitions below change based on the selection of the Data Format (Big Endian or Little Endian) and the Bit Order (MSB First or LSB First).

1. **Start Frame** – The minor frame number the decom parameter starts.
2. **Start Word** – The word number in the minor frame that the parameter decom starts.
3. **Start Bit** – The start bit in the first word where the parameter data starts.
4. **Length (bits)**– The number of bits in the decom parameter.
5. **+ Button** – Adds an entry to the table.
6. **- Button** – Removes the last entry to the table.
7. **Time Stamp Index** – When multiple entries in a Bit Mapping Table are concatenated, the decom parameter must be time stamped from only one of the entries. This drop-down box selects the index of the entry for time stamping the decom parameter.
8. **Trigger Index**– When multiple entries in a Bit Mapping Table are concatenated, this drop-down box selects the index of the entry in the Bit Mapping Table that triggers writing the sample to the decom parameter.
9. **ET (Embedded Time)**– Set embedded time in the PCM stream as a decom word. The user can define each BCD time digit to a specific nibble in the PCM word.
10. **Synchronous Channel**– Forces decom parameter to be a DEWESoft Synchronous Channel. DEWESoft Synchronous Channels are influenced by the dynamic acquisition rate.
11. **Array Channel**– Decom parameters that have more than one occurrence in a major frame and are used for special calculations; for example, the Missed Distance Calculations.

Decoding and Scaling:

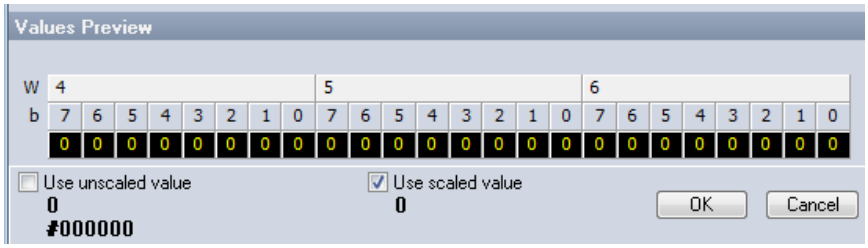
1. **Date Type** - This is how the bits extracted from the PCM stream is represented as a number:
    a. **Unsigned** – The bits are treated data as positive binary values with no sign extension.

b. **Signed 2's Com** – The bits are treated as a Two's Compliment integer that represents both positive and negative values.
c. **Signed 1's Com** –The bits are treated as a Ones's Compliment integer that represents both positive and negative values.
d. **Signed Magnitude** – Most significant bit represents the sign (zero is positive number and one is negative number). Other bits are the same as unsigned.
e. **Float IBM** – Floating point in IBM format.
f. **Float IEEE** – Floating point in IEEE format.
g. **BCD** – Each hexadecimal digit is represented by its own binary sequence. The hexadecimal values are limited to 0-9. Values of A-F are not allowed.
    i. **BCD Template** – Selected the template for breaking up the BCD value.
    ii. **… Button** – Creates a new template or edits the selected template.
    iii. **Time Channel** – Sets this decom parameter as a BCD representation of time, usually in IRIG format.
h. **Offset Binary** – A simple binary count that is offset in order to represent equal magnitude over the positive and negative ranges. The maximum negative value is when all bits are zero. The maximum positive value is when all bits are ones. The mid-range value is zero and is represented by setting the most significant bit to one and all other bits to zero.
i. **UART** – Separating UART formatted data embedded in the PCM stream and output to dedicated UART circuitry on the Ulyssix PCM card. This is a licensed feature.
j. **Video** – Insert embedded time in Video.
k. **Parallel Out** – Output the decom parameter as a 16-bit output with data strobe, frame counter, word counter, and status bits on a 50-pin connector on the TarsusHS card. This is a licensed feature and only available on the TarsusHS card.

2. **Data Format**:
    a. **Big Endian** – The most significant byte of the word is stored in the smallest address given and the least significant byte is stored in the largest.
    b. **Little Endian** – The least significant byte is stored in the smallest address.
3. **Bit Order**:
    a. **MSB First** – The most significant bit is the left most bit.
    b. **LSB First** – The least significant bit is the left most bit.
4. **Bit Mask (Hex)**– Determines which bits to read and which bits to ignore. Logic low, or '0,' bits are ignored and logic high, or '1,' bits are kept.
5. **Scaling values A0, A1, A2, A3, A4, A5** – Scales the decom parameter formatted as the selected Data type by the following formula: where: A0+A1*x+A2*x*x+A3*x*x*x+... Enter as many scaling factor values as needed for the channel and leave the others with zeroes in them.

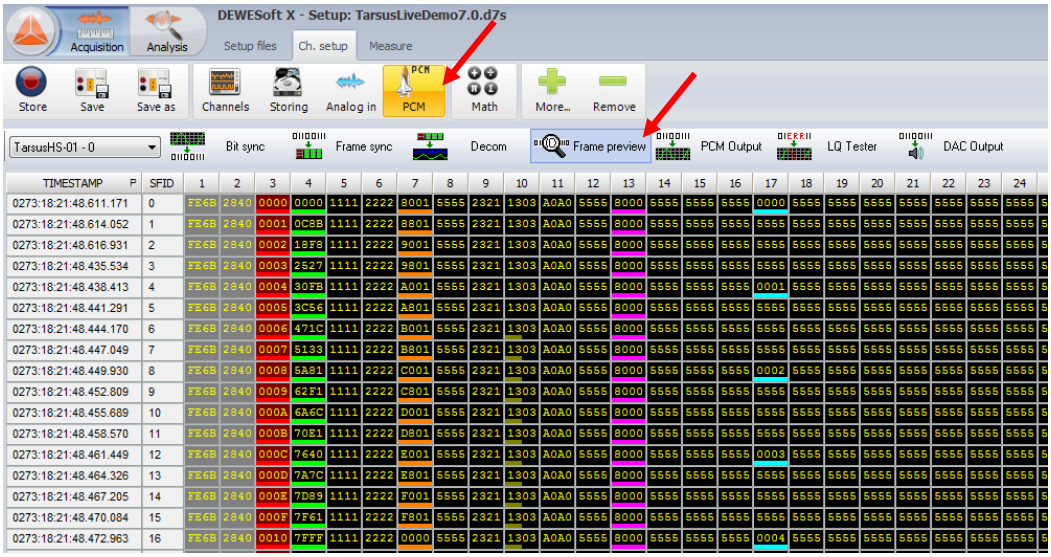
Values Preview:

Displays the output value for the decom parameter as determined by the settings in the Channel Setup window. This display is useful to check that the settings in the Channel Setup window have achieved the desired result for the decom parameter.



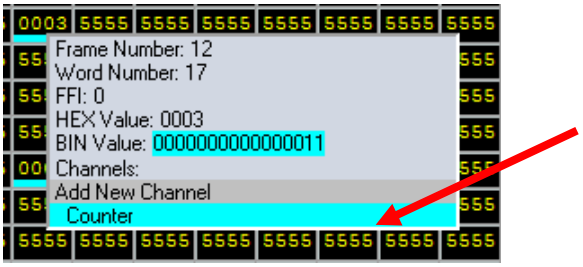
3.5 The Frame Preview

The Frame Preview displays the raw, live, major frame data dump in hexadecimal. The first minor frame with a time stamp starts at the top. The Frame Preview highlights each decom parameter with the color selected in the Channel Setup window. This is a great visualization tool for the major frame location of decom parameters of the different commutation types.



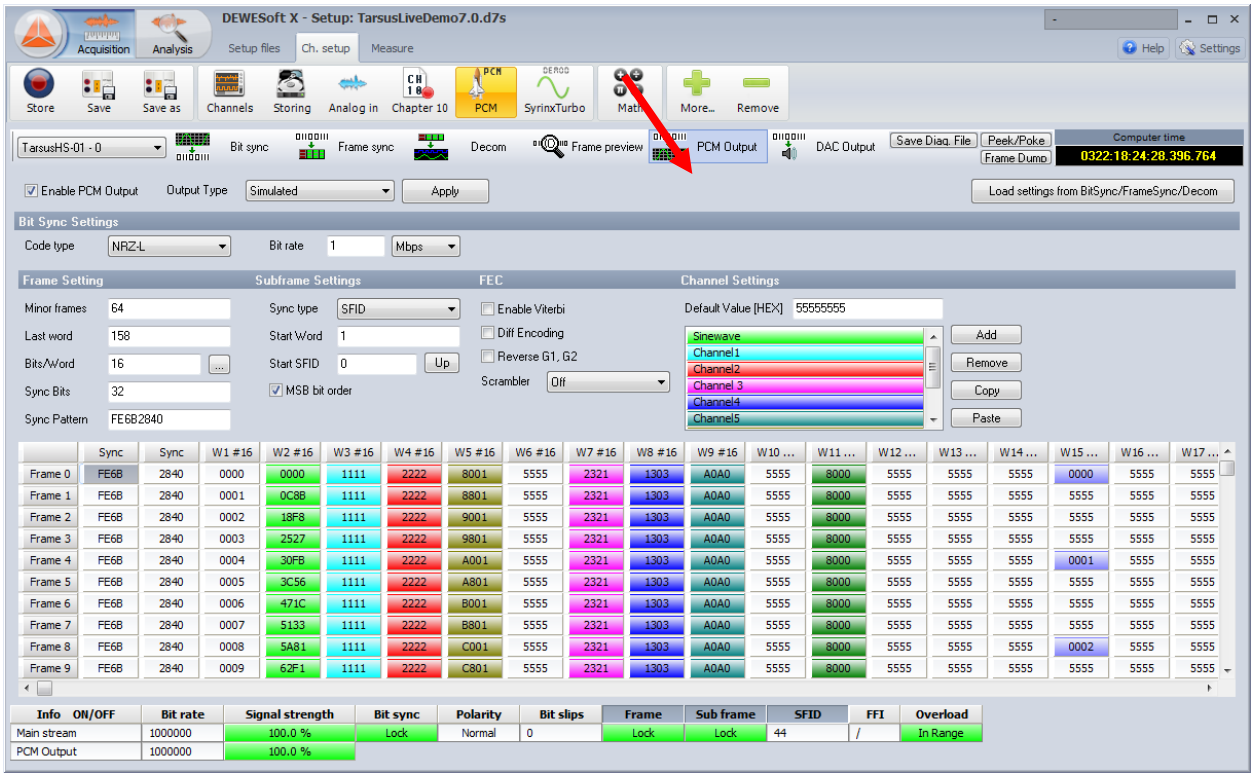
To pause the Frame Preview, click the “P” next the column header “Time Stamp.” Clicking the “P” a second time will resume live data.

Left clicking on a parameter in the frame will show a pop up window with information about the location in the frame and a list of DEWESoft Channels assigned to that location. Clicking on the DEWESoft Channel name will bring up the Channel Setup window for the decom parameter. Clicking on “Add New Channel” will bring up the Channel Setup window for a new decom parameter.



3.6 Configuring the Simulator (PCM Output)

The Ulyssix PCM cards have a programmable Simulator that generates PCM data and clock signals. The data and clock signals are available on both BNC and Trompter connectors on the Ulyssix PCM card pigtail. The simulator has two modes of operation: Simulated Mode that has fixed values and functions (Sine Waves, Triangle Waves and Square Wave). Achieve mode and another mode that plays back previously recorded archived data files.



Note: Changes to the controls on the PCM Output window are only sent to the Ulyssix PCM card when the Apply button is clicked. If the Apply button is not clicked before leaving the PCM Output window, all changes are lost.

1. **Enable PCM Output** – When checked, the data clock signals are generated by the Ulyssix PCM card and available on the connectors on the pigtail. When unchecked, the connectors on the pigtail will not have a PCM or clock signal.
2. **Output Type**:

a. **Simulated** – The Fixed Major Frame Simulator is generated from the entries in the Simulator table in the DEWESoft PCM Output window. The simulator continually repeats the same major frame.
b. **Archived** – The PCM data is read from a file.

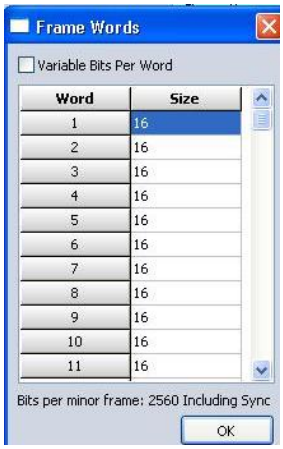
3. **Load Settings from Bit Sync, Frame Sync, Decom** – Clicking this button loads the Bit Sync Settings and Frame Settings from the Bit Sync and Frame Sync tabs. This feature also changes the Channel Settings and overwrites the values in the simulator. It takes the Decom Parameters from the Decom tab and creates a new Channel Setting with the same commutation. The new Channel Setting is always a fixed value type and the value is the word number. In this scenario, the word number is determined by counting at the start of the frame sync pattern as word one.
4. **Apply** – Sends current values of PCM Output settings to the Ulyssix PCM card.
5. **Bit Rate and Bit Rate Units** – Sets the simulator output data rate. Allowed values from 1 bps to 33 Mbps for the TarsusHS card and from 1 bps to 40 Mbps for the Bald Eagle card.
6. **Code Type**– PCM Code Type for the simulator output: non-return to zero level (NRZ_L), non-return to zero mark (NRZ_M), non-return to zero space (NRZ_S), bi-phase level (BIΦ_L), bi-phase mark (BIΦ_M), bi-phase space (BIΦ_S), delay modulation mark (DM_M), delay modulation space (DM_S), return to zero (RZ), randomized non-return to zero pseudo random 11-bit pattern RNRZ_11, or randomized non-return to zero pseudo random 15-bit pattern RNRZ_15.

3.6.1 Configuring Fixed Major Frame for Simulator

Setting up the PCM Output for the Fixed Major Frame (Output Type is Simulated) requires defining many parameters for the frame. These parameters are similar to those entered on the Frame Sync window.

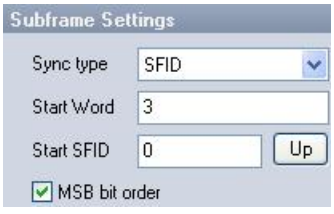
Frame Settings:

1. **Minor Frames** – Enter the number of minor frames per major frame for the simulator.
2. **Last Word** – Enter the number of the last word (total number of words including sync) per minor frame.
3. **Bits/Word** – Enter the number of bits per word if the frame has a common word size. For Variable Bits per Word, press the "…" button to display the Frame Words screen and then enter data into the Variable Bits Per Word.
4. **Sync Bits** – Enter the number of bits in the frame sync pattern.
5. **Sync Pattern** – IRIG standard patterns automatically fill in according to the number of Sync Bits entered above, or use a custom pattern.



Sub-Frame Settings:

1. **Sync Type**:
   a. **None** – Sub-Frame Sync is not used.
   b. **SFID** – A sub-frame counter is used as the Sub-Frame Sync.

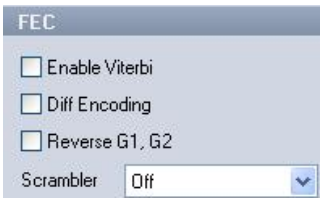


c. **FCC** – Frame Code Complement is used for the Sub-Frame Sync.

2. **Start Word**–Select the word location for the SFID.
3. **Start SFID**– Enter the starting value for the SFID.
4. **Up / Down** – Press the "Up" button to change the SFID order from "Up" to "Down."
5. **MSB Bit Order**– When checked, the most significant bit is the left most bit. When unchecked, the least significant bit is the left most bit.

FEC (Forward Error Correction):

FEC is available with the purchase of an additional license. The Simulator provides Forward Error Correction capabilities by creating a convolutionally encoded G1, G2 serial data stream.



1. **Enable Viterbi** – Select to enable the convolutional encoder.
2. **Diff Encoding** – Select to output convolutionally encoded NRZ-M data. When not selected, the encoder outputs NRZ-L data.
3. **Reverse G1, G2** – Select to transmit G2 as the first encoded bit instead of G1.
4. **Scrambler** – Use the drop-down box to select a scrambling algorithm: OFF, CCITTV.35 (currently known as V.36), INTELSAT or G2INV (G2 inversion – inverts the G2 data stream).

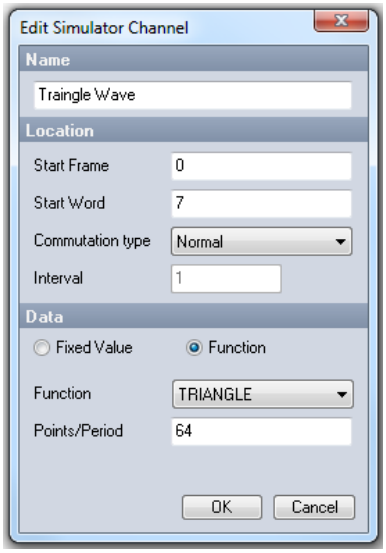
Channel Settings:

1. **Default Value (Hex)** – Enter a Hexadecimal value to be filled into all undefined words.
2. **Add** – Adds a new channel to the Channel List and launches the Edit Simulator Channel window.
3. **Remove** –Deletes the channel selected in the Channel List.
4. **Copy**– Copies the selected channel to the clipboard.
5. **Paste** – Pastes a channel from the clipboard to the bottom of the Channels list

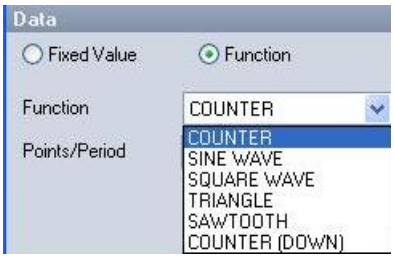
To view detailed channel information in PCM Output page, click in the field of interest and a small window displays the Frame Number, Word Number and Channels associated with the selection.

Edit Simulator Channel Window:

Use the Edit Simulator Channel window to change the settings for a simulator channel. To create a new channel, click the Add button or left click on an unused cell in the grid and click Add New Channel in the pop up window. To edit a simulator channel, double click the desired channel in the Channel List or left click on the cell in the grid and select the desired channel from the pop up window. The Edit Simulator Channel will display to edit or enter the following information:



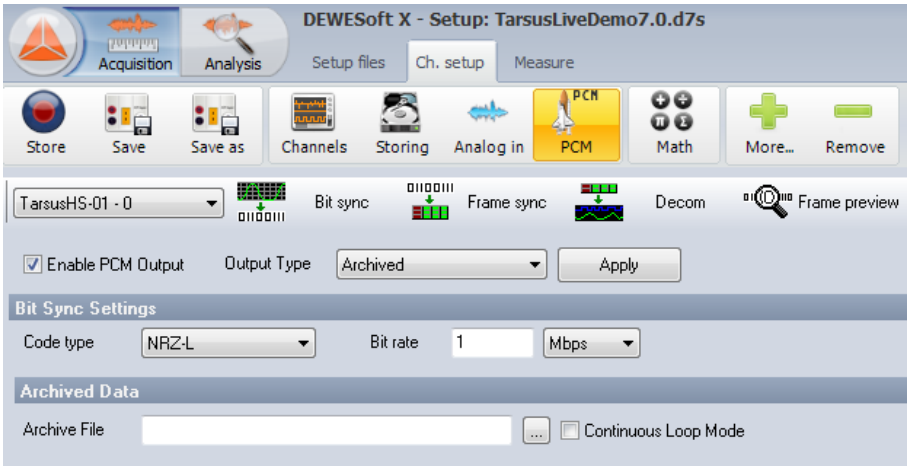
1. **Name** – Enter an identifying name for the given channel.
2. **Start Frame** – The first minor frame for the decom parameter.
3. **Start Word** – The first occurrence of the decom parameter in the minor frame.
4. **Commutation Type** - Select Normal, SubComm. or SuperComm.
5. **Interval:**
    a. For SuperComm, the interval is the number of words between samples.
    b. For SubComm, the interval is the number of minor frames between samples.
6. **Data:**
    a. **Fixed Value (HEX)** – Enter the fixed value for the simulator channel. This can be entered as any length however; it'll be truncated to the bits per word setting for the channel.
    b. **Function**–Select a function using the drop-down selection box.



7. **Point/Period** – Select the number of points per period for the function.

3.6.2 Configuring the Archive Simulator

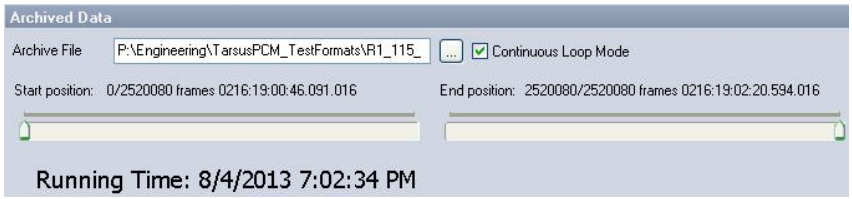
Setting up the PCM Output for Archive requires defining the output PCM settings and selecting a file. All of the PCM settings are the same as the Fixed Major Frame Simulator.



1. **… Button** – Launches the Open File Dialog window to select a TAD or Ch10 file. Chapter 10 requires the purchase of an additional license.
2. **Continuous Loop Mode** – When checked, the file plays to the end and then is restarted at the beginning. This loop continues until the data is stopped. Please note that there is often a drop of frame sync lock and sub-frame lock when the file restarts.

Note: The archive file selected must be a Frame Sync archive file. Due to data packing in Decom archived data, a Decom archive file cannot be used.

Once a file is selected, Start Position and End Position controls appear. These controls are used to exclude the beginning or end of the file. This is useful in Continuous Loop Mode if the recording has unusable data at the beginning or end of the file.



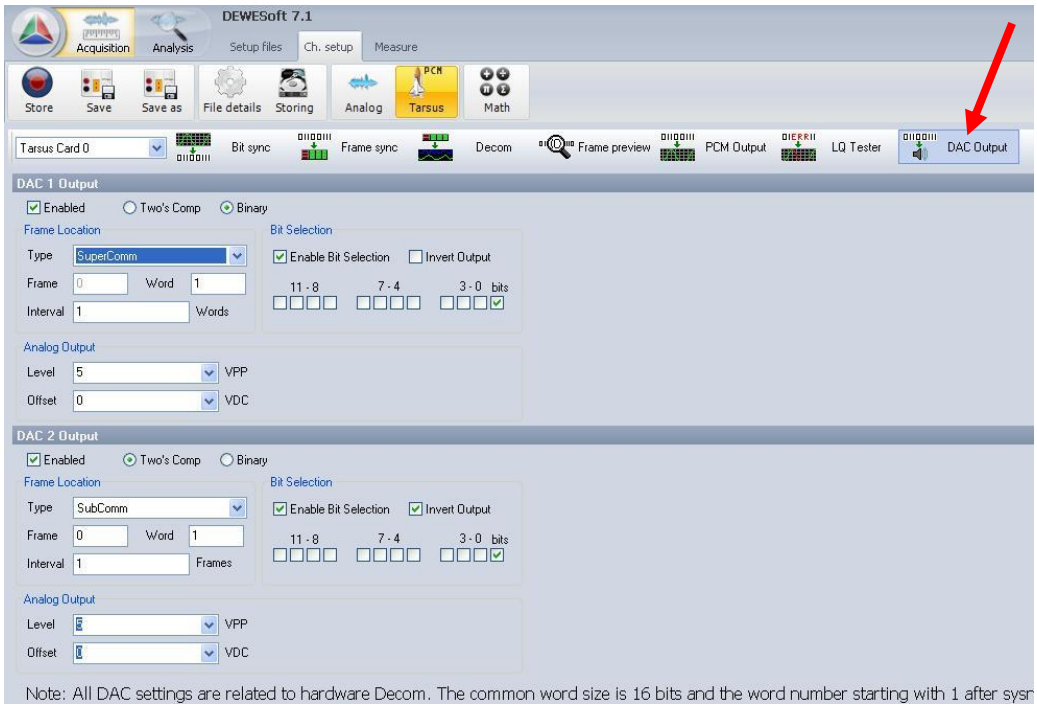
1. **Start Position** – Defines the location in the file to start playback.
2. **End Position** – Defines the location in the file to end playback.

3.7 Configuring the DAC Outputs

The Ulyssix PCM cards contain two Digital to Analog converters (DACs). Each DAC contains programmable analog offset and gain. The DAC hardware circuitry provides a convenient way of

outputting raw data extracted from the PCM stream in analog form. The DAC output can be viewed on external equipment such as oscilloscopes, meters, or strip chart recorders.

A common use for the DAC Outputs is to extract raw PCM digital Audio data from the PCM stream. The audio data is demodulated, converted into analog form, and routed to one of DACs.



Each DAC has the identical controls:

Generic:

1. **Enabled** – When checked, the DAC is output through the BNC.
2. **Two's Comp / Binary** – Select Two's Comp to use the raw PCM data as a sign extended Two's Complement number. Select Binary to use the raw PCM data as an unsigned binary number.

Frame Location:

1. **Type** – Select the Commutation Type:
    a. **Normal** – The parameter occurs once per minor frame.
    b. **SuperComm** – The parameter occurs more than once per minor frame. The spacing between words is defined by the Interval.
    c. **SubComm** – The parameter occurs once per minor frame, but not in each minor frame. The spacing between minor frames is defined by the Interval.
2. **Frame** – The first minor frame where that parameter occurs.
3. **Word** – The word location of the parameter in the frame.
4. **Interval**:
    a. For SuperComm, the Interval is the number of words between samples of the parameter.
    b. For SubComm, the Interval is the number of minor frames between samples of the parameter.

Note: The data going to the DACs is the raw PCM words, not decom parameter data which can be concatenated and processed.

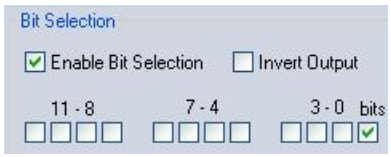
Analog Output:

1. **Level** – Sets the level of the peak to peak voltage of the output signal.
2. **Offset** – Adjusts the output signal voltage up or down by the selected value.

3.7.1 Configuring Single Bit Output

Each of the on-board DACs allows for the output of a single selected bit. The user can select one bit to output via the DAC from the most significant 12-bits. For example: If there is a 16-bit word (bit 0 is the LSB), only bits 4-15 would be available for selection. However, in the DAC form, the bits will be listed as 0-11regardless of the word size is. In this scenario, bit 4 of the word corresponds to bit 0 on the DAC output display. To use the single bit output feature, follow the steps below:

1. **Enable Bit Selection** – When checked, enables the controls for a bit filter. The bit filter allows bits of the DAC word to be ignored or the entire DAC word to be inverted.
2. **Invert Output** – When checked, inverts the selected output bit.
3. **11-8 7-4 3-0 Bits** – Each checkbox represents the bit in the 16-bit DAC word for output.

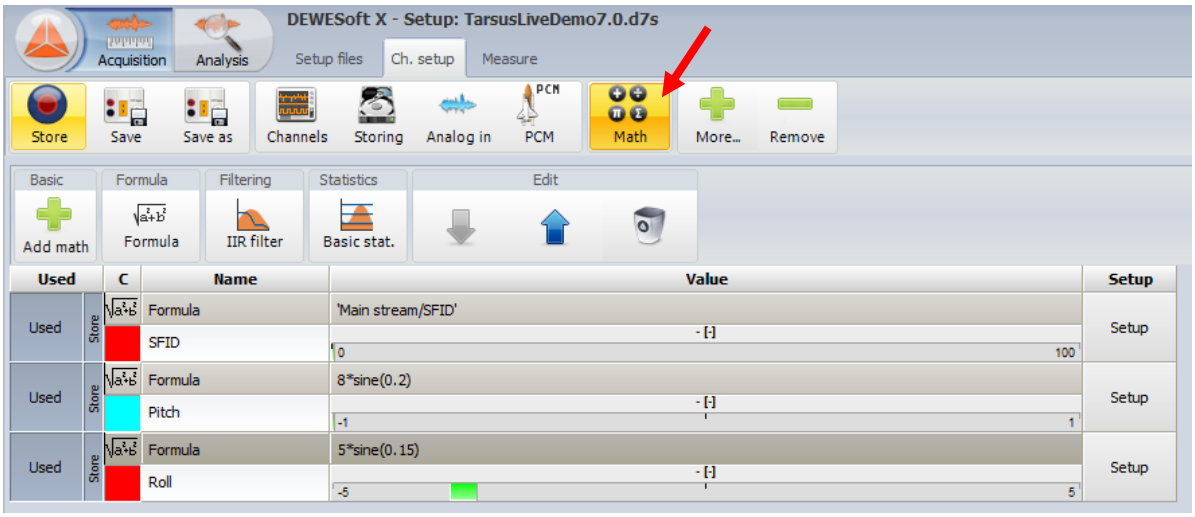


Caution: For bit selection, the word is MSB aligned with bit 11 on this form. If the MSB of the word is bit 9, that would correspond to bit 11 on this form. In other words, the MSB of the word is ALWAYS in bit 11 of this form.

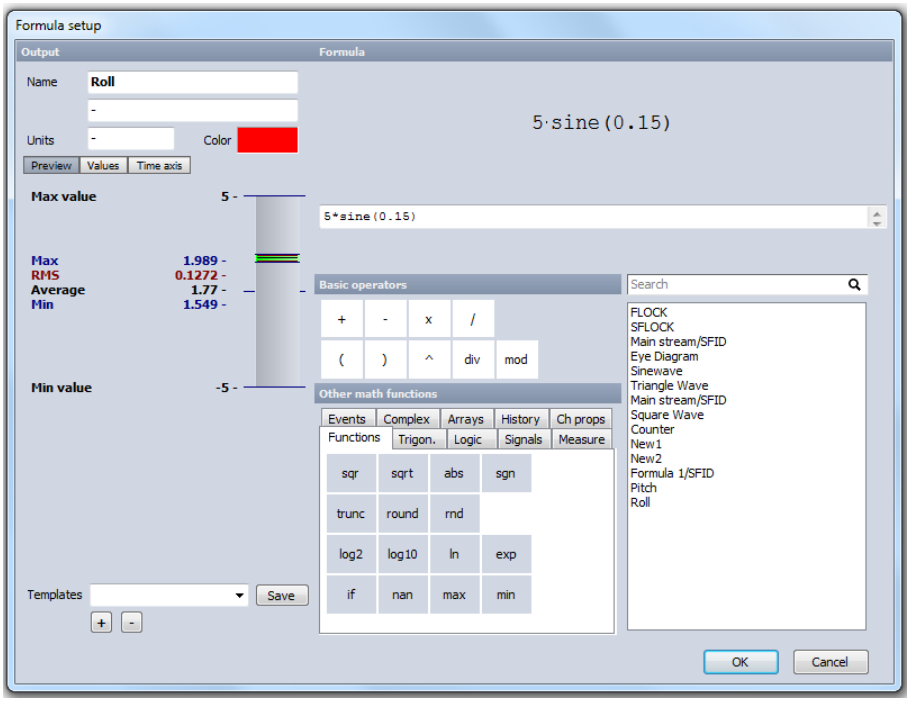
3.8 Configuring Math Channels

In telemetry applications, data in a PCM stream come from a wide variety of sources. The data could be from voltage sources, avionics busses, thermocouples, time source, etc. Sometimes the data from these sources is not scaled optimally to be viewed and analyzed. For example, the results from a thermocouple could be presented as non-linear data, thereby making small changes at certain levels hard to visually identify. Running a mathematical algorithm to linearize the data would be required in order to properly view the data.

The data processing of the DEWESoft PCM Plug-in provides a championed approach for solving these types of scaling and data manipulation problems. DEWESoft's mathematical processing allows the user to create a custom algorithm, apply it to the live PCM data, and view the converted data in a widget in the Measure screen. The following section only gives a brief overview on how to configure math channels using the DEWESoft PCM Plug-in Formula module. Please refer to the DEWESoft manual to learn more about data processing and see a comprehensive list of all the mathematic modules.



The Math Channel window has several controls. The Used / Unused button determines if the math channel is available in the Measure screen for use in widgets. The Name column displays the name of the math channel. Left clicking on the name allows editing of the current name. The Setup button launches the Formula Setup window where the math channel settings are changed.



1. **Name** – Text displayed in the Measure screen for the math channel. The length of the name can be as long as needed; however, it should be keep as small as possible due to screen space limitations.

Caution: Process names cannot be duplicated. The software will not allow duplicate names and will not allow saving of the data process.

2. **Description** – The second text box in the Formula Setup window. It contains more detailed information about the channel than is available in the Name.
3. **Units** – Engineering units for the math channel.
4. **Color** – Displays the color for the math channel. Left clicking on the color launches a Color Picker window used to select a different color. This color is used for this math channel in widgets in the Measure screen.
5. **Preview** – Shows an animated vertical bar chart of the current value of the math channel. Also shows statistical calculations based on the math channel: Max, RMS, Average, and Min.
6. **Values**:
    a. **Automatic Min/Max** – When checked, DEWESoft automatically calculates the minimum and maximum for the match channels. These minimum and maximum values are used in the Measure screen digits. When unchecked, the minimum and maximum values are set via the text boxes.
    b. **Min** – Sets the minimum value when Automatic Min/Max is disabled.
    c. **Max** – Sets the maximum value when Automatic Min/Max is disabled.
    d. **Precision** – Sets the floating-point precision of the value for the math channel.
        i. **Auto** – DEWESoft determines the needed precision.
        ii. **Single** – Uses a single precision floating point number.
        iii. **Double** – Uses a double precision floating point number.
7. **Time Axis**:
    a. **Time Base**:
        i. **Auto** – DEWESoft automatically selects the time base for the math channel
        ii. **Sync** – Uses the Sample Rate Clock as the time base. The Sample Rate Clock is divided by the SRDiv to slow down the time base if needed.
            1. **SRDiv** – The Sample Rate Clock is divided by SRDiv to slow down the time base for the math channel.
        iii. **Async** – Uses a DEWESoft Channel as the time base for the math channel.
            1. **Channel** – A list of DEWESoft channels to use as the time base. For an update once a frame, use FLOCK, SFLOCK, or SFID. To update more than once a minor frame, select a SuperComm decom parameter. To update less than once a minor frame, select a SubComm decom parameter.
        iv. **Single Value** – Calculates a static value that does not change with time.
8. **Formula** – Long text box. Contains the formula for the math channel. The formula is made up from the Basic Operators, Other Math Functions, and the Channel List.
9. **Channel List** – Contains a Search Box and a list of all available channels.

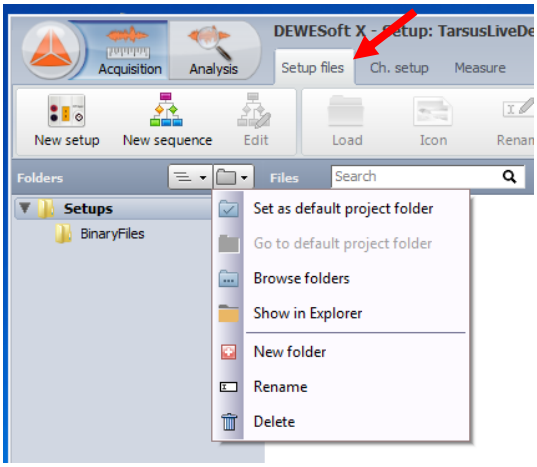
3.9 Saving and Loading Setups

The DEWESoft saves and loads hardware and software settings as a setup file (.D7S or .DXS file extensions). These setups are portable and can be used on other systems with the same hardware.

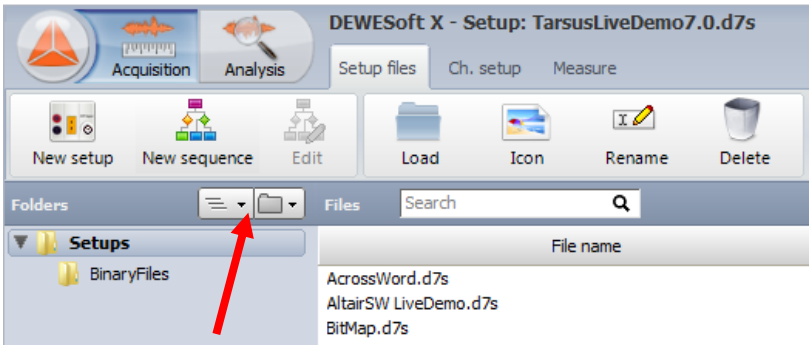
In DEWESoft, a "setup" contains all of the settings at the moment the Save icon is selected - except a few global parameters which are restored automatically when the software is started. Global parameters are those which are set in the Settings menu.

3.9.1 Loading Previous Setups

Once a setup is saved, it can be reloaded at any time. Setups are stored to the hard disk of the system, so they remain there until deleted or the hard drive is changed. To load a setup, select the Acquisition icon in the upper left-hand corner and then left click the Setup files tab shown below.

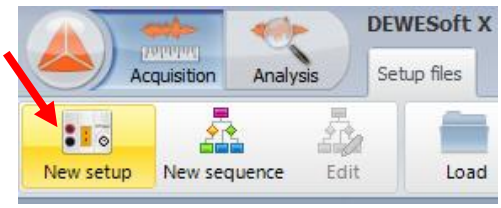


The default project folder is displayed with any setup files located inside. To browse the hard drive for setups saved in a different location, left click the open folder button (red arrow in picture below). Double click on the setup file or click the load button to open.



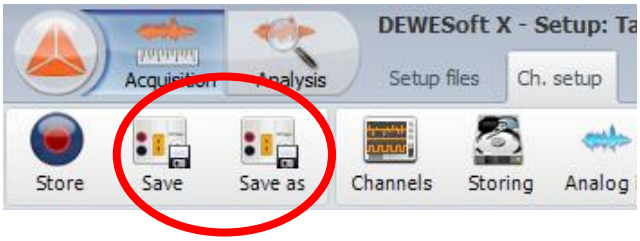
3.9.2 Creating a New Setup

Left clicking the New Setup button creates a new setup. A setup contains all aspects of your configuration which are available using the Channel Setup forms and the Measure forms in DEWESoft. Before creating a new setup, it's important to make sure that you have saved any changes to the previous setup, so they are not lost. To clear away the current setup and start a new one, select the Acquisition icon, press the Setup files tab and then the New setup tab shown below.



3.9.3 Saving Setup Configurations

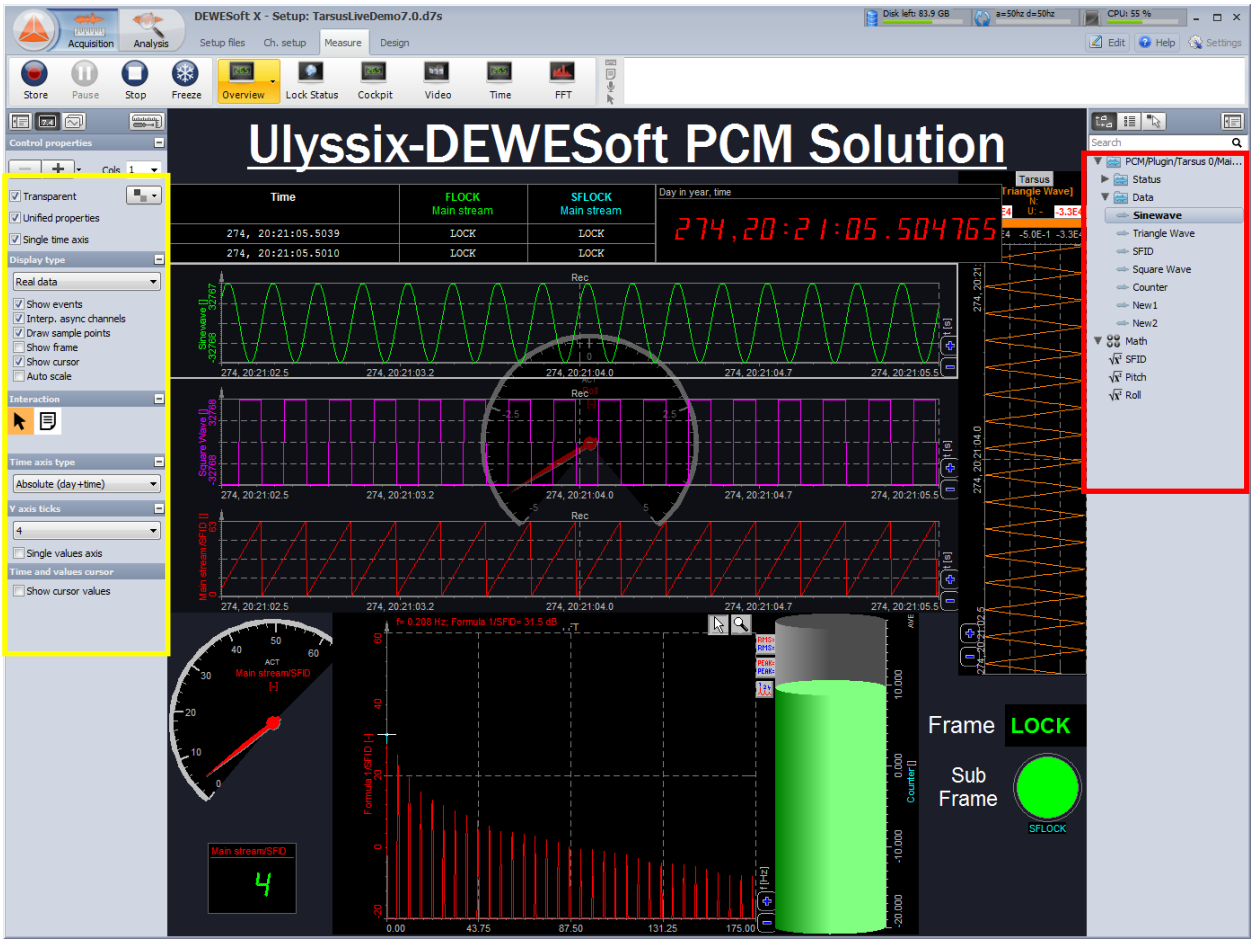
Current configuration settings within the Ch. setup and Measure tabs can be saved at any time by pressing the Save or Save As icons located in the main tool bar (shown in picture below).



4. Configuring Widgets and Storing Data

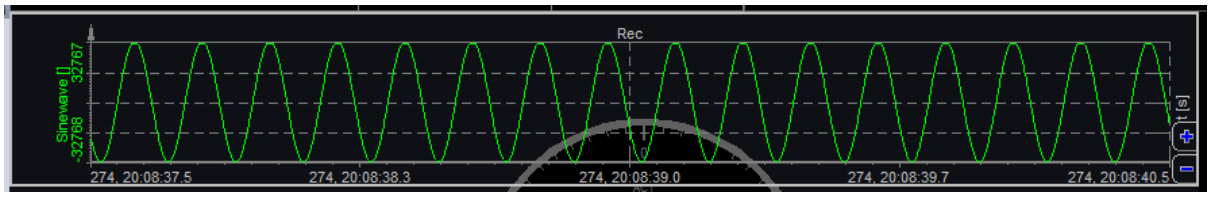
4.1 Creating Widgets

One of the most impressive aspects of the DEWESoft PCM Plug-in is the data widgets. Creating data widgets and configuring them is much like drawing a picture on the screen. DEWESoft comes with many graphical widgets, which are display types that can be placed onto the working area of the screen and then one or more channels assigned to it. To get to the Measure screen, click on the Measure tab.



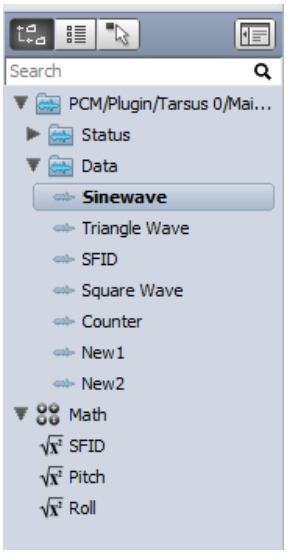
The user interface is straightforward and easy to use. While there are a large number of different widgets, they all work in a similar way:

1. To select a widget, left click on it with the mouse and a light gray box appears around the widget.



2. The vertical toolbar on the left side of the Measure screen (highlighted by the yellow box above) shows the properties for the selected widget. The vertical toolbar has sections titled: Control Properties, Display Type, Time Axis Type, Y Axis Ticks, and Time and Values Cursor. The widget properties are edited here.

To modify the channels assigned to a widget:



1. Select widget with the mouse.
2. Locate the vertical column Channel List on the right-hand side of the screen (red rectangle in the image above).
3. The selected channels are in highlighted and in bold, like “Sinewave” in the example to the right.
4. To add a new channel, left click on the desired channel.
5. To remove a channel, left click on a channel that is highlighted and in bold.

The Channel List contains all of the channels marked as “Used” in the Channel Setup tab. This includes channels from every Plug-In including the PCM Plug-In and the Math Channels. The Channel List has three buttons in the top left-hand corner. The first, displays all channels and channel categories in a nested list. The second, displays all channels in alphabetical order. The third, lists only the channels that are assigned to the selected control.

Note: Some widgets can accept more than one channel and others cannot. The digital meter and bar graph meter can only accept one. The horizontal recorder graphs can have up to four channels with independent scales or up to sixteen with a unified scale.

4.2 Using Design Mode

Design Mode is used for configuring the size and placement of widgets on a display. A display is a canvas for containing widgets. DEWESoft allows for multiple displays. Please be advised that it’s beyond the scope of this section to describe all the elements of Design Mode. Please review the DEWESoft manual for complete details about screen design.

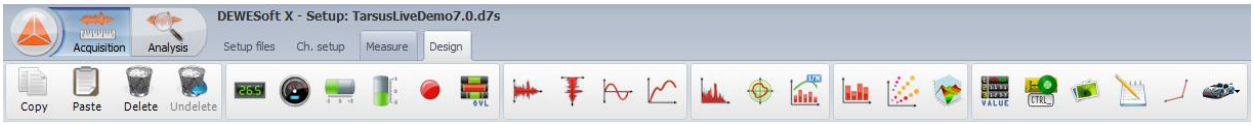
There are four types of widgets:

1. Widgets that show a large amount of data (Recorder, Vertical Recorder, XY Recorder, GPS Map).

2. Widgets that show a subset of calculated data (Scope, FFT, Octave, Vector Scope, Harmonic FFT, Tabular Widget).
3. Widgets that show a single value (Digital Meter, Bar Meter, Analog Meter, Indicator Lamp).
4. Other widgets like Pictures, Text or Lines.

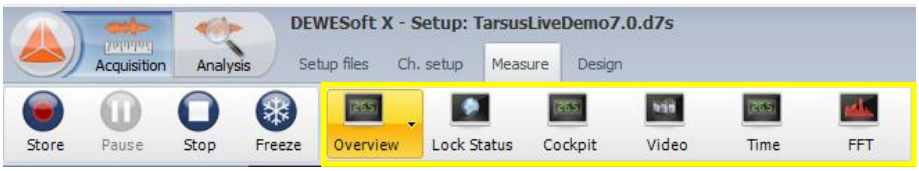
To access Design Mode, first enter the Measure tab and then either click on the Design tab or the Design button in the upper right-hand corner of the Control Properties (red arrow below).

The Design Mode tool bar is below.



4.3 Configuring a Display

Start by making a new display. Click the Display Property button (red arrow above). The Display Icon Ribbon is shown below inside the yellow rectangle. The selected icon in the ribbon is yellow. In the image below, "Overview" is selected.

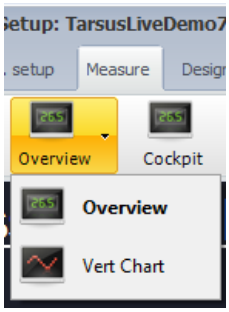


Display Properties:

1. **Display Name** – String displayed below the icon in the Display Icon Ribbon.
2. **Icon**– Select an image from drop down box or click "Custom" and select an image file.
3. **Move Left / Move Right** – These buttons position the icon between existing icons in the Display Icon Ribbon.
4. **Remove Display** – Removes the selected Display in the Screen Icon Ribbon.

Create Display:

5. **Select Template** – This drop-down box selects the starting displays in the new display. "Custom" starts off with a blank display. Other options begin with a display that includes predefined widgets.
6. **Add as Main Display** – Adds the new widget icon to the Display Icon Ribbon to the right of the selected icon.
7. **Add as Sub Display** – Adds the new screen icon to the Display Icon Ribbon as a sub display. A sub display is accessed by clicking the arrow on the icon. In the example above, "Overview" has sub display (image to the right).



After creating the new display, add a widget.

1. **Adding a new Widget to Display**–Click the Design button and click on the widget in the design toolbar. The widget will appear on the display. The widget size can be positioned by left clicking and holding the mouse button down while dragging the widget.
2. **Resizing a Widget**– Click the Design button or tab to enter the design mode. Click on widget to display the handles around it. Grab any of the handles to resize the widget to a custom shape or size.

3. **Deleting a display or widget:**
    1. To delete a widget in a display, click on the widget and press the delete icon located in the upper left-hand corner of the page, or hit the "Delete" key on the keyboard.
    2. To delete a display, select the display and then click the "Remove" button in the Display Properties menu.
    3. If a mistake is made, simply hit the "Undelete" icon.

Some widgets have buttons and other controls inside them that can be selected and edited. For example, with the recorder graph the user can click to change the vertical and horizontal scales, as well as, see measured values by moving the mouse over the graph.

Note: Please see the DEWESoft Manual for complete details about all widgets and screen design.

4.4 Storing Data

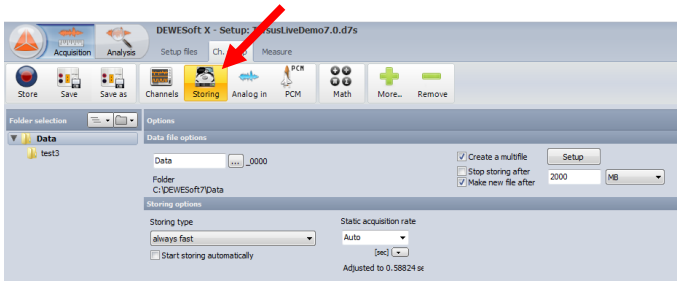
DEWESoft offers many ways of storing data, but because this manual is most specific to the features and feature of the PCM Plug-In. Storing data is a standard feature of DEWESoft, please refer to the DEWESoft user's manual for complete information about this topic.

Caution: Before attempting to store data, it's important to configure each input type in the DEWESoft Channel Setup screens. Some systems may only have a Ulyssix PCM Card, others may also have 8, 16, 32, or 64 analog inputs with a separate IRIG time code input (this is needed when analog inputs are used) or some could have GPS, CAN bus, VIDEO, and 1553 interfaces in the system which can be configured in a wide variety of ways. For this reason, be certain to set-up each channel properly using the appropriate settings using the set-up forms in DEWESoft.

4.4.1 Configuring Storing & File Details

To access the Storage screen, click the Channel Setup tab and then click the Storing icon.

Data File Options:



1. **Storage File Name** – Enter the name for the storage file.
2. **… Button** – Launches the Save File dialog box to select a file name and a folder location.
3. **Create a Multifile** – When checked, DEWESoft will change the file name instead of overwriting the file. For repetitive measurements, it can be helpful because the Multifile function automatically assigns a new file name for each cycle (start) of storage. File names can be either consecutive (such as 0001, 0002, 0003) or by the date and time.
4. **Setup** – Configures how the file name is changed for a new cycle of storage.
5. **Stop Storing After** – Stops the storage process after a fixed value that is defined in the Stop text box and drop-down box.
6. **Make New File After** – Creates a new storage cycle and new file after a fixed value that is defined in the Stop text box and drop-down box.
7. **Stop Text Box and Drop-Down Box** – Defines the value for when the storage should be stopped or when a new file should be created. Options for the stop value are: MB, Hours, Minutes, Seconds, or a Trigger.

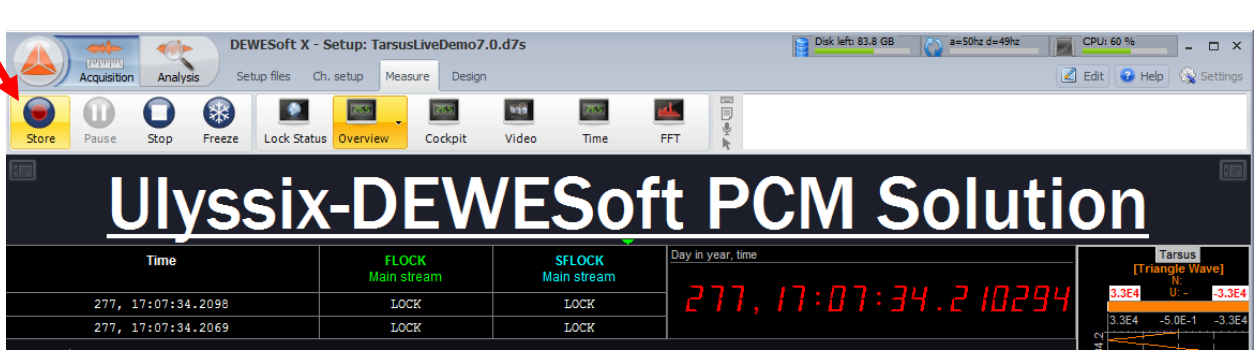
Storage Options:

1. **Storing Type** –The default setting is Always Fast. This will give the best results for standard file storing. Four different storage options which relate to the basic sample rates include:
    1. **Always Fast** – Data will be always stored at high speed, as defined by the dynamic acquisition rate.
    2. **Always Slow** – Data will be always stored at reduced speed, as defined by the static/reduced rate.
    3. **Fast on Trigger** – Data will be stored with the dynamic rate, once the trigger point occurs. No data is stored before the trigger.
    4. **Fast on Trigger, Slow Otherwise** – Data will be stored with the dynamic rate at trigger points and with the reduced rate when there is no trigger.
2. **Static Acquisition Rate** – Sets the acquisition rate for the slow acquisition. Can be set in Hz, Seconds, Minutes, or Samples.
3. **Start Storing Automatically** – Automatically begins storing when DEWESoft enters the Measure screen.

Note: Please refer to the DEWESoft software user's manual for more information on storage options.

4.4.2 Storing Data

To store data, go to the Measure screen by clicking on Acquisition and then clicking the Measure tab. The display screen with widgets will appear. Data can now be stored to the hard drive of the system by clicking the Store icon. The data is stored in a DEWESoft data file (.d7d or .dxd file extension) as well as other file types selected on the Frame Sync screen. These other file types include optional storage of a Ulyssix TAD file and Chapter 10 file (requires additional license).



When the Store icon is clicked, the system will began writing data from all the defined input sources to a file(s). If analog inputs are being recorded, there might be a brief delay while the IRIG interface locks onto the IRIG time and begins controlling the sample rate of the A/D card.

Press the Stop icon in the toolbar and data storage will cease. If video is being recorded with the data, there may be a brief pause as the last video frames are written to disk (video is stored in separate but tightly linked AVI or DVI video file).

The Freeze icon will freeze live data to be quickly taken into the Analysis mode. This gives the user the ability to quickly look at data stored in the file while live data is simultaneously being stored to the hard drive

Caution: Freezing requires a great deal of processing power on the CPU. Live data cannot be viewed while in Freeze mode. To return to live data, press the freeze button again. Under Project settings, the Buffer size settings defines how long the freeze mode can be active before automatically going back to live data.

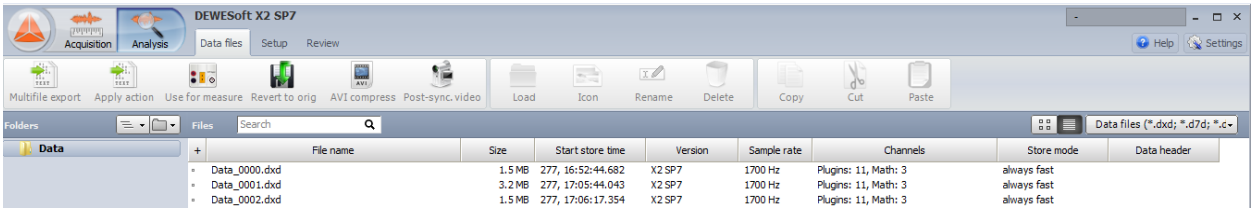
Note: Please refer to the DEWESoft software user's manual for more information on Storing Data.

5. Analysis Mode

Analysis Mode is used for analyzing data stored to a DEWESoft data file. In Analysis Mode, there are many options for the stored data: display data in widgets with signal overview; replay data at user select playback speed; start, pause, and stop replay and sound output; arranging existing widgets and add new widgets; watch events; signal analysis; reload triggered file; print displays; create new Math Channels; store changes to widgets and displays, copy Channel Setup and widget elements to the clipboard; export data, and many more options.

5.1 Replaying and Reviewing Data

Replaying and reviewing data files is very helpful to analyze measured data. Click on the Analysis icon and then the Data Files tab. If data has been recently captured, DEWESoft automatically loads the recent data file. Otherwise DEWESoft will open a selection window to select a data file. Double click to open a file.



When opened, the display screen will display the beginning of the recording. To start the replay, simply press Play. To stop the replay, press Stop. The data file can be played and replayed with options much like DVD player, by using the playback controls located in the top left-hand corner of the screen (controls shown below):

Note: Please refer to the DEWESoft software user's manual for more information on Replaying Data.

5.1.1 Using Replay Modes, Zoom, and Display Cursors

There are several Replay Modes available for use when playing back data files. Zooming in and out on a widget and using the different replay modes help a user analyze playback data in Analysis Mode.

The following Reply modes are available:

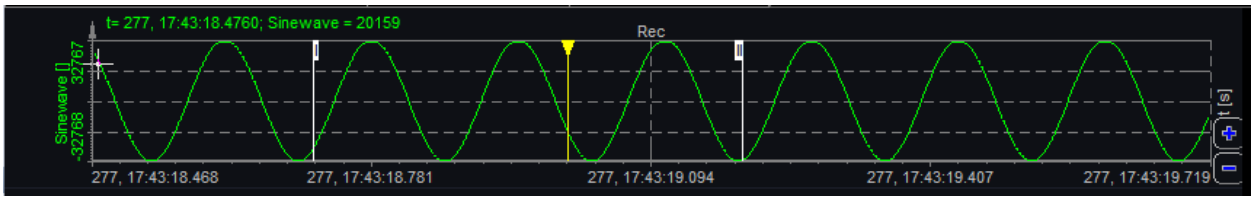
Normal Mode – Replay the data in the selected time window from the current cursor position to the end of the selected time window.

Loop Mode - Replay the data in the selected time window continuously. Once the cursor reaches the end of the selected time window it will start again at the beginning.

Scroll Mode –Replay the data from the current position to the end of the selected time widow. Then the current time window scrolls forward until the cursor reaches the end of the data file. To view a complete data file while zoomed in, use Scroll Mode.

Zoom - To zoom in on or out of a widget, use the "+" and "-" zoom buttons on the time axis.

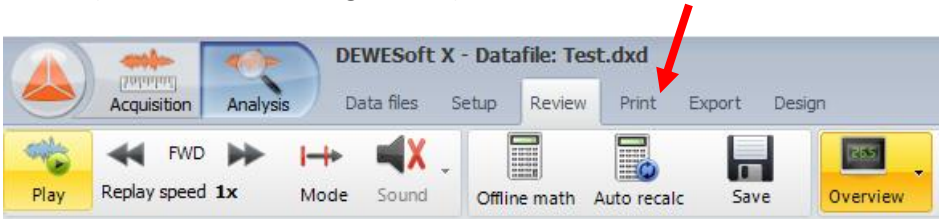
Display Cursors:



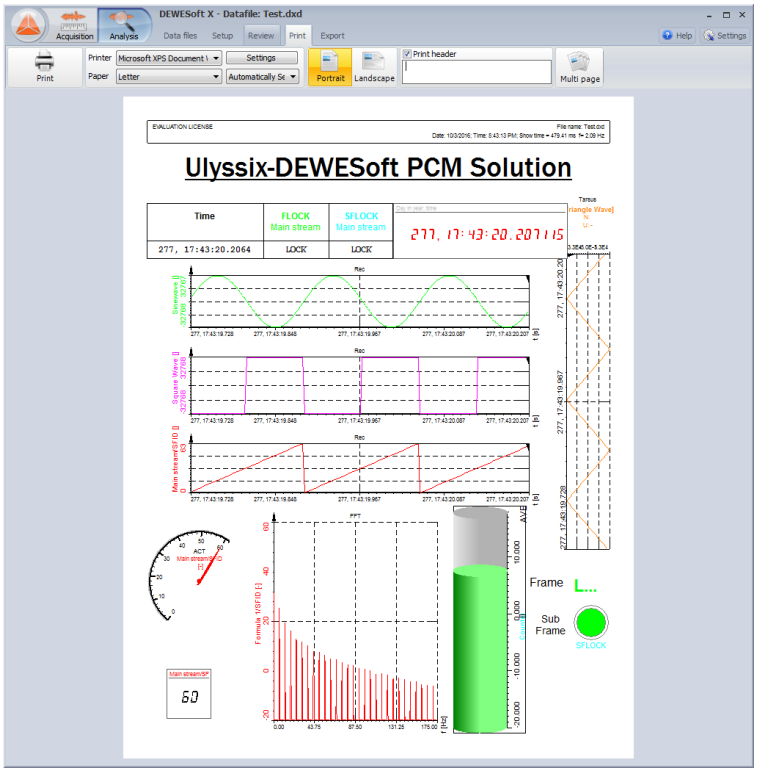
- **Yellow Cursor**–Marks the current time location in the widget or Time Overview bar. The cursor is synchronized across all displays and indicates the current position within the file. It can be moved by using a mouse.
- **White Cursors (I and II)**–Use the White cursors to select a time section of interest. Move the mouse on top of the I cursor and the mouse cursor will change to arrows pointing left and right. Then left click on the White Cursor and move the mouse to reposition White Cursor. Left clicking between the White Cursors causes all widgets in DEWESoft to zoom to that time span.
- **Red cursors (B and E)** – The red cursors represent the Beginning and End of the Data file.

5.2 Printing Data

DEWESoft offers a printing function in the Analysis mode. It works with any display in the Measure screen and with any setup window in Channel Setup. When the display is set to user's liking, press "Print" (red arrow in the image below).



A screen like the one below will appear:



After all desired properties are set, press the “Print” icon. The standard Windows print window will appear. Adjust the printer properties, print range, and number of copies as desired.

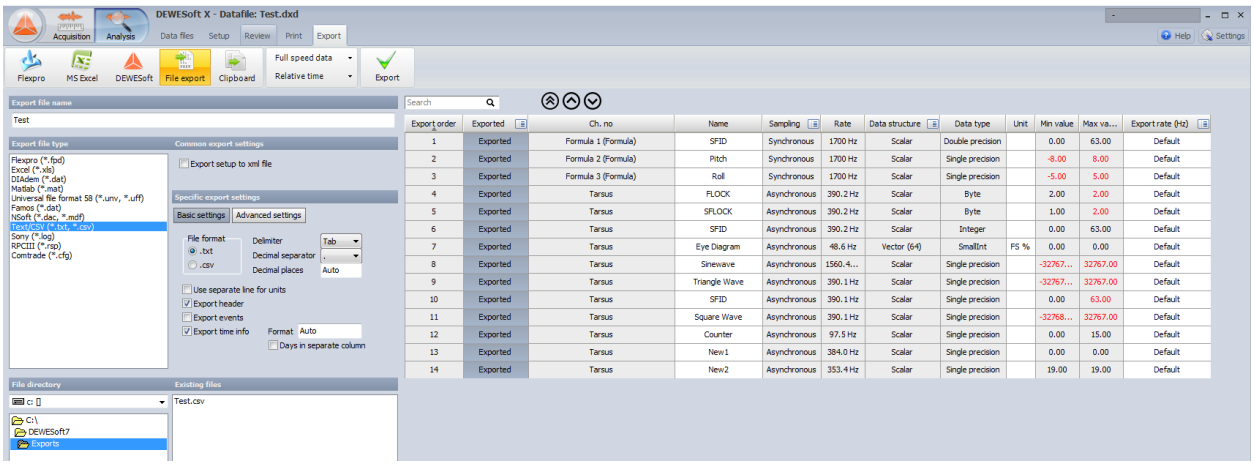
DEWESoft uses the complete Windows printer support. As a standard, DEWESoft will suggest using the default printer, but user can select between all available printers.

Note: Please refer to the DEWESoft software user’s manual for more information on Printing Data.

5.3 Exporting Data

Data Export in DEWESoft supports a wide variety of popular formats which makes data files transportable to other software packages. To begin exporting data, click the Export tab and then click on the “File Export” icon:

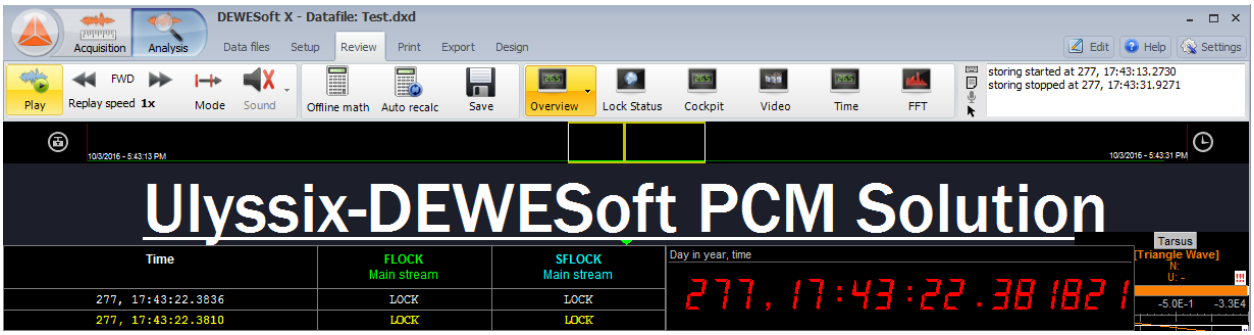
1. **Export File Name** – Define the file name.
2. **Export File Type** – Select the desired file type.
3. **Exported channels** – Select the channels to export from the Channels List on the right side of DEWESoft (not available for all export options). Please note that each export type has custom options. For a description of each export type, please see the DEWESoft manual.
4. **File Directory** – Select the file location for the export file to be saved.
5. **Perform export data**: After all settings are complete, select the “Export” button in the ribbon at the top of the DEWESoft window.



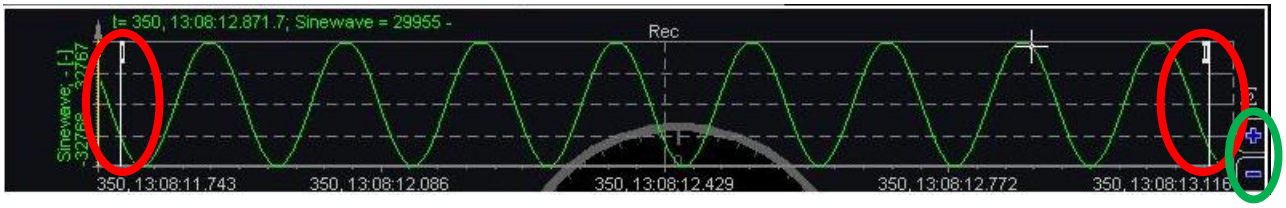
Note: Please refer to the DEWESoft software user's manual for more information on Exporting Data.

5.3.1 Exporting a File Segment

To select a segment of a recorded file to export, use the start and stop cursors located on the left and right side of the display and the zoom buttons. After the segment is identified and the user's preferences are made to the segment, follow the exporting or printing steps explained in the previous sections.



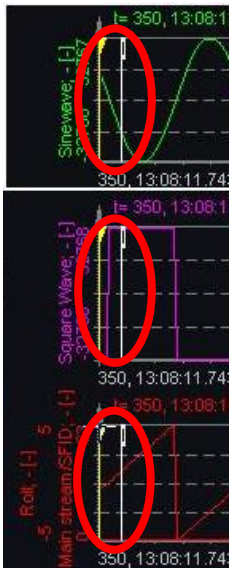
In the image below, we have identified and zoomed in on a portion of data we want to export. To do this, use the white start and stop cursors located on both the left and right-hand side of a display (pointed out in picture below).



To zoom, move the I white cursor to the desired start position and the II white cursor to the desired stop position and then left click between the two white cursors. Or use the zoom buttons located on the display (circled in green above).

At the top of the display, the segment identified within the file is pointed out by a highlighted box. This box can be moved left to right by left clicking in the box and drag and drop at a new location. Using the playback buttons will only play the identified segment. Press Trigger mode to exit and display the original file.

The yellow cursors in the widgets move synchronously together; scrolling from left to right as the display runs from start to stop. Select the yellow cursor when the display is stopped or paused to scroll through the recorded data.



When the time segment is identified, simply follow the exporting steps explained in the previous sections. Some displays do not have the start and stop cursor. In this case, use the time selector button to select a specific time segment for viewing.

6. Licensed Options

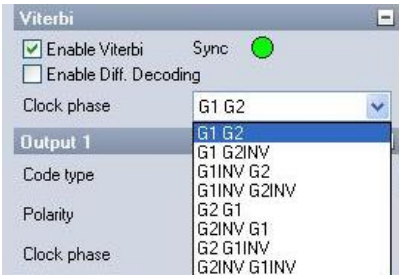
Ulyssix Technologies Inc. and DEWESoft provide optional features that can be purchased separately and included in any DEWESoft system. This section only provides a brief overview of those options with some additional details about a few. The following options listed below are currently available for any DEWESoft Ulyssix enabled system:

- **Viterbi Decoder Option** – Provides FEC on the PCM Simulator and Viterbi decoding on Bit Sync.
- **TCP/IP Frame Publisher/Simulator Option** – Provides TCP/IP streaming of frame data via UDP.
- **LQ Tester Option** – Provides functionality for analyzing the latency and quality of a PCM signal.
- **RS232 Output Option** – Provides the ability to transmit decom parameter data through four RS232 (UART) ports.
- **CVSD Audio Option**– Decodes CVSD encoded data.
- **Parallel Output Option** – This feature allows output of selected decom parameters through the parallel interface on the TarsusHS card.
- **Forward Error Correction Option** – For use with our simulator, FEC gives the capability of creating a convolutionally encoded G1G2 serial data stream.
- **Chapter 10 Recorder and Reproducer Option** – Reproduce or Record Chapter 10 UDP Ethernet packets and Chapter 10 files with DEWESoft.
- **DEWESoft NET Option**– This feature allows a computer with data acquisition hardware (Measurement Unit) to broadcast data over a network to other computers to view the data (Client). The DEWESoft NET Option also allows the Measurement Unit to be controlled over the network by the Master Client.
- **Astro-Med Plug-In Option**–This Plug-In implements printing to the Astro-Med Everest or Real Chart printers.
- **Missed Distance Calculator Option** –This Plug-In implements a frequency domain calculation for Doppler ranging.

6.1 Viterbi Decoding

With Viterbi, the Bit Sync uses the commonly known Viterbi algorithm to decode convolutionally encoded data that has a k/n = ½ rate, constraint length K =7, and G1, G2 generator polynomials 171_8, 133_8 and 3-bit soft decision. It provides FEC on the Simulator and Viterbi decoding on the Bit Sync and must be activated through the purchase of an additional license. If licensed, the controls for Viterbi are located in the Bit Sync and PCM Output windows.

The selections available for Viterbi include:



1. **Enable Viterbi** – When checked, enables the convolutionally encoded data decoder.
2. **Enable Diff. Encoding** – When checked, decodes convolutionally encoded NRZ-M data. When unchecked, decodes convolutionally encoded NRZ-L data.
3. **Clock Phase** – Select what order to convert the coefficients and their polarity:
    a. **G1 G2** – Decodes G1 first and G2 second.
    b. **G1 G2INV** – Decodes G1 first and Inverts G2 second.
    c. **G1INV G2** – Inverts and decodes G1 first and G2 second.
    d. **G1INV G2INV** – Inverts and decodes G1 first and inverts and decodes G2 second.
    e. **G2 G1** – Decodes G2 first and G1 second.
    f. **G2INV G1** – Inverts and decodes G2 first and G1 second.
    g. **G2 G1INV** – Decodes G2 first and Inverts G1 second.
    h. **G2INV G1INV** – Inverts and decodes G2 first and inverts and decodes G1 second.

Since the Viterbi decoding is at half rate, data received by the Bit Sync is actually moving at twice the specified bit rate. The actual Viterbi bit rate is shown at the bottom of the main Bit Sync window (circled in red below).

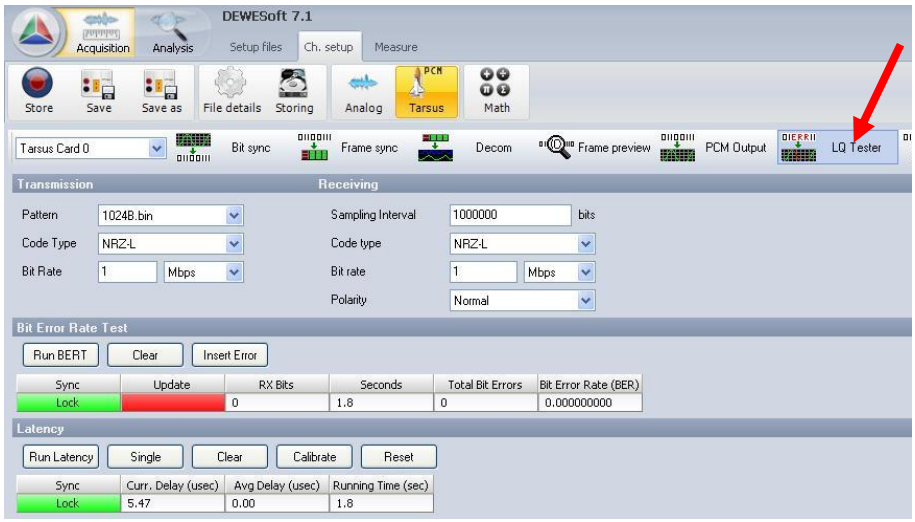
When the decoder is running, the sync lock indicator should display a green light. If the light is not green, make sure the box labeled Enable Viterbi is checked. If this doesn't resolve the problem, verify the Encoder is running and the received message was encoded to match the design constraints of the Viterbi decoder.

6.2 LQ Tester

6.2.1 Configuring the LQ Tester

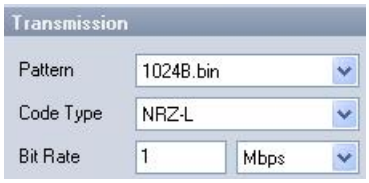
The LQ Tester measures both the quality of the data coming through the bit sync as well as the latency time between the Ulyssix PCM card simulator back and the Ulyssix PCM signal input. The LQ Tester can perform a bit error rate test (BERT) using either an internally setup simulator format or by using a pre-stored industry standard pattern. The LQ Tester option is made available through the purchase of an additional license.

Go to the Channel Setup screen. Click the PCM icon and then press the LQ Tester button.



Note: To setup the receiving data source (TTL or RS422), go to the Frame Sync form and look for PCM Stream Source in the bottom left hand corner of the screen.

Transmission:



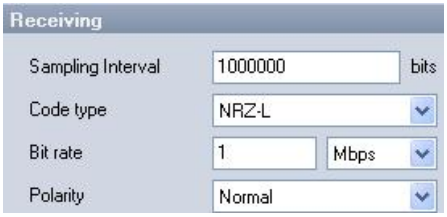
1. **Pattern** – Defines the data used for the LQ Tester:
    a. **Current Simulator Setup**– Last pattern configured in the PCM Output (Simulator).
    b. **256B**– 256-bit pattern with the IRIG 32-bit sync pattern of FE6B2840 and then a pattern of 16-bit words that change the transition density from all ones to all zeros.
    c. **1024B** – 1024-bit repetitive pattern that also uses the IRIG 32-bit sync pattern of FE6B2840 and then the same pattern of the 256B. After the end of the 256 bits then there is a repetitive pattern of AAAA for the remaining 1024 bits to increase the bit transition density.
    d. **11PN** – Standard 2047-bit pseudo-random pattern that starts with a 32-bit sync pattern of B70D671F and then continues with the 11PN exclusive-OR pattern for the remaining 2047 bits.

e. **15PN** – Standard 32,767-bit pseudo-random pattern that starts with a 32-bit sync pattern of B70D671F and then continues with the 15PN exclusive-OR pattern for the remaining 32,767 bits.
f. **25TD**–25% transition density pattern.
g. **GU**– 32-bit sync pattern of 0xc4b890ec followed by 358 sixteen-bit words of 0xa0a0. This pattern creates a string of six '0's then a '1' then a '0' then a '1' which is very difficult to lock at high bit rates (above 20 Mbps).

2. **Code Type**:
   - Non-return to zero level (**NRZ_L).**
   - Non-return to zero mark (**NRZ_M).**
   - Non-return to zero space (**NRZ_S).**
   - Bi-phase level (**BIΦ_L)**, bi-phase mark (**BIΦ_M).**
   - Bi-phase space (**BIΦ_S).**
   - Delay modulation mark (**DM_M).**
   - Delay modulation space (**DM_S).**
   - Return to zero (**RZ)**.
   - Randomized non-return to zero **RNRZ_11.**
   - Randomized non-return to zero **RNRZ_15**.
3. **Bit Rate and Units**– Select the outgoing data rate from 1 bps to 33 Mbps.

Note: The data is output using the SIMOUT and SIMCLK BNC outputs on the Ulyssix pigtail connector**.**

Receiving:



1. **Sampling Interval**– The larger the intervals, the more samples are measured for the BER calculation and the longer the time between measurements occur. The sampling interval is selectable for intervals from 2^8 to 2^32 with 2^4 spacing.
2. **Code type**:
   a. Non-return to zero level (**NRZ_L).**
   b. Non-return to zero mark (**NRZ_M).**
   c. Non-return to zero space (**NRZ_S).**
   d. Bi-phase level (**BIΦ_L)**, bi-phase mark (**BIΦ_M).**
   e. Bi-phase space (**BIΦ_S).**
   f. Delay modulation mark (**DM_M).**
   g. Delay modulation space (**DM_S).**
   h. Return to zero (**RZ)**.
   i. Randomized non-return to zero **RNRZ_11.**
   j. Randomized non-return to zero **RNRZ_15**.
3. **Bit Rate and Units** – Select the incoming data rate from 1 bps to 33 Mbps.

4. **Polarity** – Select Normal, Inverted, or Automatic polarity (detection) for the incoming PCM data stream. If the polarity is unknown, select Automatic polarity and the software will determine the setting.

Note: The Receiving data comes through CH1IN BNC or the DECOMIN and DECOMCLK BNC cables on the Ulyssix pigtail.

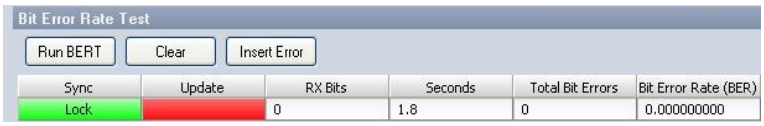
Caution: If different bit rates or code types are used for transmitting and receiving, then the exact same pattern must be generated and used for the BERT to work correctly.

6.2.2 Bit Error Rate Test

The BERT function measures the quality of the incoming PCM data to the Ulyssix PCM card.

1. **Run BERT**– Starts the Bit Error Rate Test.
2. **Clear** – Resets the Total Bit Errors and BER readings to zero.
3. **Insert Error** – Adds an error to the BERT pattern to confirm that LQ Tester is working as expected.

The continual running results of the BERT function are shown in the above section and described below:



1. **Sync** – Indicates frame sync status.
2. **Update**– Green indicates the completion of a sampling interval.
3. **RX Bits**– The total number of received bits since starting the test.
4. **Seconds**– Total length of the BER test.
5. **Total Bit Errors**– Number of bits that were received by the BERT that did not match the transmitted values.
6. **Bit Error Rate (BER)**– Calculation of the number of bit errors divided by the number of bits transmitted during the selected sampling interval.

6.2.3 Latency Test

The Latency Test measures the time between when the data leaves the Ulyssix simulator output to when the data received by the Ulyssix card. The software automatically calibrates the internal times of the card and therefore, only shows the actual external time.

1. **Run Latency**– Starts a continuous running latency test. The display is shown in hundredths of microseconds or 10-nanosecond resolution. The internal timer that does the calculation has an 11.2 nS resolution.

2. **Single** – Runs a single latency test. This disables the continuous run mode and only gives a single reading.
3. **Clear**– Resets all displays to zero.
4. **Calibrate**– Zeroes the latency tester for current connection between the simulator output and the Ulyssix card input. To use this feature, connect a short BNC cable between the two BNC connections and then hit the "Calibrate" button. The display will show a reading with +/- 0.5 uS.
5. Reset – Resets the Latency Test.

The continual running results of the Latency Test function are shown in the above section and described below:

1. **Sync** – Indicates frame sync status.
2. **Current Delay**– Single test reading in microseconds.
3. **Avg. Delay** – A running boxcar average of the last one hundred single latency readings.
4. **Running Time (sec)**– The amount of time the Latency Test has been running.

Note: The Receiving data comes through CH1IN BNC or the DECOMIN and DECOMCLK BNC cables on the Ulyssix pigtail. To configure the receiving PCM Stream Source (TTL or RS422), press the Channel Setup tab, the PCM Icon, and then press the Frame Sync button and look for PCM Stream Source in the bottom left hand corner of the screen.

6.3 IRIG Chapter 10 Recording and Reproducer Plug-in

In addition to the DEWESoft PCM Plug-in, the IRIG Chapter 10 Plug-In adds the ability to record and playback IRIG-106 Chapter 10 files and well as stream Chapter 10 UDP packets via Ethernet.

As a Recorder, the Chapter 10 Plug-In converts PCM data to Chapter 10 Throughput, Packed or Unpacked format. That Chapter 10 data can be saved to the hard drive or transmitted via an Ethernet port in Chapter 10 UDP packets.

As a Reproducer, the Chapter 10 Plug-In routes PCM data from a Chapter 10 source to the PCM Plug-In. The Chapter 10 Plug-In can read Chapter 10 Throughput, Packed or Unpacked formats from a Chapter 10 file or incoming Ethernet Chapter 10 UDP packets via an Ethernet port. DEWESoft then processes the PCM data for viewing in Measure screen and/or stored into an. d7d file for post analysis.

6.3.1 Enabling the Chapter 10 Recorder/Reproducer Plug-in

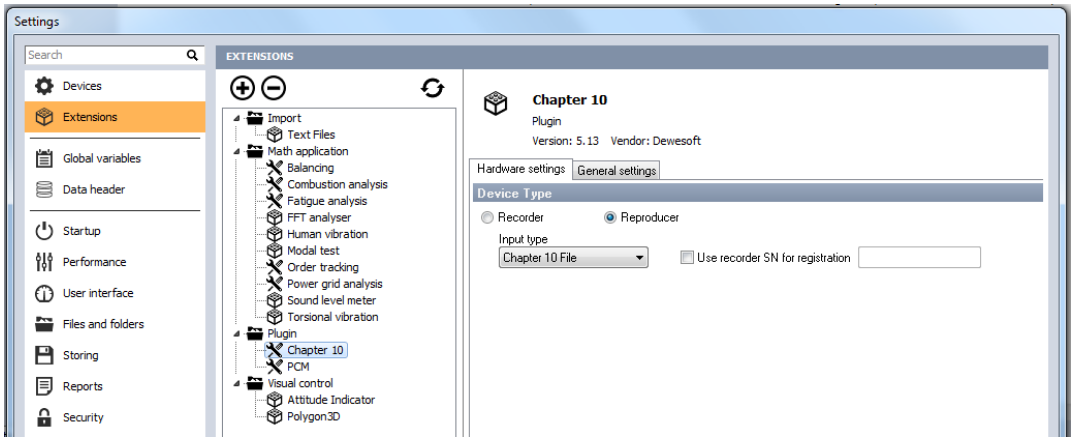
To enable the Chapter 10 Recorder/Reproducer Plug-in for recording and reproducing capabilities:

1. Ensure that the Chapter10.dll and Tarsus.dll are found in the DEWESoft Addons folder.
2. Click on the “Settings” button in the upper right-hand corner and click “Settings” from the menu. Click on “Extensions” in the upper left-hand corner.
3. In the Extensions window, look under the Plugin entry. If the Chapter 10 Plug-In is not listed, please do the follow:
    a. Click the “+” button at the top of the Extensions window. The “Manage Extensions” window appears.
    b. Find “Chapter 10” in the Plug-Ins list and click the circle to the right. The circle should now contain a check.
    c. Click “OK” to close the “Manage Extensions” window.

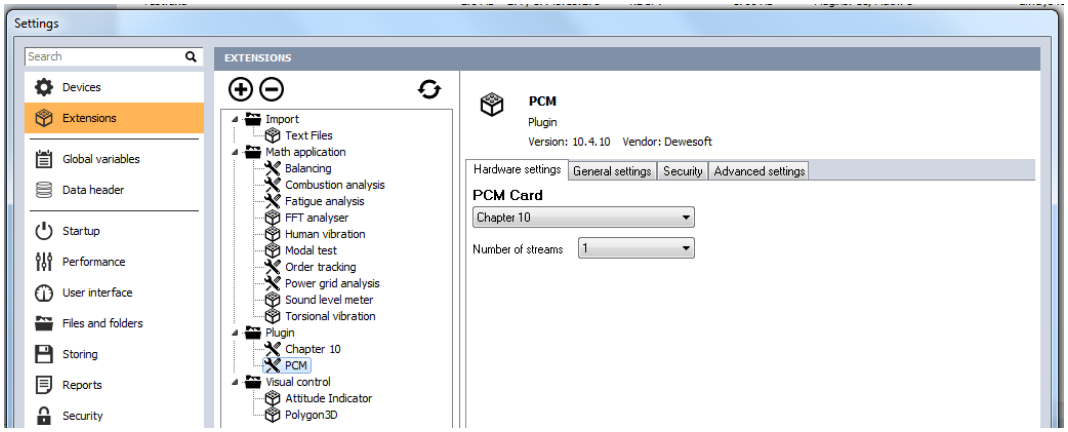
6.3.2 Chapter 10 File Playback and Processing

The Chapter 10 Plug-In has two configurations: Recorder or Reproducer. In this section, we will discuss how to load and replay Chapter 10 files as a Reproducer.

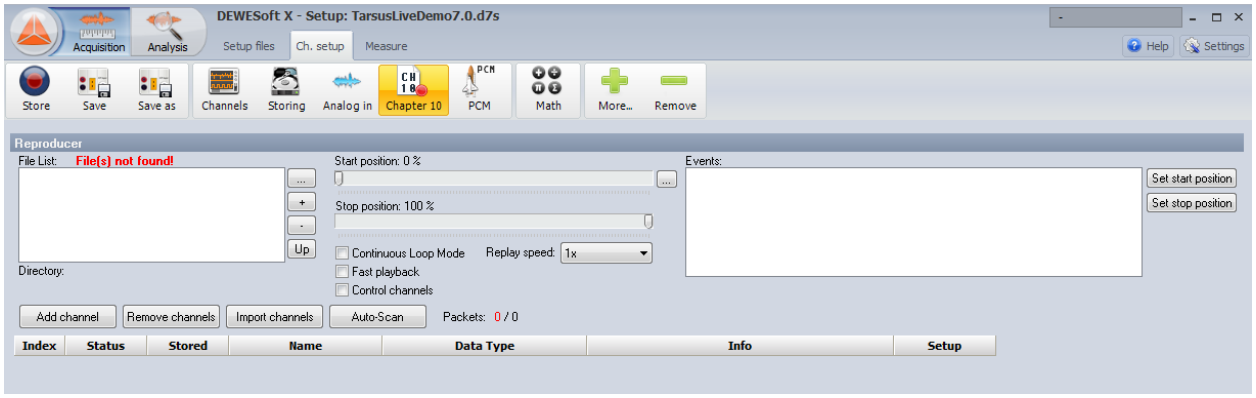
1. Click the Settings button in the upper right-hand corner and click Settings in the menu. Click on Extensions in the upper left-hand corner. Select Chapter 10 under the Plug-Ins heading.



2. Select the Reproducer radio button under Chapter 10 Device Type. As a Reproducer, the DEWESoft PCM Plugin software reads a Chapter 10 file or receives Chapter 10 UDP Ethernet packets (Input type).
3. Enter an Input Type. Select either Chapter 10 File or Ethernet Chapter 10 UDP data packet.
4. When checked, the "Use recorder SN for registration" feature allows for a serial number to be used for licensing the DEWESoft suite. This feature is needed when there is no Ulyssix hardware installed in the computer.
5. Select "PCM" under the Plug-Ins heading.



6. Under the "Hardware Setting" tab select Chapter10 from the drop-down box located under the label "PCM Card."
7. Choose the Number of streams (up to 8) for the Chapter 10 data. This defines how many PCM streams that DEWESoft will decommutate from the Chapter 10 file.
8. Click "OK" to accept changes in the "Settings" window.
9. In the Channel Setup tab click the "Chapter 10" icon.



10. Press the "…" browse button to browse the system for Ch.10 files. Once found, select Open.

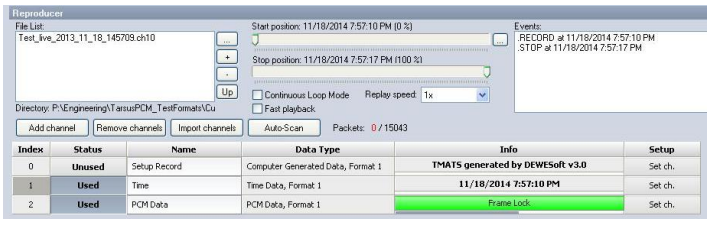
Note: Use the "+" button to add additional files and the "-" button to remove a file after being highlighted. To change the file list order, press the "Up" button. Using the browse button "…" to add a file to the file list will removed all currently listed files. When adding multiple files to the file list, make certain of correct file order (the absolute time of the first file should be before the second file).

11. Move the Start and Stop position cursors to select a portion of the Chapter 10 file for playback.
12. Use the Events list section of the display to see start and stop tag of the file as well as recorder events.

Note: The DEWESoft Chapter 10 recorder does not support events.

13. Use the Set Start Position and Set Stop Position buttons to set the time tag to start or stop playing the files.
14. Choose a playback mode and/or Replay speed:
    a. Continuous Loop Mode plays the file from start to finish and automatically restarts.
    b. Use Fast Playback for full speed Chapter 10 playback.
    c. Use Replay speed to configure faster or slower replay speeds.

Note 1: These options only relate to the Acquisition Measure screen.
Note 2: To use DEWESoft Analysis features, a Chapter 10 file must be played and stored as a data file (.d7d or .dxd file extension) in the Acquisition Measure screen.



15. Select a method for setting up the Chapter 10 channels:

a. Use the Add channel/Remove channels buttons to manually add, setup, or remove channels.
b. Use the Import channels button to import TMATS data to setup the Decom. This can also be done under the Decom tab.
c. Use Auto-Scan and the software will read the Chapter 10 file TMATS header data to configure all the data settings (recommended).

16. Verify the channel named PCM Data has Frame Lock. The grey lines above and below Frame Lock are indicators showing the channel is alive.

Note: Frame Lock will not be observed if the data was previously recorded in Throughput Mode.

17. Enable channels individually by clicking the Unused button. It will change to Used. To select all the channels, right mouse click on the Status column heading and then press Select All.

Note: In the Channel Setup form, channels can be enabled or un-enabled. The channel name and setup can be changed by pressing the Set Channel button.

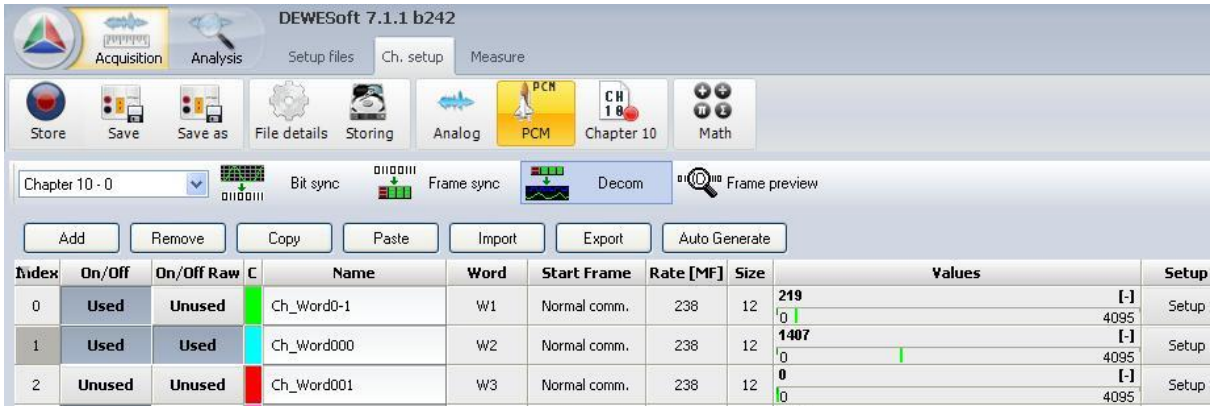
18. Click the PCM icon and then click the Bit Sync icon.
19. Under the Input Channel drop down box, select "PCM Data."
20. Press the "Load Settings from Channel" button and the software will automatically configure the proper settings by using the Chapter 10 TMATS data. When synced, the eye-pattern display will look like the one pictured below:

21. Press the "Frame Sync" to confirm frame sync settings have been imported from the Chapter 10 file TMATS header. Frame Lock should be observed on the bottom of the form.
22. Press the Decom button to manually setup channels, or select "Auto Generate" for a fast channel setup. For more information on channel setup, please refer to Section 3.4Configuring the Decom.

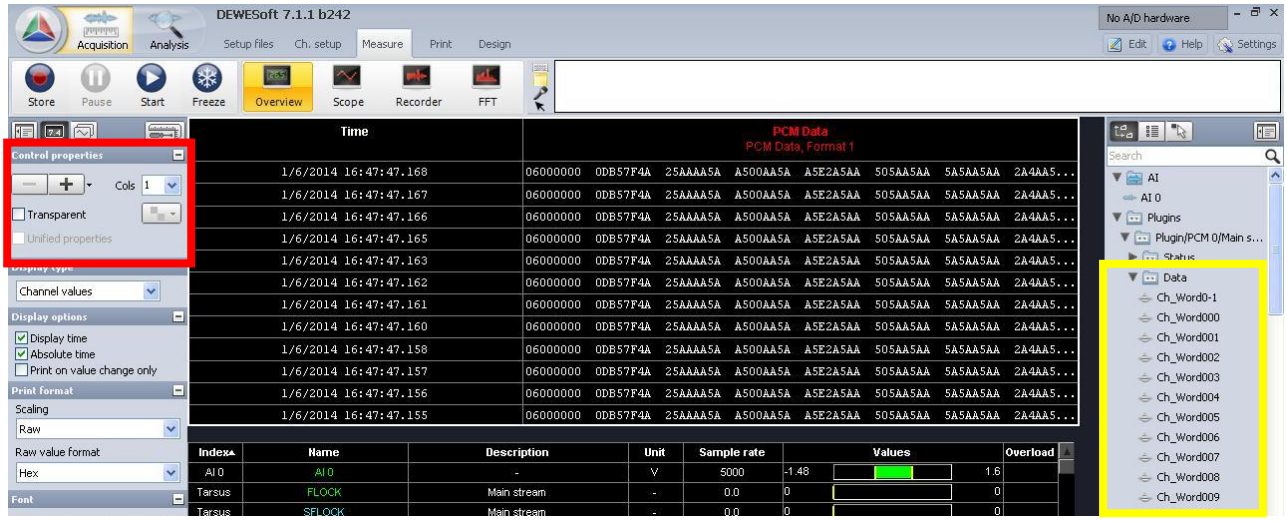
23. Enable channels for display in Measure screen by setting the desired channel to “Used” and unwanted channels to “Unused.”

Note: Parameters can be enabled for viewing in the Measure screen multiple ways. The first way is to simply click in the Unused/Used field next to the channel name. To select multiple parameters that are not in successive order, hold down the “Control” button and select each parameter, or hold down the Shift key to select a group of parameters in order (for example, all parameters between 50-100). Once the parameters are selected, right mouse click on the Index, On/Off, or On/Off Raw column heading box and choose either Select or Deselect.

Note: When using Auto Generate channels, only basic channel information will be imported. To configure channels further press the Setup button for each channel.



24. Click the Frame Preivew icon to see a full-scale view of the major and minor frames. To Add a new channel from the Frame preview page, left click on a location within the frame and select Add New Channel.
25. Select the Measure tab to setup and design a data display. Below, is an example of how to show PCM channel values in Measure by pressing Measure>Design>Add tabular display data> select Data channel on the right-hand side of the screen. Also enable Raw Scaling and Hex Format using the Print Format sections on the left-hand side of the screen.

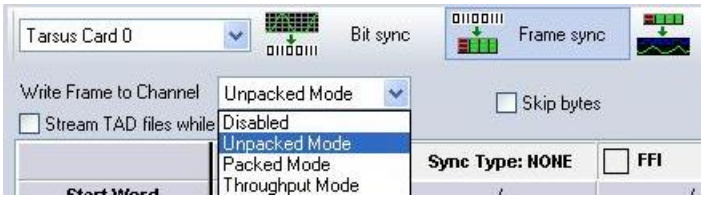


6.3.3 Recording a Chapter 10 File

This section explains how to setup the software and hardware to serve as a Chapter 10 Recorder. Some information pertains to basic setups may be looked over in this section, but can be found in other sections of the manual. To setup as a Recorder:

1. Click on the Settings button in the upper right-hand corner and click Settings from the menu. Click on Extensions in the upper left-hand corner. Select Chapter 10 under the Plug-Ins heading.
2. Set the Device Type radio button to Recorder. As a Recorder, the Ulyssix hardware receives the PCM data and DEWESoft converts the data to one of the following formats: Packed, Unpacked, Throughput, or Throughput Aligned Mode. The converted data is either saved to a file or broadcast from an Ethernet port in Chapter 10 UDP.
3. Enter an Output type: either Chapter10File or Ethernet Chapter 10 UDP data packets.
4. Select PCM under the Plug-Ins heading.
5. Under the Hardware settings tab select Ulyssix PCM Card from the drop-down box located under PCM Card.
6. Press OK to close the Settings window.
7. Go to the Channel Setup tab and click the PCM icon. Click on the Bit Sync icon to configuring the Bit Sync.
8. Press the Frame Sync icon and enter the major and minor frame settings.
9. Locate the Write Frame to Channel drop down box and select a Chapter 10 format for saving the data
    a. **Unpacked Mode**– Data packing is disabled and each decom word is padded with the number of filler bits necessary to align the first bit of each word.
    b. **Packed Mode** – Data packing is enabled and padding is not added to each data word. However, filler bits may be required to maintain minor frame alignment on word boundaries.
    c. **Throughput Mode**– PCM data is not frame synchronized. The first data bit in the packet can be any bit in the major frame.

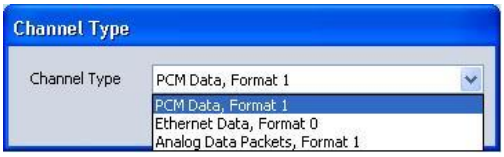
d. **Throughput Aligned Mode** – This is a special format developed by DEWESoft. The data is aligned on 32-bit boundaries, but any 32-bit word can start a Chapter 10 PCM packet.



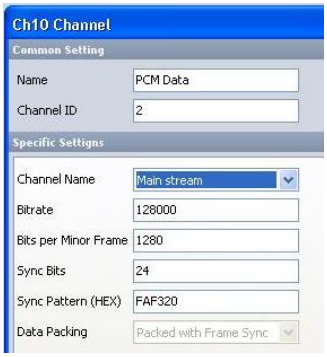
10. Press the "Chapter 10" icon.

Note: Channel Name scan be edited from this form. Other configurations related to the channels are available under the Set Channel button. Press Add Channel to add a channel or Remove Channel to delete a channel.

11. Press Add Channel and select a Channel Type:
    a. PCM Data, Format 1
    b. Ethernet Data, Format0
    c. Analog Data Packets, Format1



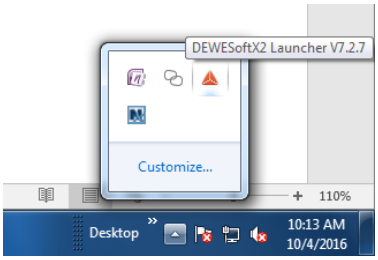
12. The Chapter 10 Channel form will open (the information stored here is derived directly from what was configured in the Bit Sync and Frame Sync).
13. Press Ok.
14. Press the Decom icon and set up the Decom channels manually or use Auto Generate for a fast channel setup.
15. For further information on Decom setup and the Design/Measure screen, please refer to the appropriate section of the manual.



6.4 DEWESoft NET Option

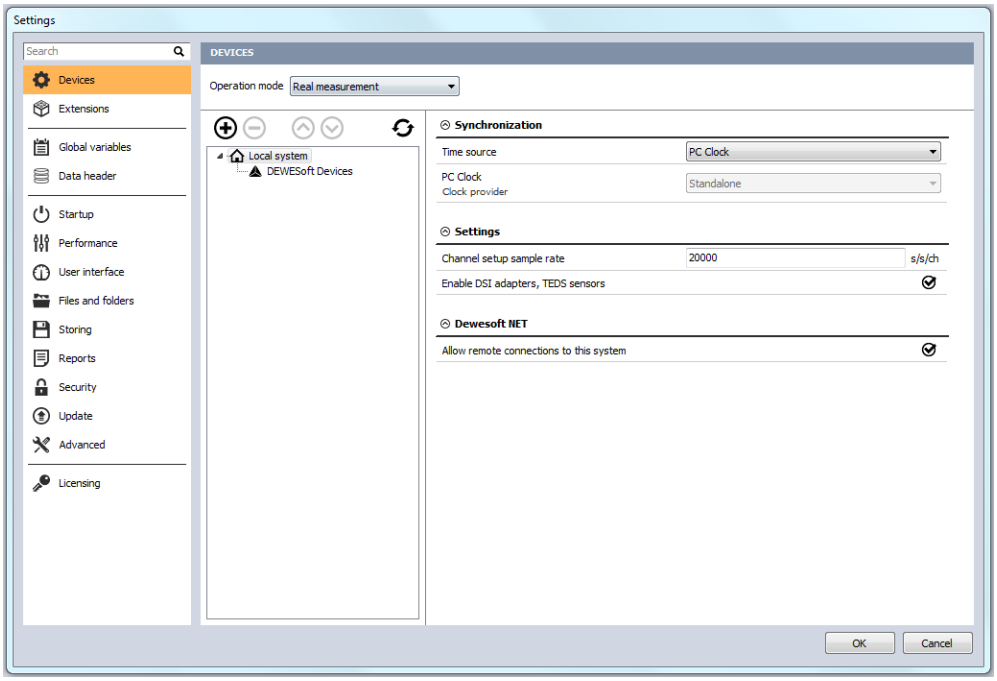
The DEWESoft NET Option allows a computer with data acquisition hardware and DEWESoft to forward selected channels, via a network connection, to other computers running DEWESoft. The computer with the data acquisition hardware is called the Measurement Unit. Please note that the Measurement Units and Clients must be on the same network. The NET Option allows for multiple Measurement Units and multiple Clients on the same network.

Note: All the Measurement Units and Clients must use the same version of the DEWESoft Launcher. The DEWESoft Launcher is accessed through the Windows taskbar. The easiest way to ensure that the DEWESoft Launcher is the same version is to use the same version of the DEWESoft full installation on all computers with the NET Option.



6.4.1 Measurement Unit

In the DEWESoft NET Option terminology, the Measurement Unit is the computer with the data acquisition hardware. The Measurement Unit should be setup first.



1. Open a DEWESoft setup file for the system hardware and software configuration.

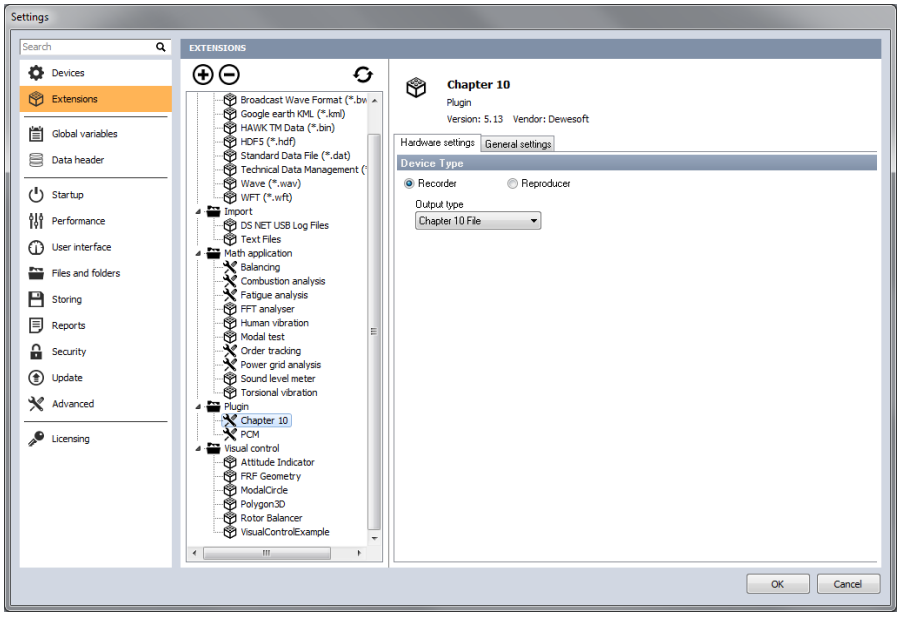
2. In the upper right-hand corner of DEWESoft, click the Settings button and then select Settings from the pop up menu. The Settings window will appear.
3. In the Setting window, select Devices from the menu on the left. On the right of the Settings window there is a column of options, under DEWESoft NET, check the circle for "Allow Remote Connections to this System."
4. In the column of options in the Settings window, examine the options under Synchronization. There are two entries: Time Source and PC Clock / Standalone. These entries must be properly configured for your time setup or one of the entries will be highlighted in red and DEWESoft will not allow you to exit the Settings window.
    a. When Time Source is set to "PC Clock," the bottom option will be PC Clock and set to "Standalone." This will use the computer clock for time synchronization.
    b. When Time Source is set to "External," the bottom option will be External. The options for External Time Source are: Clock / Trigger, IRIG-A DC, IRIG-B DC, IRIG-G DC, IRIG-A AC, IRIG-B AC, IRIG-G AC, or NTP.
5. Click OK to close the Settings window.
6. Click on the Measure tab.

Note: Leaving the Measurement Unit on the Measure screen is important for setting up a View Client. The View Client only connects to the Measurement Unit when the Measurement Unit is on the Measure Screen

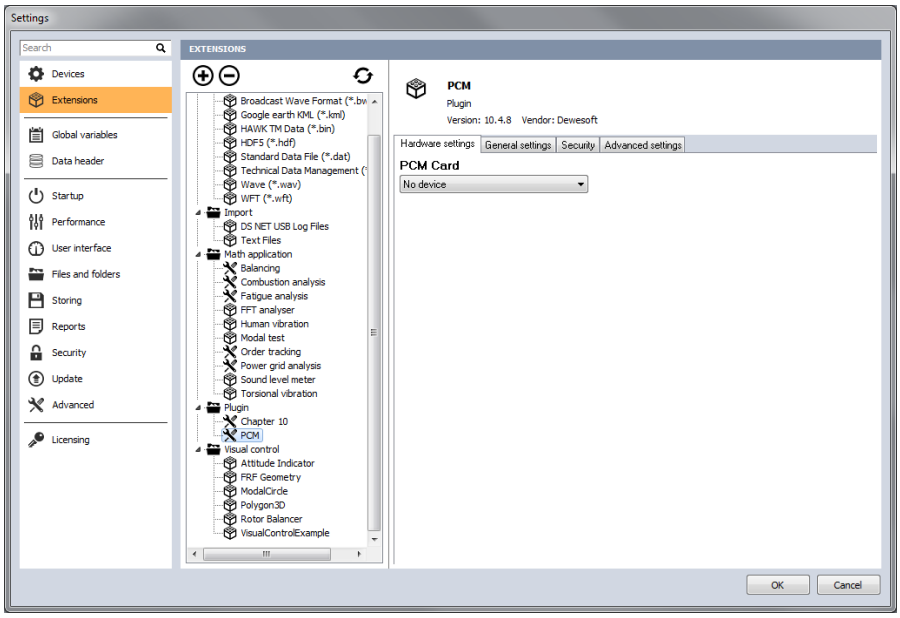
6.4.2 Client

In the DEWESoft NET Option terminology, the Client is the computer that receives data from the Measurement Unit. The standard Client type is the View Client. View Clients can view data acquired from the Measurement Unit. The Clients do not need data acquisition hardware and can run the trial version of DEWESoft. The Measurement Unit should be set up first.

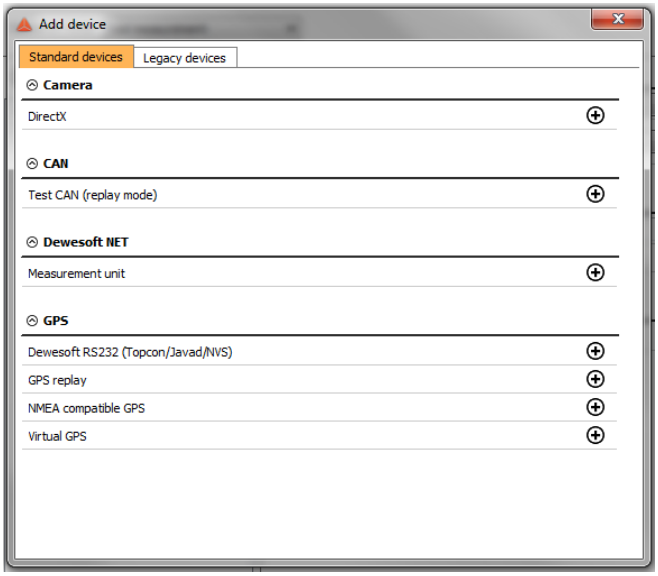
1. Open a DEWESoft setup file that has the screens and widgets for the Measure screen.
2. In the upper right-hand corner of DEWESoft, click the Settings button and then select Settings from the pop up menu. The Settings window will appear.
3. Disable data source for Chapter 10 and PCM Plug-Ins, if either Plug-In is enabled in DEWESoft. DEWESoft can only have a single time source. To ensure that the time source is the .NET Option Measurement Unit, the Chapter 10 Plug-In and PCM Plug-In configuration must be changed:
    a. In the Settings window, select Extensions.
    b. Under the Extension heading, find Plugin in the Extension list.
    c. Select the Chapter 10 Plug-In and in the Hardware Setting" tab ensure that the Recorder radio button is selected.



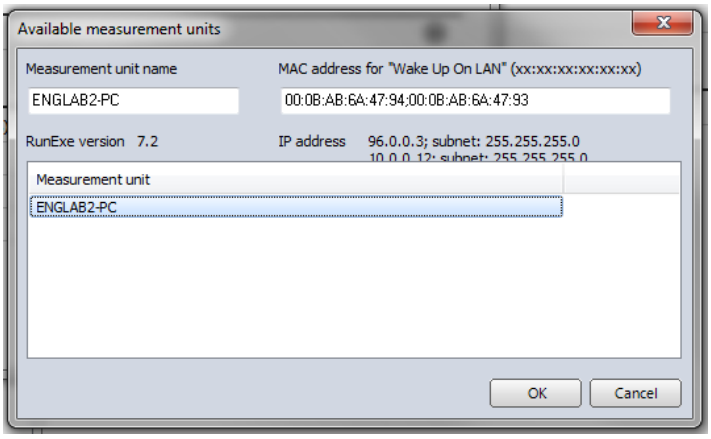
d. Select the PCM Plug-In and in the Hardware Settings tab set the PCM Card to No device.



4. In the Setting window, select Devices from the menu on the left. At the top of the center column, click the “+” button to add a Measurement Unit. The Add Device window will appear.

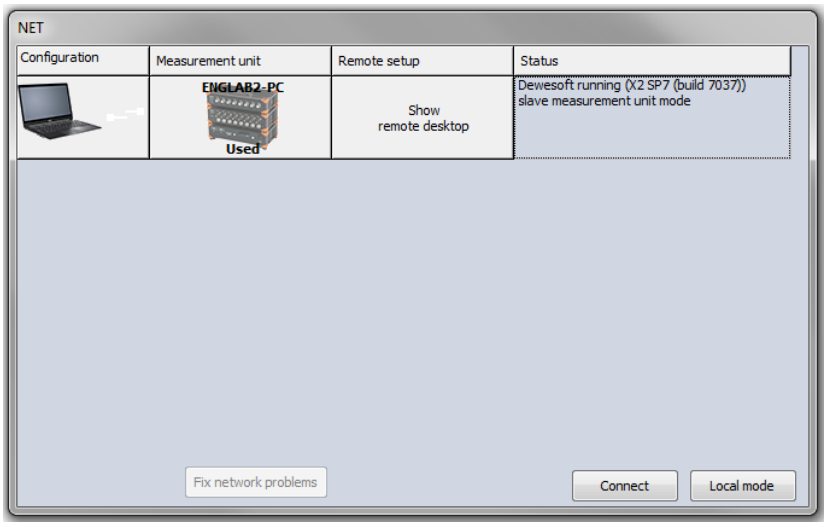


5. In the Add Device window, click the "+" next to Measurement Unit. The Available Measurement Unit window will appear. Select the name of the Measurement Unit from the list. The name will be the name assigned to the Measurement Unit computer as the top layer in Windows Control Panel Device Manager. Click the OK button to close the Available Measurement Unit window.

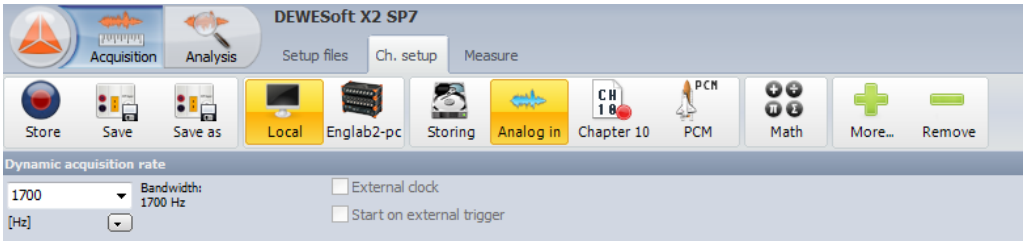


6. In the Setting window, select Devices from the menu on the left. On the right-hand side of the window, locate Synchronization. Set Time Source to "PC Clock" and set the second entry, PC Clock, to "Automatic."
7. In the Setting window, select Devices from the menu on the left. On the right-hand side of the window, locate DEWESoft NET. Set the Remote Mode to "View Client." Check the option for Auto Connect.
8. Click OK to close the Settings window.

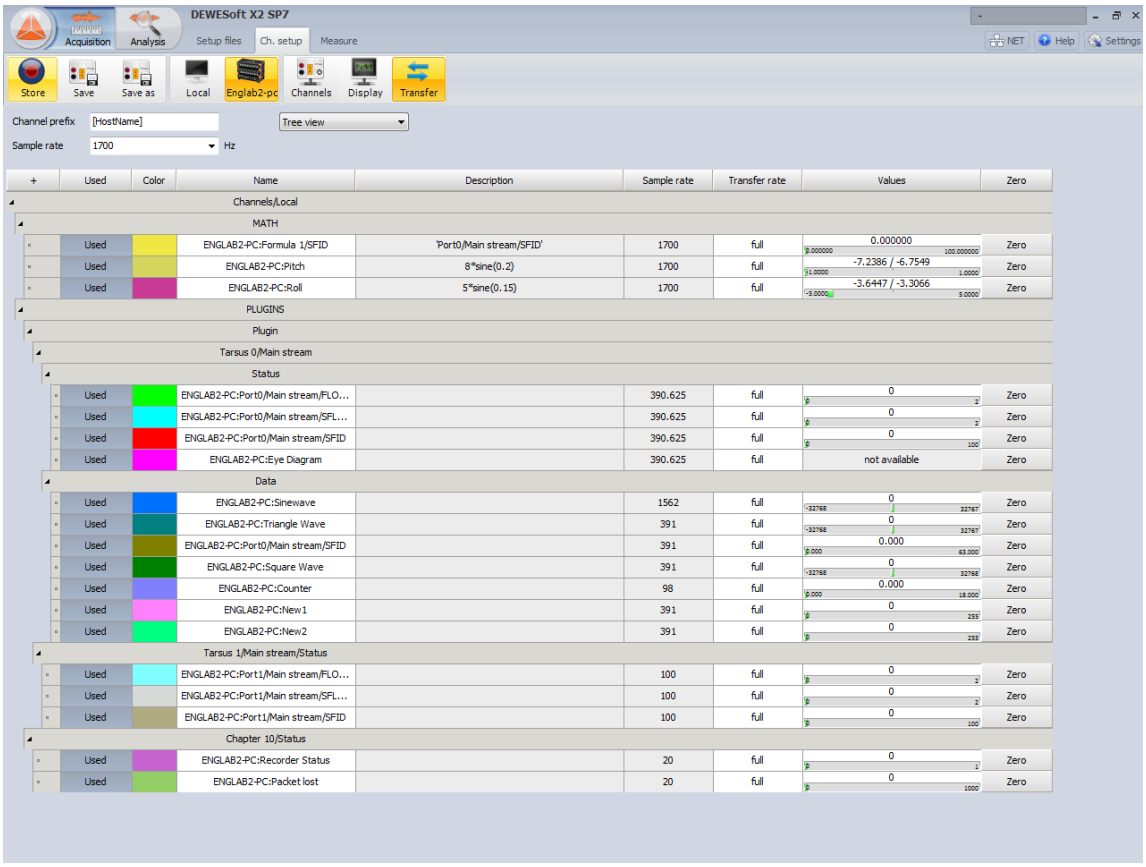
9. The NET window will appear briefly and then close for the Auto Connection to the Measurement Unit. If the window does not close, look under the Status heading to see if there is a Firewall warning. Firewalls will cause issues with the Client connecting to the Measurement Unit.



10. The DEWESoft main window will appear. There will be two new icons: the Local icon and an icon with the name of the Measurement Unit (in our example this is Englab2-pc).



11. Click on the icon with the Measurement Unit name to bring up the Measurement Unit Channel window. In this window, set the desired channels to Used. To select an individual channel, left click on the Unused button next to the channel name. To select all channels at once, click the column header Used to highlight all rows and then left click on the Unused button on any row.



12. Click on the Measurement tab to enter the Measure screen. If data is not flowing, follow the trouble shooting steps below:
    a. An error box appears that says “Start pulse is not detected. Please check the hardware.” This message appears when DEWESoft has multiple time sources selected. The most likely culprit is that the Chapter 10 Plug-In is set to Reproducer instead of Recorder. See Step 3 above for more details.
    b. If the Measure screen widgets are blank, there could be multiple causes.
        i. The first possibility is that the widgets do not have channels assigned from the Measurement Unit. Select a widget and then select a channel from the Channel List sub menu named with the computer name for the Measurement Unit.
        ii. The second possibility is that the PCM Plug-In is not set to “No Card.” See Step 3 for more details.

6.5 Missed Distance Calculator Option

The Missed Distance Calculator Option calculates Doppler ranging using frequency domain data. The miss distance calculation is done inside of the DEWESoft 3d Graph widget. The frequency domain data is created using the DEWESoft's Short-Time Fourier Transform on a time domain Doppler data source. The time domain Doppler data source can be from an analog signal or Doppler embedded as a decom channel in a PCM data stream.

Note: The DEWESoft 3D Graph widget will only display a synchronous time channel. If the decom channel is not synchronous, then the decom channel must be converted to synchronous using a Math channel.

The missed distance calculation is only done in DEWESoft's Analysis Mode. However, the 3d Graph widget can display the Doppler data live if the Short-Time Fourier Transform is applied to the live data via a Math Channel.

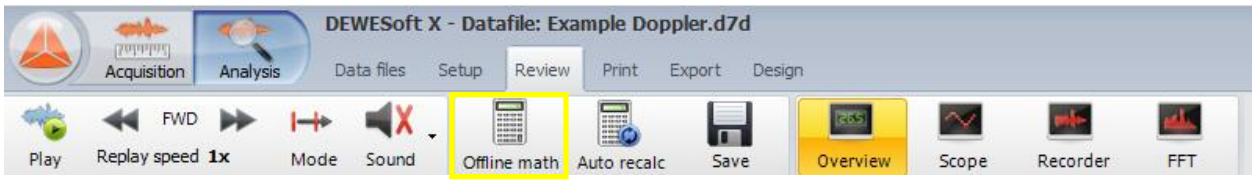
6.5.1 Setting up an Analog Doppler Data Source

Setting up the analog data source for use with the Missed Distance Calculator requires an analog data source with Doppler data. In DEWESoft, all analog data sources are synchronous time channels. There are two typical Doppler Analog data source:

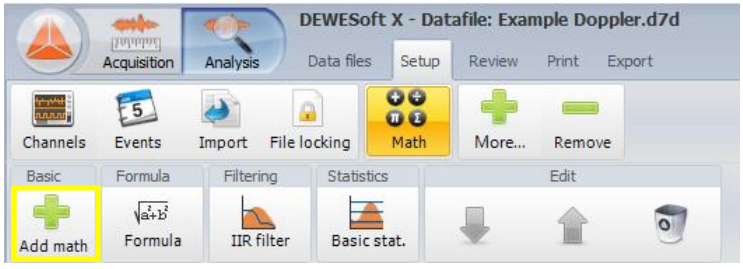
1. The input from a hardware analog to digital data acquisition card. DEWESoft supports a variety of data acquisition cards.
2. An analog channel from an IRIG 106 Chapter 10 file.

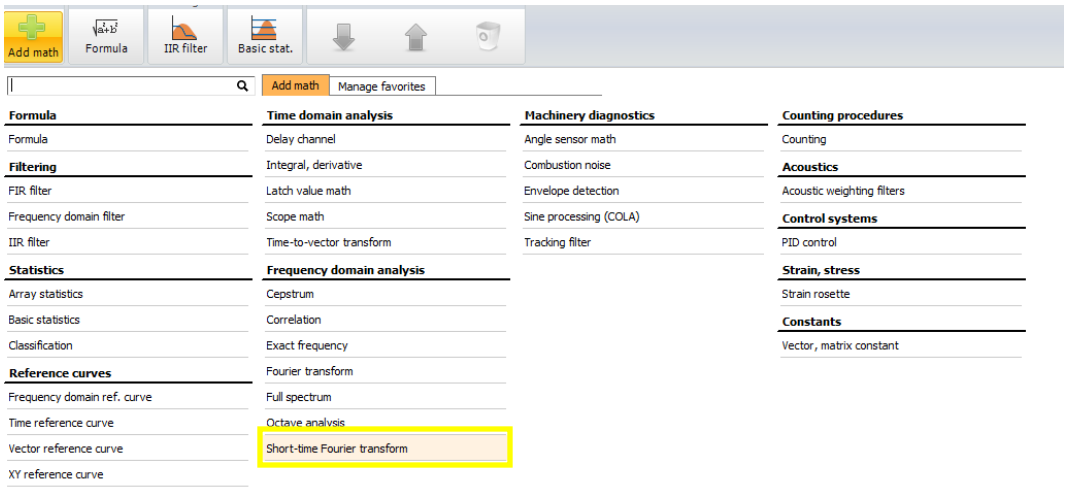
Follow the procedure below to set up the analog data source for the Missed Distance Calculator:

1. Load the DEWESoft data file, either D7D or DXD, into Analysis Mode.
2. In the DEWESoft Analysis Mode Ribbon, click the "Offline Math" button (yellow rectangle below) to display the Math Channel window.

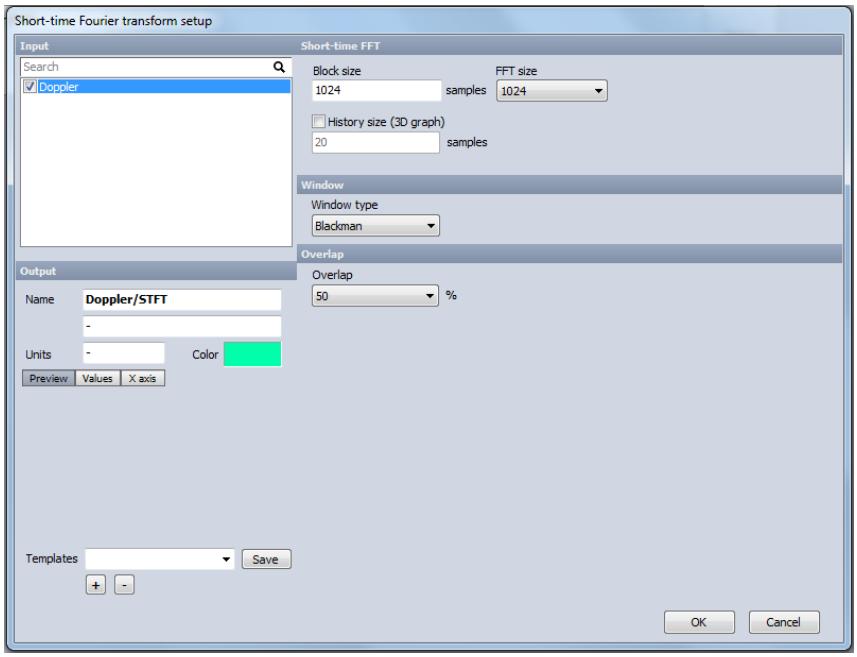


3. In the Math Channel window, click the "Add Math" button and then select "Short-Time Fourier Transform" from the list of Match Channel types. This will launch the Short-Time Fourier Transform Setup window.



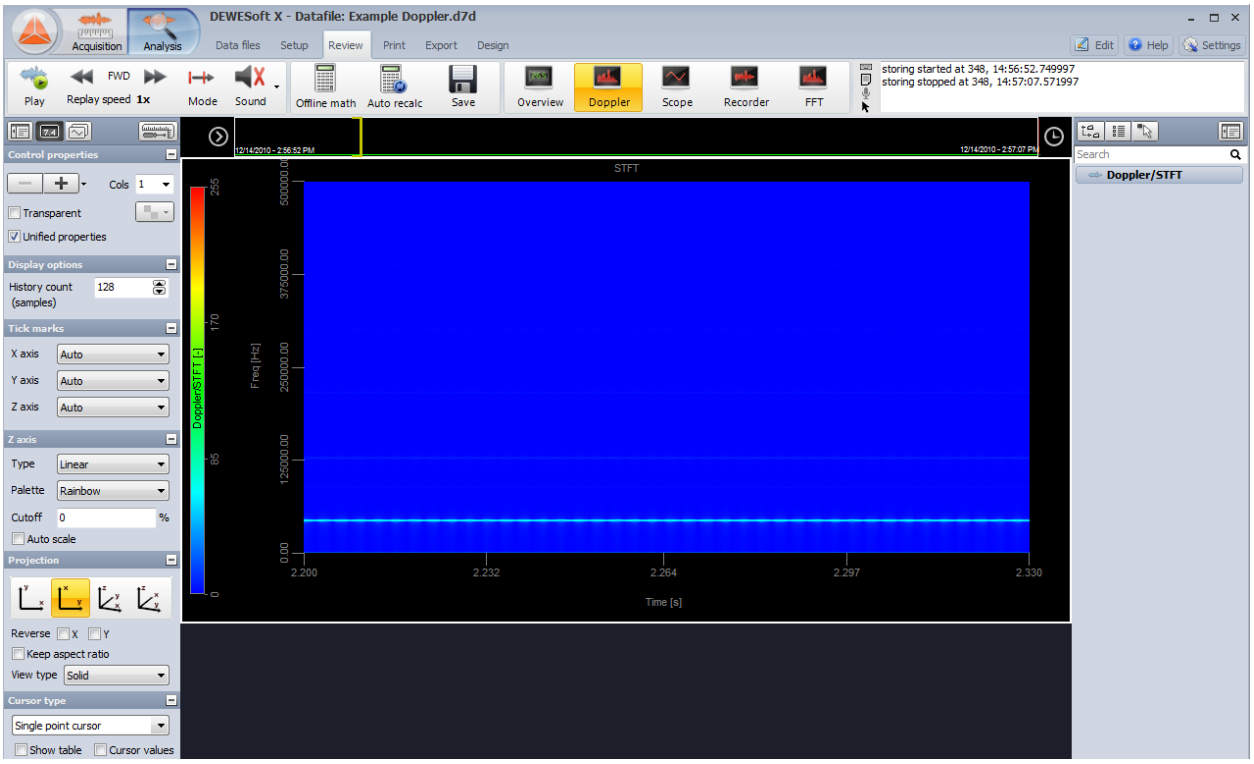


4. In the Short-Time Fourier Transform Setup window, select the desired DEWESoft Decom channel for the conversion to the frequency domain. In the example below, the channel name is "Doppler." Then click "OK."



5. Click the "Review" tab at the top of the DEWESoft display to return to Analysis Mode.
6. The "Offline Math" button is now labeled, "Recalculate." This name changes communicates that a new math channel has been created and the data for this math computation has not been done. Click the "Recalculate" button to calculate the data for the Short-Time Fourier Transform.
7. Click the "3d Graph" button (see image below) to add a 3d Graph widget to a DEWESoft display page. Resize the 3d Graph as desired.

8. Select the 3d Graph widget by left mouse clicking on the display and then select the desired DEWESoft channel from the Channel List on the right. The Channel List will only display Short-Time Fourier Transform channels appropriate for the 3d Graph widget. In the image below, the "Doppler/STFT" is the only channel appropriate channel available for the 3d Graph widget.

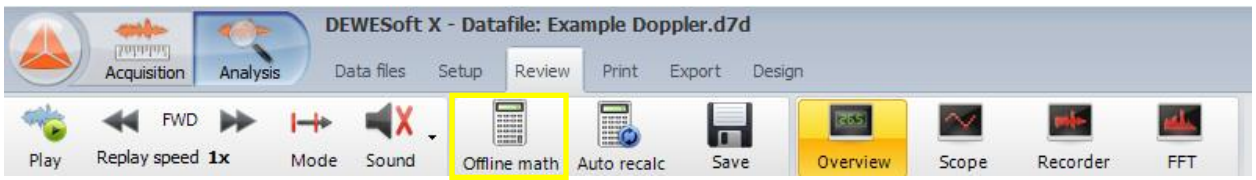


6.5.2 Setting up an Embedded PCM Doppler Data Source

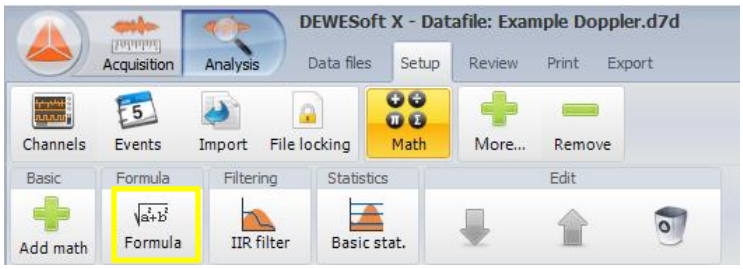
Setting up the embedded PCM data source for use with the Missed Distance Calculator requires that DEWESoft is configured to acquire the PCM data source and that the decom channel for the Doppler is configured. Channels from PCM Plug-In and from the Chapter 10 Plug-In are considered asynchronous time channels by DEWESoft, therefore the Doppler decom channel must be converted to a synchronous time channel using a Math Channel.

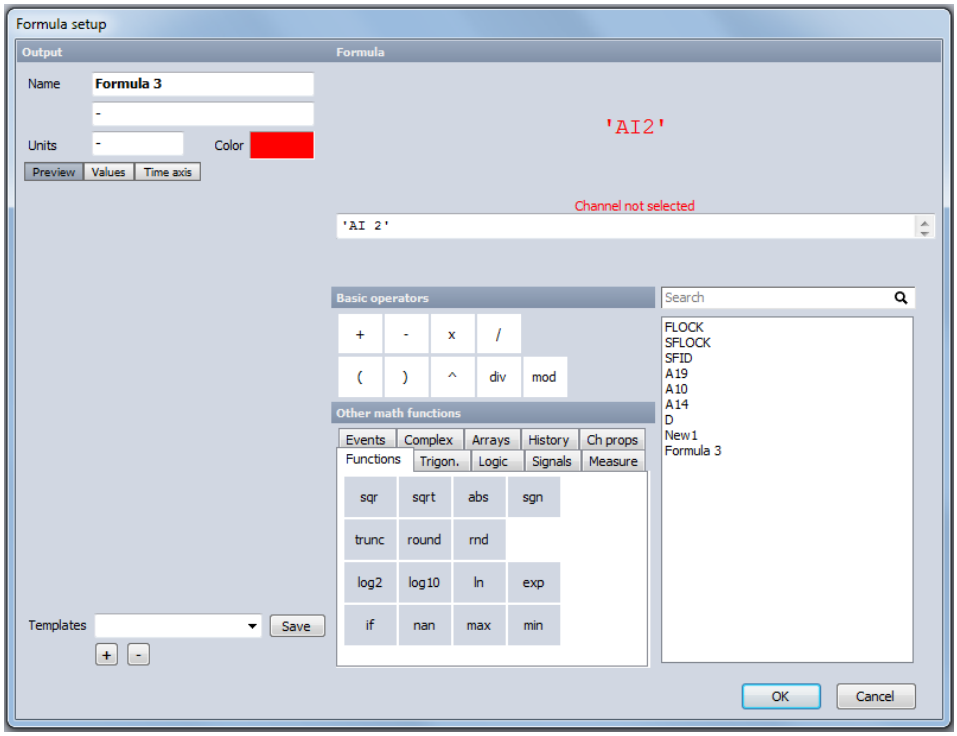
Follow the procedure below to set up the analog data source for the Missed Distance Calculator:

1. Load the DEWESoft data file, either D7D or DXD, into Analysis Mode.
2. In the DEWESoft Analysis Mode Ribbon, click the "Offline Math" button (yellow rectangle below) to display the Math Channel window.

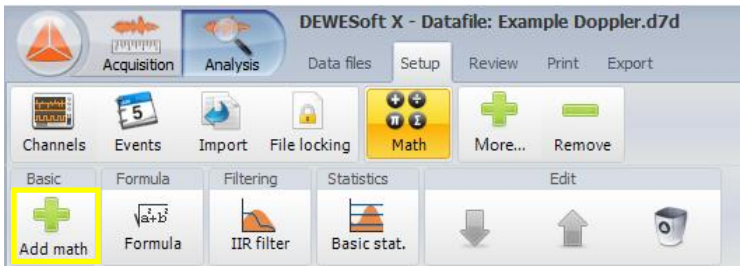


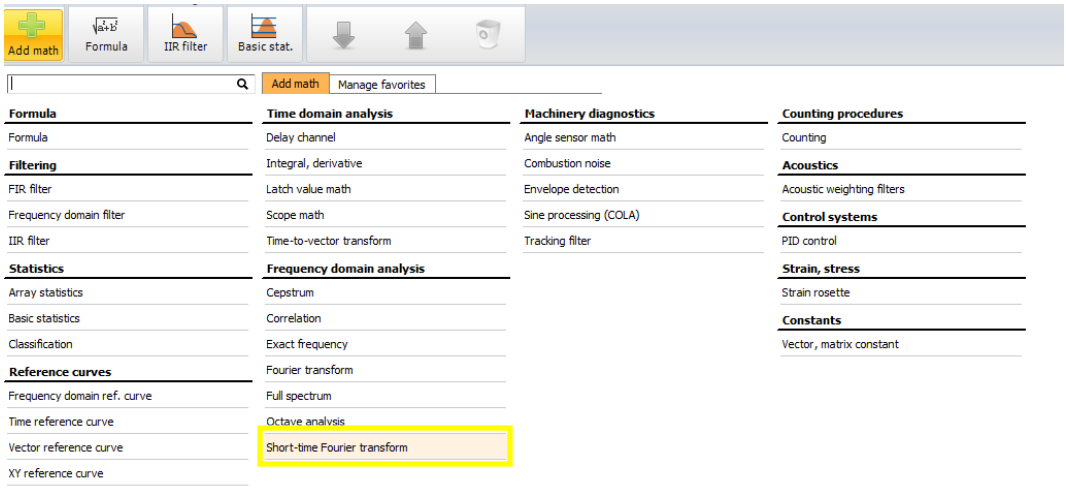
3. In the Math Channel window, click the “Formula” button (yellow rectangle in the image below). This will launch the Formula Setup window.



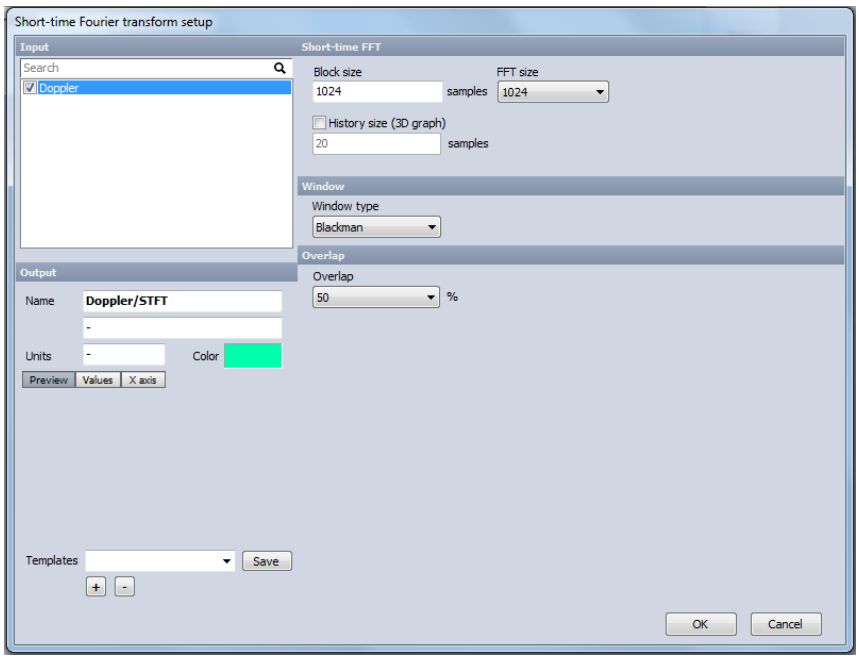


4. In the Formula Setup window:
    a. Change the Name in the upper left corner to “Doppler.”
    b. Delete the text in the formula box. In the example above, this text is “AI 2.”
    c. Double click the DEWESoft channel for the embedded PCM Doppler channel in the list of channels on the right side. In this example, that is channel “D.” The channel name should appear in the text formula box.
    d. Click the “Time Axis” button to display the options for time. From the Timebase drop-down box, select “Sync” to set the Math Channel to a synchronous time channel.
    e. Click “Ok” to close the Formula Setup window.
5. In the Math Channel window, click the “Add Math” button and then select “Short-Time Fourier Transform” from the list of Match Channel types. This will launch the Short-Time Fourier Transform Setup window.



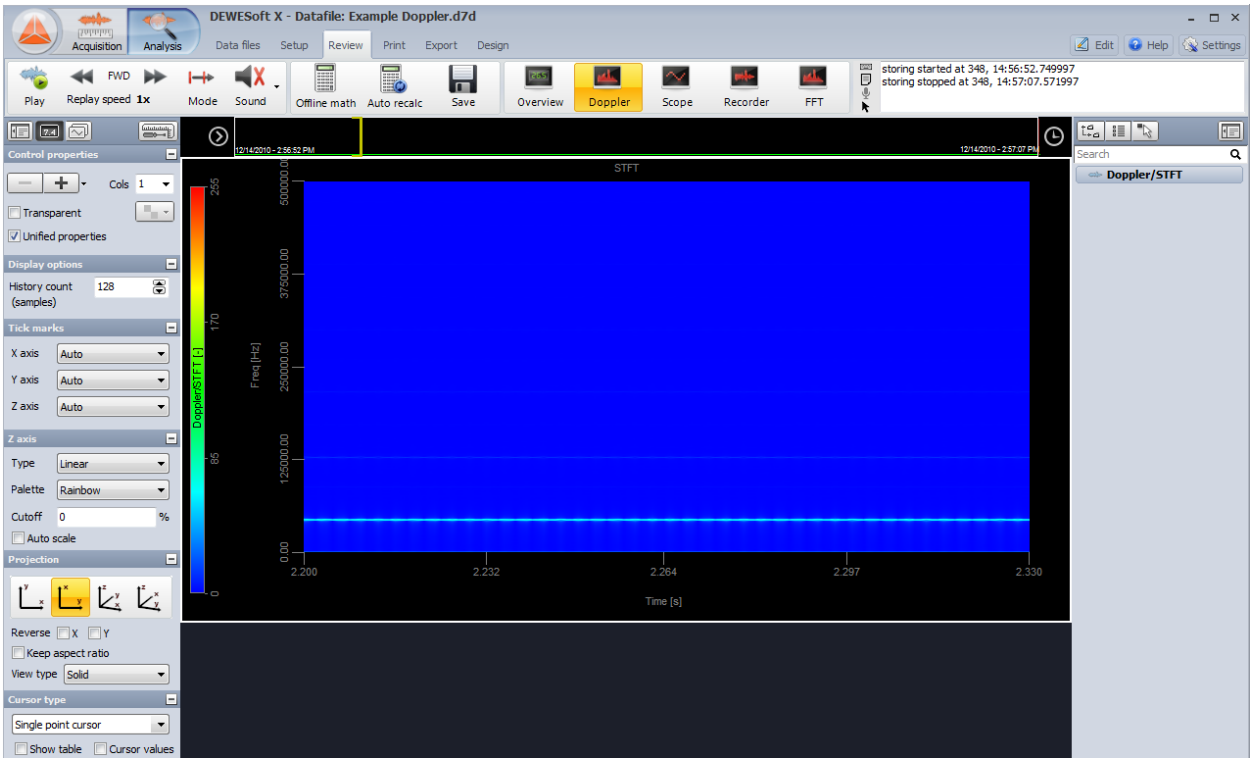


6. In the Short-Time Fourier Transform Setup window, select the desired DEWESoft Decom channel for the conversion to the frequency domain. In the example below, the channel name is "Doppler." Then click "OK." Discussion of the Short-Time Fourier Transform settings is beyond the scope of this manual. Please consult the DEWESoft Manual for more information of the implementation and configuration of the Short-Time Fourier Transform and other math functions.



7. Click the “Review” tab at the top of the DEWESoft display to return to Analysis Mode.
8. The “Offline Math” button is now labeled, “Recalculate.” This name changes communicates that a new math channel has been created and the data for this math computation has not been done. Click the “Recalculate” button to calculate the data for the Short-Time Fourier Transform.
9. Click the “3d Graph” button (see image below) to add a 3d Graph widget to a DEWESoft display page. Resize the 3d Graph as desired.

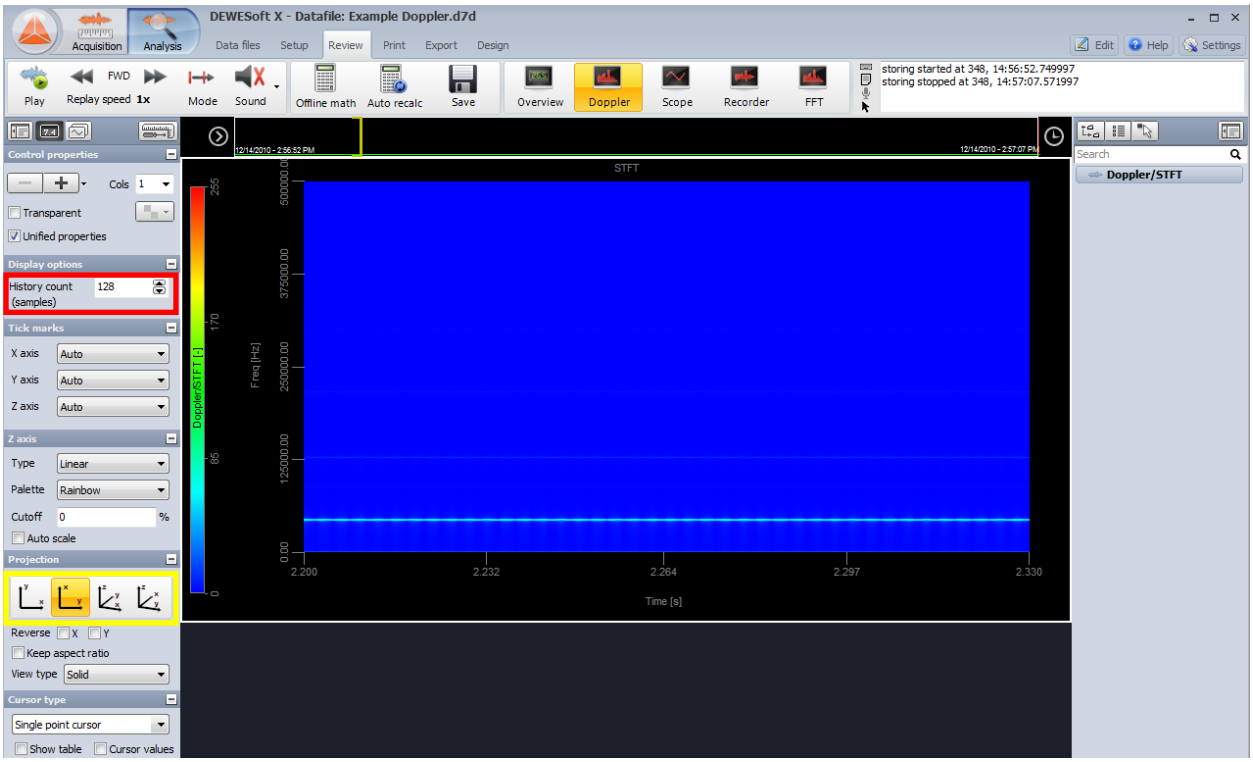
10. Select the 3d Graph widget by left mouse clicking on the display and then select the desired DEWESoft channel from the Channel List on the right. The Channel List will only display Short-Time Fourier Transform channels appropriate for the 3d Graph widget. In the image below, the “Doppler/STFT” is the only channel appropriate channel available for the 3d Graph widget.



6.5.3 Using the DEWESoft 3d Graph Widget and the Missed Distance Calculator

The 3d Graph widget is a standard display in DEWESoft. To best use it for the Missed Distance Calculator, the 3d Graph needs to be configured. The 3d Graph, as its name indicates, is a three-dimensional plot. For the Missed Distance Calculator application, the X-axis is Frequency in Hertz, the Y-

axis is Time in seconds, and the Z-axis is Fourier Intensity (unitless). The plot has multiple configurations.



Display Options – The History Count is the number of Short-Time Fourier samples that are plotted along the Time Axis. Changing the History Count zooms in or out in along the Time Axis. The History Count can be changed via the numeric up down control in the left menu (red rectangle in the image below) or by clicking on the left most number on the Time Axis of the 3d Graph. The History Count has a minimum of 0 samples and a maximum of 1077 samples for a Short-Time Fourier Transform with default settings of Block Size of 1024, FFT Size of 1024, and Overlap of 50%.

Z-Axis – These controls configure the Z-Axis (blue rectangle in the image below). The Type drop down box determines if the Z-Axis is in Linear or Log Scale. For the Doppler plot, it is recommended to use the Log Scale. The Palette drop down box sets the color scheme for the Z-Axis.

Projection – The standard way to view the Doppler in the 3d Plot is the Y-X Projection where Frequency is on the vertical axis and Time is on the horizontal axis. This is the second icon from the left where X in on the vertical axis and Y is on the horizontal axis. Other Projections maybe useful. The Projection Controls are located on the left side menu with the 3d Graph is selected (yellow rectangle in the image below.

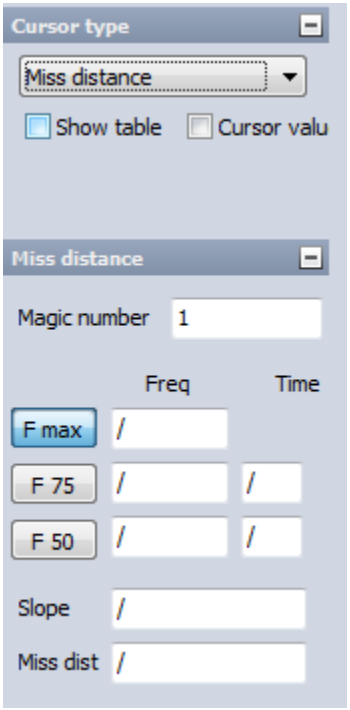
Cursor Type – Determines the use of the cursor in the 3d Graph Widget. Possible values are:

1. Single Point Cursor – Left clicking adds a cursor marker on the display. Right clicking clears all cursors.

2. Delta Cursor – Left clicking adds up to two cursors. The slope of the line is displayed in the Cursor Type menu. Right clicking clears both cursors.
3. Info Channel Cursor – Similar to Single Point Cursor
4. Missed Distance Cursor – Adds the Missed Distance display below the Cursor Type in the left-hand menu.
5. Time Domain Cursor – Similar to the Single Point Cursor.

Missed Distance – Controls for using the Missed Distance Calculator.

1. Magic Number – Test event specific value. This value is used to missed distance calculation.
2. Fmax – After clicking this button, select the maximum frequency or the stable horizontal part of the Doppler plot on the 3d Graph widget.
3. F 75 – After clicking this button, select the point on the Doppler roll off that is 75% of the maximum frequency.
4. F 50 – After clicking this button, select the point on the Doppler roll off that is 50% of the maximum frequency.
5. Slope – this is the calculated slope between the F 75 and F 50 points.
6. Missed Dist – This is the calculated missed distance.



Setting the X-Axis and Z-Axis Maximum and Minimum Values
The 3d Graph widget allows adjustment to the X-Axis and Z-Axis by clicking and setting the maximum and minimum values on the display.

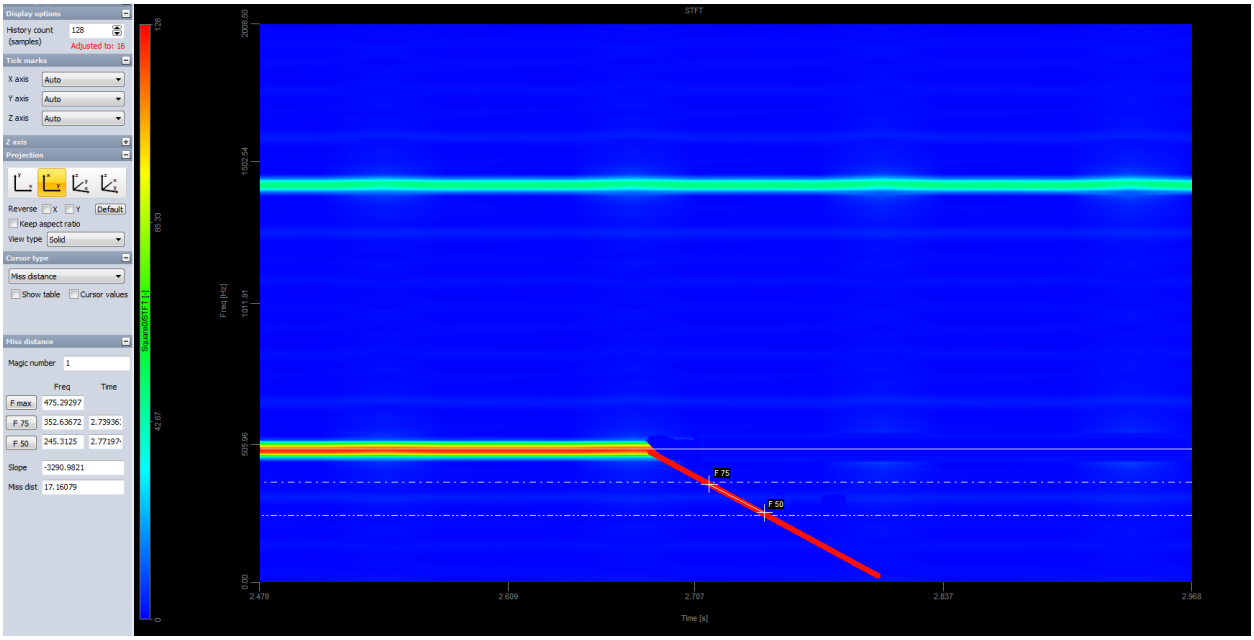
The Z-Axis control is the color spectrum bar to the left of the plot. In the Doppler plot, the Z-Axis represents the Fourier Transform intensity. It is important to adjust the maximum and minimum values so that the signal of interest is a contrasting color to the back-ground signals. Setting the Z-Axis to Log Scale provides better resolution for the Fourier Transform intensity, it does make settings for the maximum and minimum value sensitive. The maximum value is set by clicking value at the top of the color bar and changing the value. The minimum value is set by clicking the value at the bottom of the color bar and changing the value.

The X-Axis control is the vertical scale on the 3d Graph Doppler Plot. The X-Axis is the Frequency of the Doppler plot. The maximum value is set by clicking value at the top of the axis and changing the value. The minimum value is set by clicking the value at the bottom of the axis and changing the value. It is important zoom in on the X-Axis

6.5.4 Missed Distance Calculation

The Missed Distance Calculation is used on stored data in Analysis Mode. Once in Analysis Mode, scroll through the data to locate Doppler roll off.

1. Adjust the History Count to adjust the horizontal axis for an appropriate zoom.
2. Adjust the vertical axis by adjusting the maximum and minimum frequency values.
3. In the Cursor Type drop down box, select “Missed Distance Calculator.” The Missed Distance controls will appear below the Cursor Type in the left-hand menu.
4. Click the Fmax button. On the 3d Graph widget, click the horizontal maximum value of the Doppler plot. After Fmax is defined, three horizontal lines are added the 3d Graph widget. One line at Fmax. A second line at 75% of Fmax. And a third line at 50% of Fmax.
5. Click the F 75 button. On the 3d Graph widget, click the intersection of the 75% horizontal line and the Doppler roll off.
6. Click the F 50 button. On the 3d Graph widget, click the intersection of the 50% horizontal line and the Doppler roll off.
7. The calculated values of the Slope and Missed Distance are displayed in the left-hand menu.



6.6 Astro-Med Plug-In

The DEWESoft Astro-Med Plug-In feeds data acquired by DEWESoft to the Astro-Med Everest or Real Chart printers. The plug-in sends Ethernet data packets the Astro-med printer. The DEWESoft GUI remotely sets which channels are displayed on the Astro-Med.

7. Saving a Diagnostic File

The Diagnostic File is a troubleshooting feature for the Ulyssix hardware. This feature should be used when encountering a problem with your system. The “Save Diag File” button is found in the upper right hand corner the Channel Setup screen.

1. Press the “Channel Setup” tab and then press the “Save Diag File” button.
2. In the dialog box, briefly explain the problem you’re having and then press “Save File.”
3. The Save As dialog will appear. Select a file name and file location for the diagnostic .tdd file.
4. Contact Ulyssix and send them diagnostic file.

8. Appendix B – The DEWETRON Portable Chassis

8.1 BIOS Login for DEWETRON Portables:

1. Immediately after startup, press the DELETE key and enter the last 5 digits of the DEWETRON system's S/N found on the back, or bottom of the chassis.