Syrinx3 ALTAIR Software and DeweSoft User's Manual

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Ulyssix Technologies, Inc
7470 New Technology Way, Suite B, Frederick, MD 21703-9461
Tel: 301-846-4800 ~ Fax: 301-846-0686 ~ www.ulyssix.com

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Chapter 1 System Overview

1.1 Overview

The Syrinx3 can be used with Ulyssix Technologies ALTAIR software or DeweSoft data acquisition software. The Syrinx3 requires that your system has the Syrinx3 card drivers properly installed in it.

What is the Syrinx3 hardware?

The Syrinx3 Baseband Demodulator board has four different configurations: single FM baseband demodulator, dual FM baseband demodulators, FM/64 channel PAM baseband demodulator, or as an element in a FM Demux System. All configurations allow the demodulators to be disabled and the card can run as a digital lowpass filter.

The Syrinx3 allows the user to set up each individual card with an easy to use GUI interface. For FM mode, the user GUI allows users to program the center frequency and deviation or enter the IRIG constant or proportional bandwidth frequency number where PAM allows the user to setup the 64 channel PAM carrier frequency as well as output the PAM demodulator signal in PCM form. The PAM/PCM output is done using eight 16-bit PCM words per PCM channel with a 32-bit FE6B2840 Frame Sync pattern output during words 7 and 8 of the 5^{th} PAM sync word. This PAM/PCM output gives a total of 512 16-bit words per 64 channel frame running at 128 times the channel rate (3.2 Mbps for 25 kHz, 5.333760 Mbps for 41.67 kHz and 12.8 Mbps for 100 kHz).

All configurations allow the user to select the input impedance, output filter data type and output filter frequency, as well as setting the output analog level and offset. Graphical displays like spectral FFT and waveform displays give the user easy tool to optimize the Receiver performance

1.2 Scope of this document

This help file and manual is meant for users running Syrinx3 using ALTAIR or DeweSoft.

For ALTAIR users, this document will serve the purpose of describing how to set up the demodulator, explain demodulator functions, and how to view waveform displays.

For DeweSoft users, it is meant to serve as an adjunct to the current version of the DeweSoft user's manual, but 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 systems in general. Please refer to that manual for all general operational aspects of the system.

This document is intended to supplement that manual with information specific to the Syrinx3 hardware and the software plug-in called Syrinx3 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 exist within that application to add new features and capabilities. Software Plug-ins range from very simple applications that perform a single basic function, or complex plug-in such as the Syrinx3 Plug-in, with thousands of features and functions with extensive interaction with complex hardware.

Please use this document as a reference when using the Syrinx3 within your system.

What is the Syrinx3 Plug-in for DeweSoft?

The Syrinx3 Plug-in provides the software interface to the Syrinx3 hardware. It allows you to easily access and use the digital baseband demodulator in a graphical, easy to use manner. This document will illustrate how to set up and then use the Syrinx3 hardware installed within the system, via the software plug-in.

Chapter 2 ALTAIR Software Installation

2.1 System Requirements

The ALTAIR software utilizes the latest software technologies by using Microsoft .NET framework and Microsoft DirectX, Direct3D graphics interface. The following table contains the minimum computer configuration requirements for installing and operating the Ulyssix card and the supporting software. For optimum performance, please install into a computer that meets or exceeds these Configuration Specifications.

Parameter	**Minimum Configuration**
Processor Speed	Intel i7 Quad Cord with Hyper-Threading
RAM	4 GB or Higher for 32-bit Windows OS 8 GB or Higher for 64-bit Windows OS
Available Hard Drive Space	40 GB
Operating System	Windows 7 32-Bit (4GB) Windows 7 64-Bit (8GB)
Power Supply	25 Watts available power per cPCI or PCIe card installed
Chassis	1 Slot is required for each cPCI or PCIe card installed
Drives	CD/DVD ROM
Video Adapter Card	GeForce GTX 660 2GB on-board RAM Video card must support DirectX and Direct3D.

Minimum System Requirements Table

2.2 ALTAIR Software and Ulyssix Driver Installation

The Windows based ALTAIR software runs on Windows 7 32-bit, Windows 7 64-bit, and Windows 10 64-bit operating systems. Please contact Ulyssix for questions about other Windows based operating systems.

Please install the Ulyssix driver before installing the Ulyssix cards into your computer chassis. This will simplify the installation process and prevents possible Windows Plug and Play issues.

Ulyssix Driver Installation

There are three scenarios to consider when installing the Ulyssix driver. Please consider which scenario applies to your system and follow the instructions accordingly.

1. Upgrading from the old Jungo Driver. See **Upgrading from the Jungo Driver**.
2. Upgrading from a previous version of the Ulyssix Driver. See **Upgrading from a previous version of the Ulyssix Driver.**
3. Installing the Ulyssix Driver onto a new computer. See **Installing the Ulyssix Driver onto a new computer.**

Upgrading from the Jungo Driver

Upgrading from the original ALTAIR software that used the Jungo Plug 'n Play Driver requires two steps. First, uninstall the Jungo Driver and WinDriver from your computer. Second, install the new Ulyssix Driver. Instructions for the first step are below. For the second step, please see **Installing the Ulyssix Driver onto a new computer.**

1. To remove the Jungo Driver, open the Control Panel and select the Device Manager. Expand the listing for "Jungo." There should be two entries: "Ulyssix Technologies, Inc. Tarsus PCI Card" and "WinDriver." Please see **Figure 1 – Device Manager with Jungo Driver**.
2. Using your left mouse button, highlight "Ulyssix Technologies Inc., TarsusPCI Card," then hit the right mouse button and click on "Uninstall." Check the "Delete the driver software from this device" and then hit the OK button on the Confirm Device Uninstall dialogue box.
3. Repeat the above steps to uninstall the "WinDriver" from the "Jungo" folder.
4. The Device Manager will refresh and Jungo will not appear in the device list.
5. Follow the instructions in **Installing the Ulyssix Driver onto a new computer**.

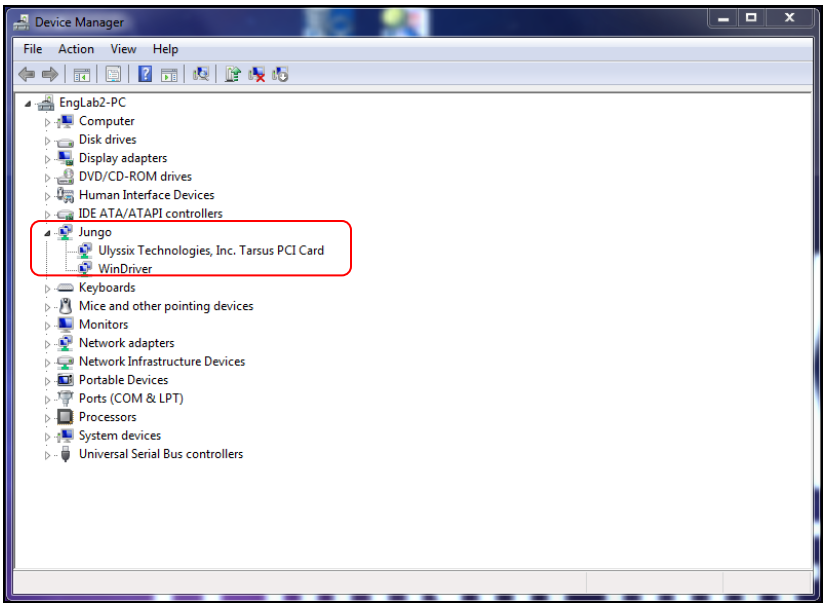
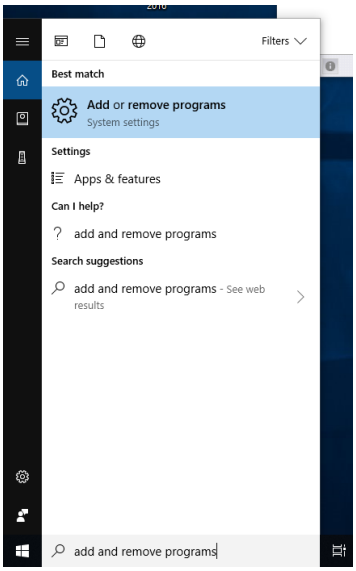


Figure 1 – Device Manager with Jungo Driver

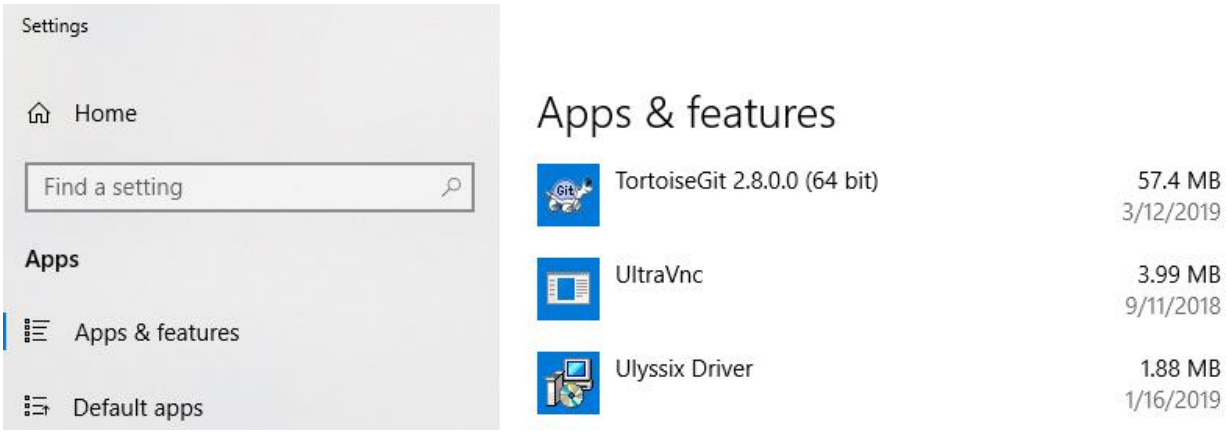
Upgrading from a previous version of the Ulyssix Driver

To upgrade from a previous version of the Ulyssix Driver requires two steps. First, uninstall the previous version of the Ulyssix Driver. Second, install the new version of the Ulyssix driver. Instructions for the first step are below. For the second step, please see **Installing the Ulyssix Driver onto a new computer.**

1. In the Windows Run prompt type “Add and Remove Programs.” Select Add and Remove Programs from the list of applications.



2. In the Add and Remove Programs window, find Ulyssix Driver. Highlight Ulyssix Driver and select Uninstall.



3. Windows will ask if you are sure that you want to uninstall this app, click Yes. This will launch the Ulyssix Driver uninstall wizard. Windows 10 might ask "Do you want to allow this app to make changes to your computer." Click Yes.
4. When the uninstall is completed, Ulyssix Driver will no longer be listed in the Add Remove Programs window.
5. Follow the instructions in **Installing the Ulyssix Driver onto a new computer**.

Installing the Ulyssix Driver onto a new computer

Select the correct Ulyssix Driver for the Windows operating system on your computer. The following drivers are currently available. Please contact Ulyssix for other Windows operating systems.

- For Windows XP, use installer "installer_WXP_x86.exe"
- For Windows 7 32-bit, use installer "installer_WIN7_x86.exe"
- For Windows 7 64-bit, use installer "installer_WIN7_x64.exe"
- For Windows 10 64-bit, use installer "installer_WIN10_x64.exe"

1. Select the correct Ulyssix Driver for your operating system and run the executable file. Windows 10 might ask "Are you sure that you want to allow this app to make changes to your computer?" Click Yes.
2. The installer will begin with this a welcome screen. Click the Install button to start the installation.

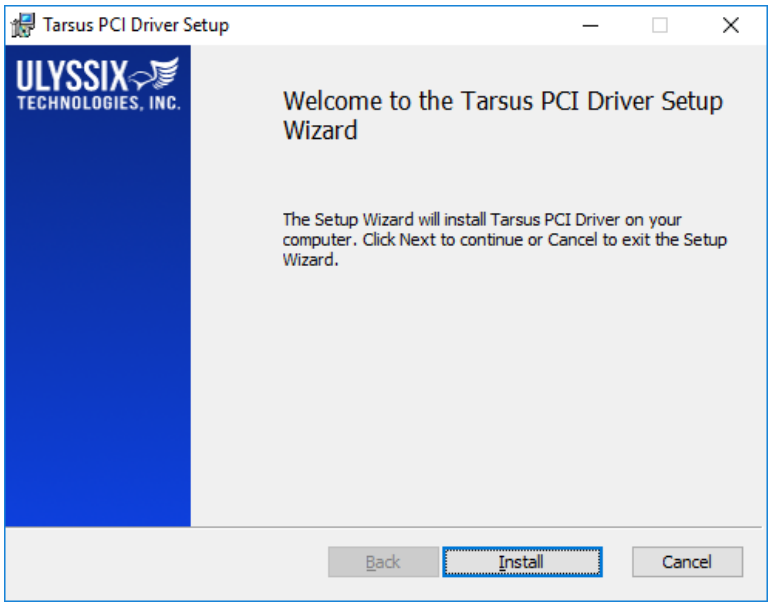


Figure 2 – Ulyssix Driver Installer Welcome Screen

3. As the new driver is being installed, you may see the following screen. Click "Install this driver software anyway" if this form appears. This is a Windows Security check for new driver installations.

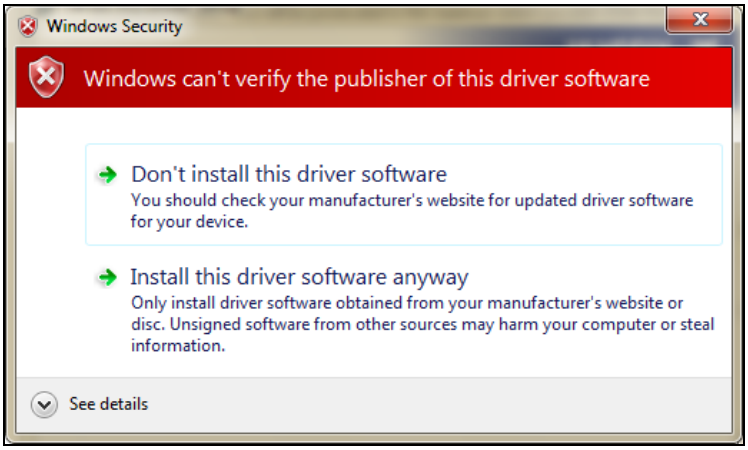


Figure 3 – Windows Security Screen

4. When the Ulyssix Driver Installation finishes, an installed completed screen will appear:

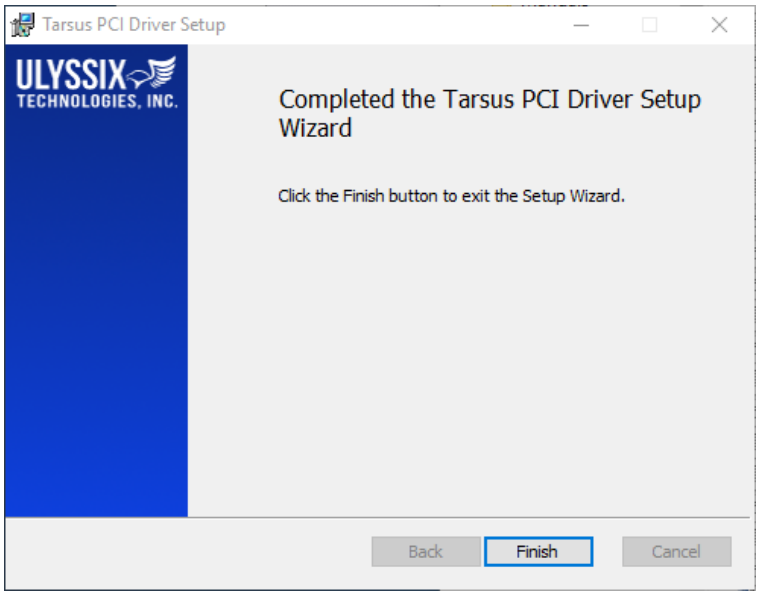


Figure 4 – Ulyssix Driver Completed screen

5. Verify the installation of the new Ulyssix Driver in Device Manager. Navigate to the Control Panel and then to the Device Manager. In the list of installed devices, look for the entry "Ulyssix Technologies, Inc." If you expand this entry, there should be an Ulyssix card listed below it. In the example below, a TarsusHS card is listed.

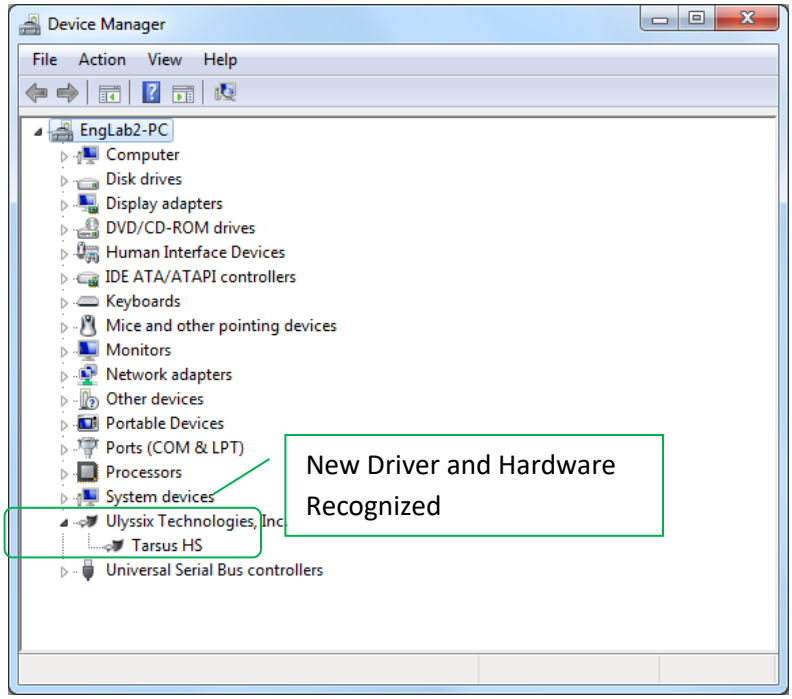


Figure 5 – Device Manager with a successful Ulyssix Driver installation

Installing ALTAIR Software

Starting with ALTAIR version 18.7, there is a 32-bit release and 64-bit release of ALTAIR. ALTAIR 32-bit will run on Windows 7 or Windows 10 computer that meets the hardware requirements. ALTAIR 64-bit will only run Windows 7 64-bit or Windows 10 64-bit operating systems. Please contact Ulyssix with any questions.

The process for a new installation or an upgrade of the ALTAIR software is very similar. It is important to document the version numbers of your current software and DLL encase there is an issue after the upgrade.

New Installation of the ALTAIR Software

Installing ALTAIR software begins by acquiring the correct Altair.exe file for your computer. There is an installer for ALTAIR 32-bit and an installer for ALTAIR 64-bit. This installer is available on the Ulyssix webpage or on the CD that came with your Ulyssix hardware.

1. Double click to launch ALTAIR 32-bit.exe or ALTAIR 64-bit.exe.
2. The **ALTAIR Installer Setup** window will appear. Click the **Install** button to begin.

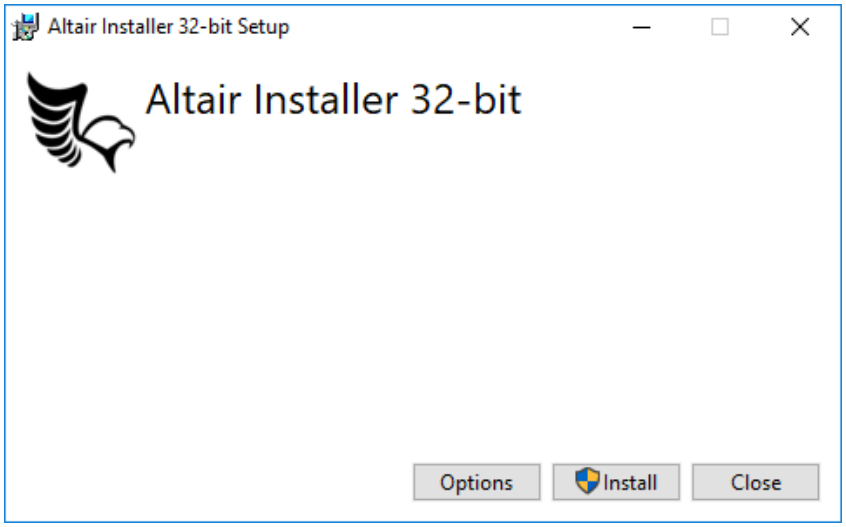


Figure 6 – Location to Extract Files

3. If Windows asks if you would like to let ALTAIR Installer make changes to your computer, click Yes.
4. After a brief wait, the installation process begins.
5. A window will appear for installing SlimDX. Check the box to accept the License Agreement and then click Install. SlimDX is a replacement for the Microsoft DirectX DLLs.

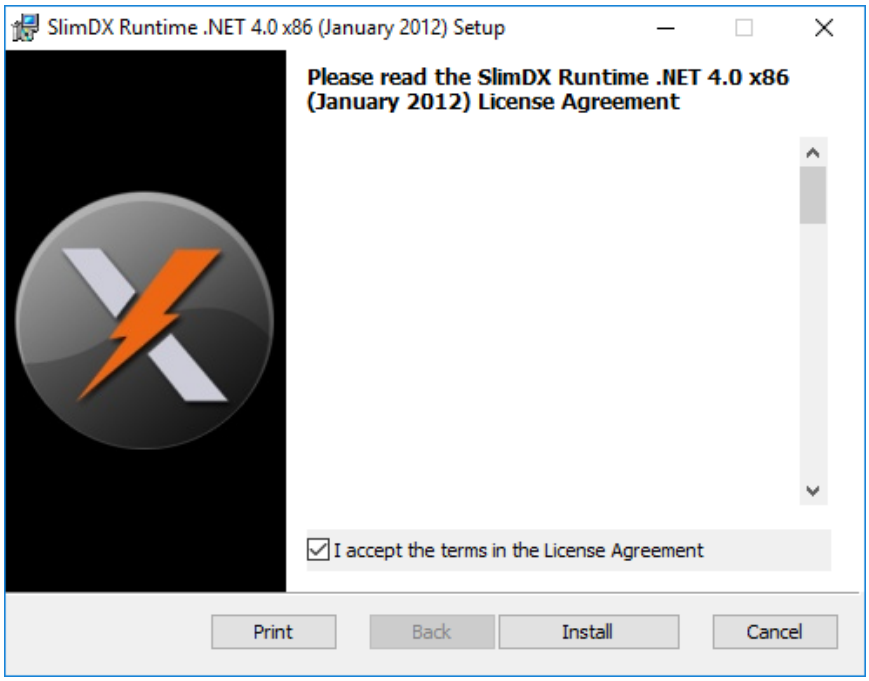


Figure 7 – SlimDX Install Wizard

6. SlimDX will install. SlimDX might require some applications to close to finish installation. If the installer asks to close application, please click Yes.
7. When SlimDX is finished installing, click Finish to continue installing ALTAIR.

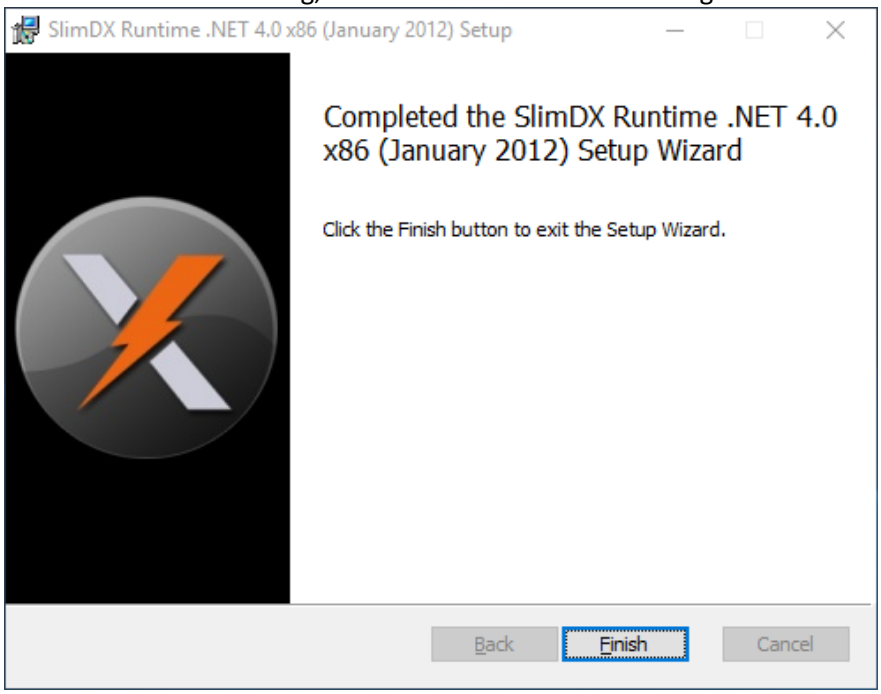


Figure 8 – SlimDX Install Complete

8. **ALTAIR Installer Welcome** screen will appear. Click **Next** to begin the installation.

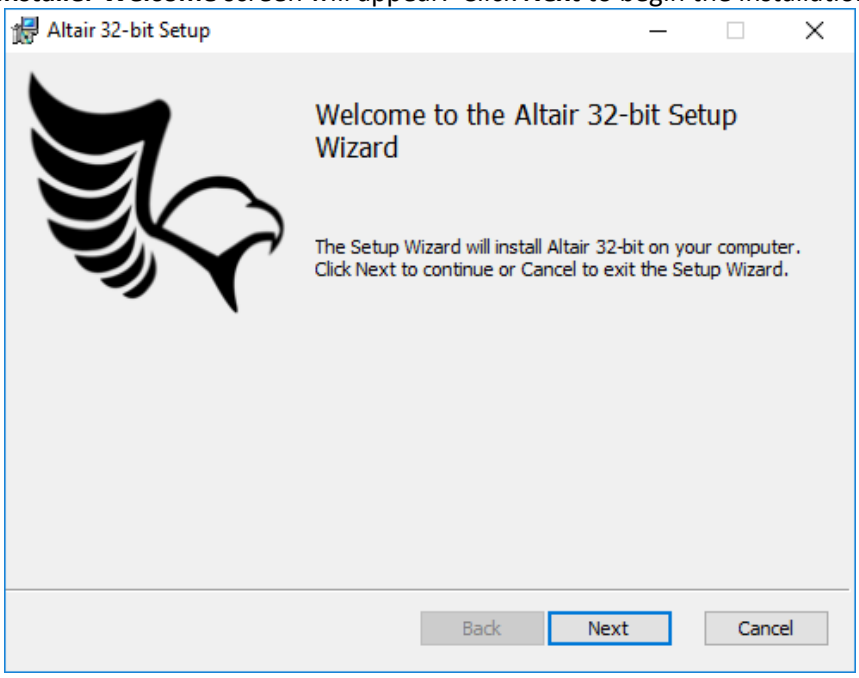


Figure 9 – ALTAIR Installer Welcome Wizard

9. The installer requests the destination folder. Strongly consider the default location. This will aid in any future troubleshooting. Also note that every user needs Read/Write access to the folder location for all features of the software to work. Click the **Next** button to continue.

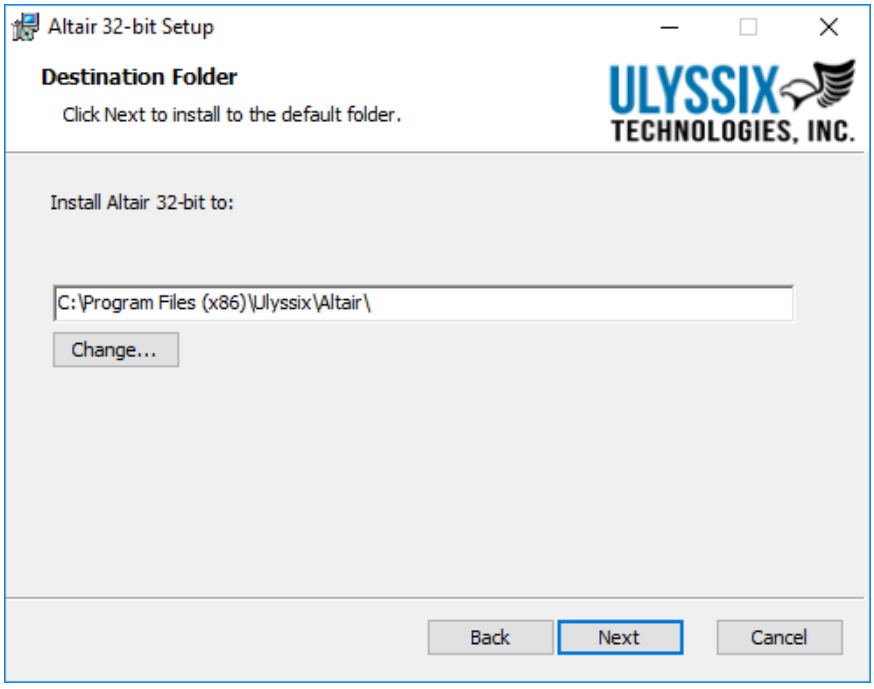


Figure 10 – Installer Destination Folder

10. The **Ready to Install the Program** window will appear. Please click the **Install** button to finalize the installation.

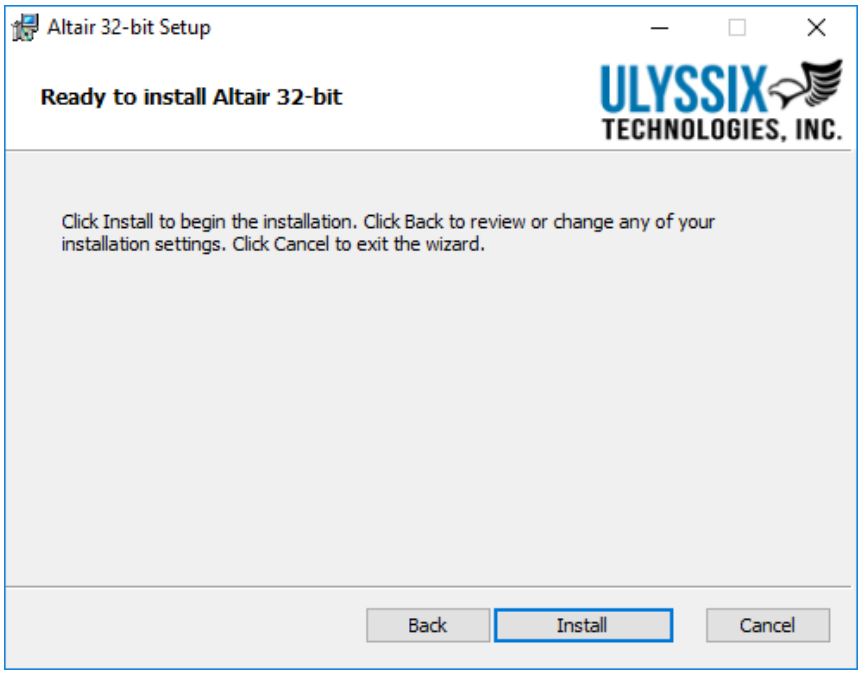


Figure 11 – Ready to Install the Program

11. The next window will be the **Installing ALTAIR** window. This window includes a bar to indicate progress. Please be patient, it takes the bar does not start moving instantly.
12. When the installation is complete, the Installation Complete window will appear. Click the Close button to close the installer.

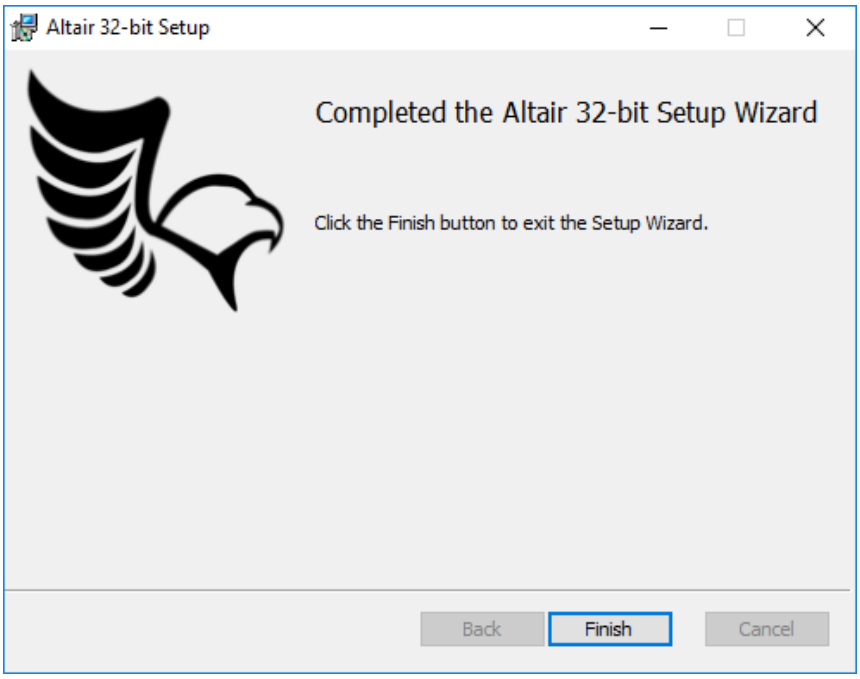


Figure 12 – ALTAIR Installation Complete

13. The ALTAIR Installer window will show the success window.

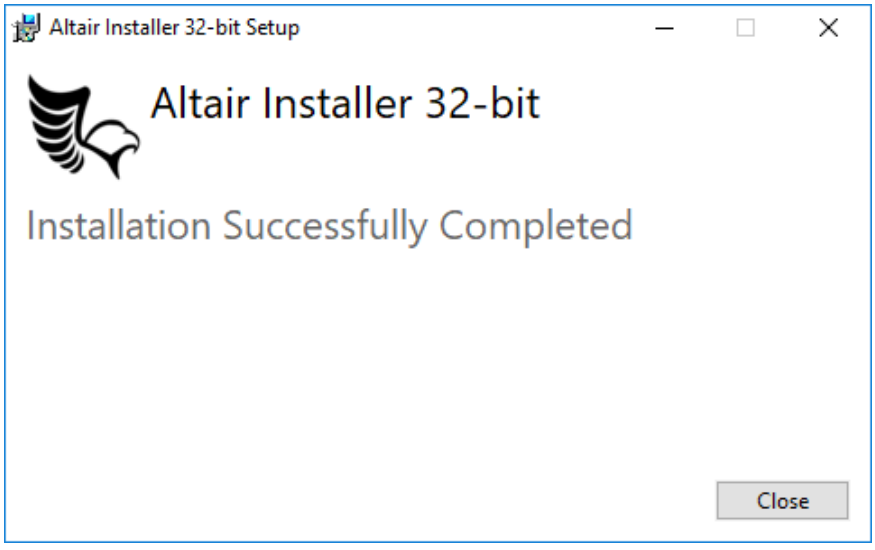


Figure 13 – ALTAIR Installer Successfully Completed

Upgrading ALTAIR Software

Upgrading the ALTAIR software is similar to a new installation of ALTAR. First, start by launching your current version of ALTAIR. The version numbers of ALTAIR and pcm_hw.dll are located at the bottom of the ALTAIR window. Record these two numbers before installing the new ALTAIR software and exit the ALTAIR software. These original version numbers are useful for troubleshooting any future issues.

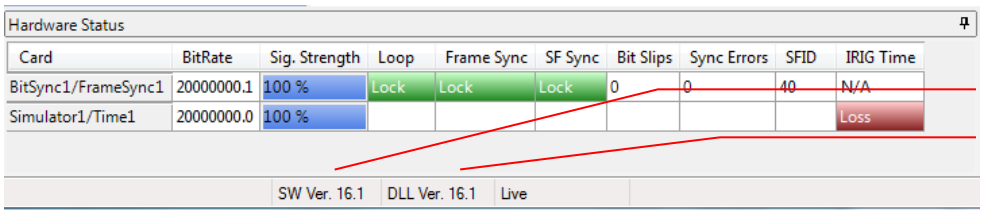


Figure 14 – ALTAIR Version Numbers

To upgrade ALTAIR, follow the instructions in **New Installation of the ALTAIR Software.**

ALTAIR and the Windows Firewall

Windows 10 blocks applications from sending or receiving data through the Windows Firewall. In order to use the ALTAIR UDP Receiver or optional licensed feature UDP Publisher, ALTAIR must be added to the list of approved applications to communicate through the firewall. Please note, Administrator rights might be needed to change the Windows Defender Firewall settings.

1. In the Windows Search Bar, type Firewall and select “Allow an Application Through Windows Firewall” from the list of options.
2. Click the Change Settings button to allow the window to change settings to the Windows Firewall properties.
3. Locate Altair in the list of applications and click the Detail button to launch the Edit an App window. In the Edit an App window, click the Network Types button. In the Choose Network Types window, check the boxes for both Private and Public networks. Click OK in the Network Types window. Click OK in the Edit an Add window.
4. In the Allowed App window, check the box next to Altair. Click OK to finish the process.

Uninstall Software – Windows XP

1. To un-install the ALTAIR Software from your computer, click the Start Button, go to Settings, and select the Control Panel. Inside the Control Pane, double-click the **Add or Remove Programs** icon.
2. In the list of programs, highlight ALTAIR INSTALLER and click the **Add or Remove Programs** button.
3. If prompted by the software, select **Remove** to un-install the program. Uninstalling the software does not uninstall the driver or remove the Ulyssix hardware from the Windows registry.

Uninstall Software – Windows 7 or Windows 10

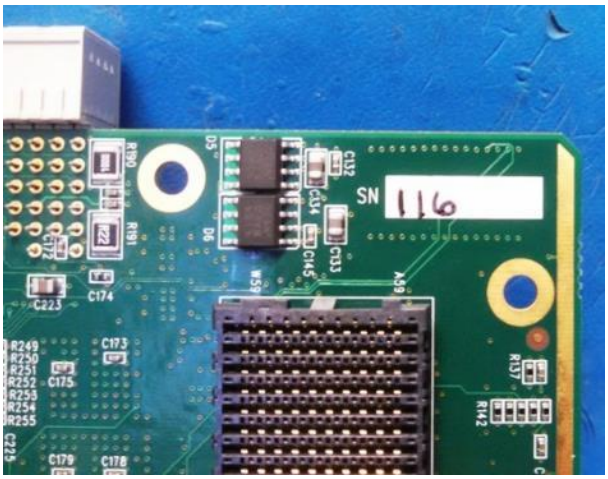
1. To un-install the ALTAIR Software from your computer, type Add and Remove Programs into the Run bar then select "Add and Remove Programs" from the list of suggested applications.
2. In the list of programs, highlight ALTAIR Installer 32-bit or ALTAIR Installer 64-bit and click the **Uninstall** button.
3. If prompted by the software, select **Remove** to un-install the program. Uninstalling the software does not uninstall the driver or remove the Ulyssix hardware from the Windows registry.

Power Cycling Guidelines

Ulyssix Technologies board level products are easily installed into almost any PCIe, or cPCI computer chassis. Unfortunately, all computers do not behave identically regarding the amount of time for the PCIe, or cPCI bus and the ATX power supply to settle after power down. The electronics on the Ulyssix boards require that the bus and power supply are fully settled before re-applying power to the system. We recommend you wait a minimum of 30 seconds after you power down before restarting your computer. This will ensure the system has had time to settle and the Ulyssix cards will start-up properly.

2.3 Product Identification

Every Syrinx3 Digital Baseband Demodulator is assigned a unique serial number before shipment from the factory. This number, as well as the unit's model and revision are clearly marked on the reverse side of the PC board. Refer to the following figure below.



Product Identification

2.3.1 Model Number

The model number of the Ulyssix card indicates which options are installed on that specific unit. Model number definitions are provided in the table below.

Model	Description
Syrinx3	Single or dual channel DSP based baseband demodulators card capable of demodulating FM/FM, FM/PCM, BPSK/ PCM and PAM legacy modulated streams.

Syrinx3 Models

2.3.2 Serial Number

A unique serial number is assigned to each Syrinx3 board. Reference this number to identify the specific unit during any communications with the factory.

2.3.3 Revision Numbers

The REV number indicates the assembly revision level of the unit.

2.4 Hardware Setup

The Syrinx3 is a sophisticated electronic device. Damage can occur if the product is not handled and used properly. Care should be taken not to expose the unit to physical abuse, moisture, Electrostatic Discharge (ESD), or other potentially harmful conditions. Carefully unpack the board in an ESD safe location and check the product for physical damage from shipment. Factory installed modification wires and components will be secured to the board with adhesive to prevent damage. If there is any question about the condition of your board upon receipt, contact the factory.

2.5 Hardware Installation

The Syrinx3 is easily installed into any PC chassis with an available cPCI or PCIe slot. The ALTAIR software must be installed before installing the Syrinx3 card. Follow the steps below to install the Syrinx3 card.

WARNING: SERIOUS DAMAGE WILL RESULT IF YOU DO NOT TURN POWER OFF BEFORE INSTALLING THE SURINX3 CARD.

1. Make sure the ALTAIR software has been installed before installing any hardware.
2. Turn off power to the computer.
3. Remove the cover of the computer to expose the available slot.
4. Remove the blank bracket on the back of the computer that is covering the opening to the available slot. Retain the screw to secure the Syrinx3 card.
5. Install the Syrinx3 card in the slot and secure with the screw from the bracket.
6. Return the cover to the computer.
7. Turn on power to the computer.

2.5.1 Adding Cards to an Existing System

Before adding any Ulyssix cards to an existing system it is important to verify that the host computer's power supply has adequate surplus power for the total number of installed cards. Calculate the total amount of power required by the cards by adding the individual card power requirements as noted on the product data sheets. Contact the factory if you need assistance.

Additional Ulyssix cards can be installed into any available slot in your computer at any time. Follow the installation instructions above. When you install additional cards into a computer, the bus may assign new ID numbers for existing and/or new cards depending upon the slot you install the card into, and the configuration of the bus for your specific computer. If this happens, the configuration files will be corrupted and will not program the hardware properly.

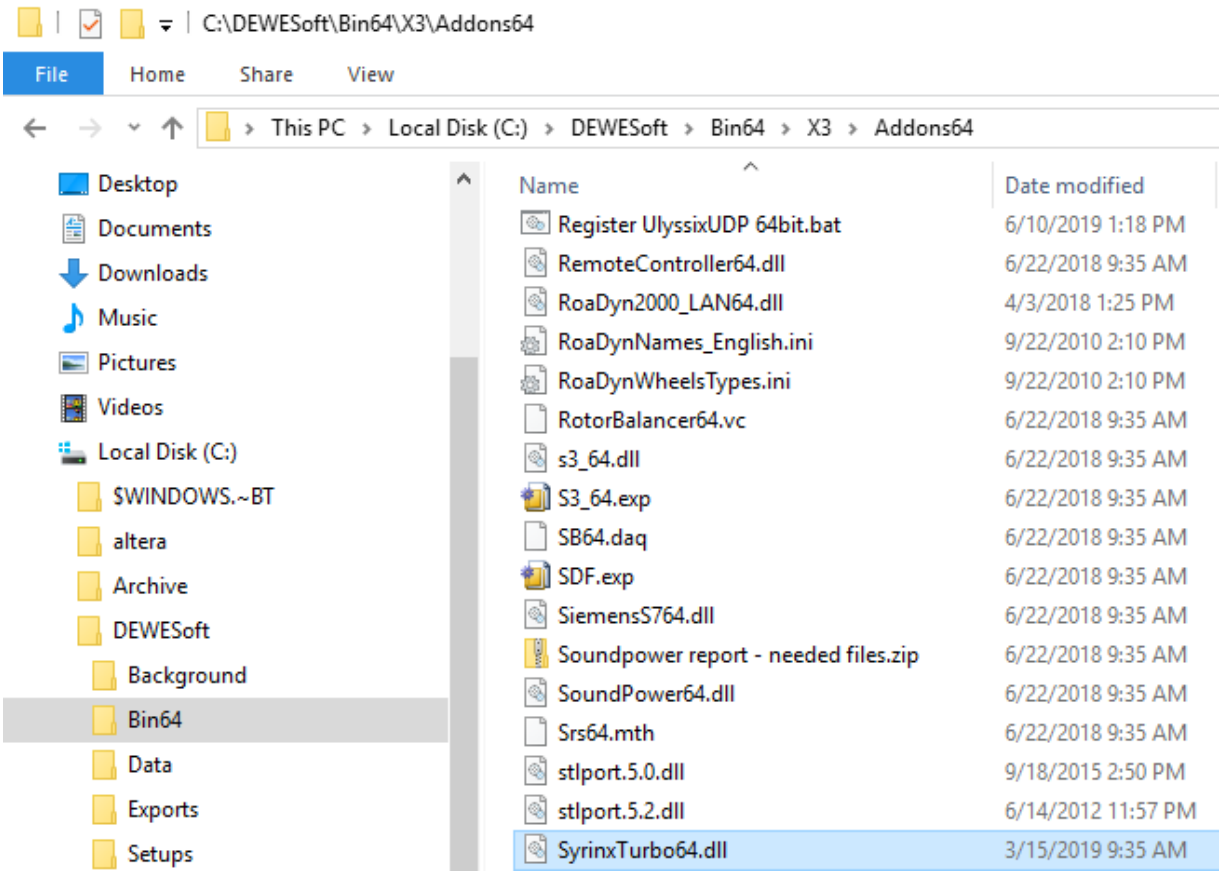
Chapter 3 Installation

3.1 Install the Syrinx3 into DeweSoft

The following section will discuss adding the Syrinx plug-in to 64-bit DeweSoft X3. For other versions of DeweSoft, please contact Ulyssix.

3.1.1 Installing the Syrinx3

To install the Syrinx3 Plug-in without the CD requires you to copy the Syrinx Plug-in file into the addons directory of your DeweSoft installation path. For 64-bit DeweSoft X3 the file name is SyrinxTurbo64.dll. For 32-bit DeweSoft X3 the file name is SyrinxTurb.dll. The version of the plug-in must match the version of DeweSoft (64-bit only works with 64-bit DeweSoft and 32-bit only works with 32-bit DeweSoft).



The path to the Addons Directory for 64-bit DeweSoft X3 is:

C:\DEWESoft\Bin64\X3\Addons64

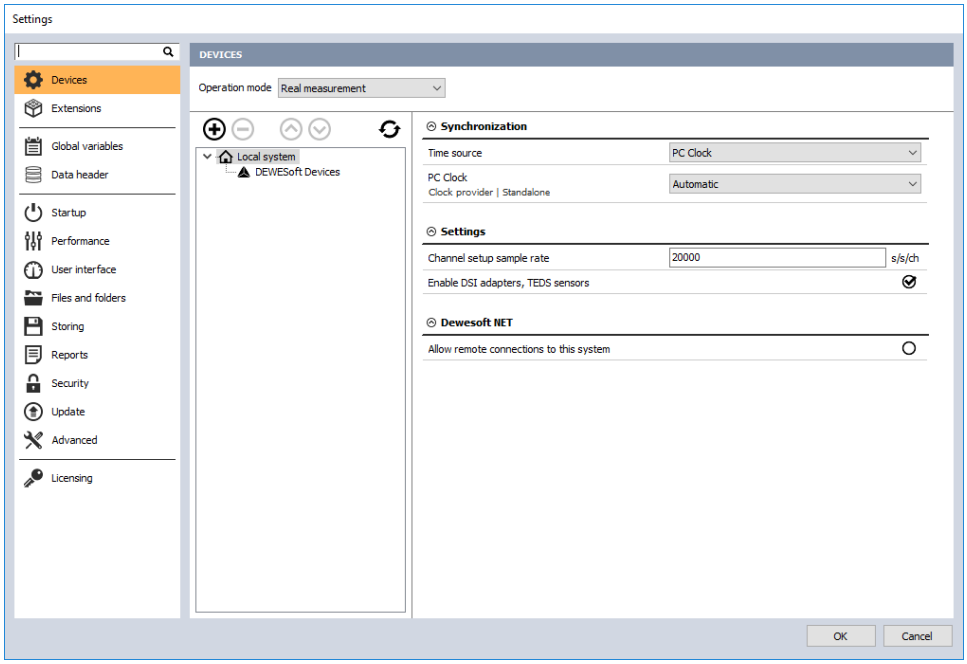
The path to the Addons Directory for 32-bit DeweSoft X3 is:

C:\DEWESoft\Bin64\X3\Addons

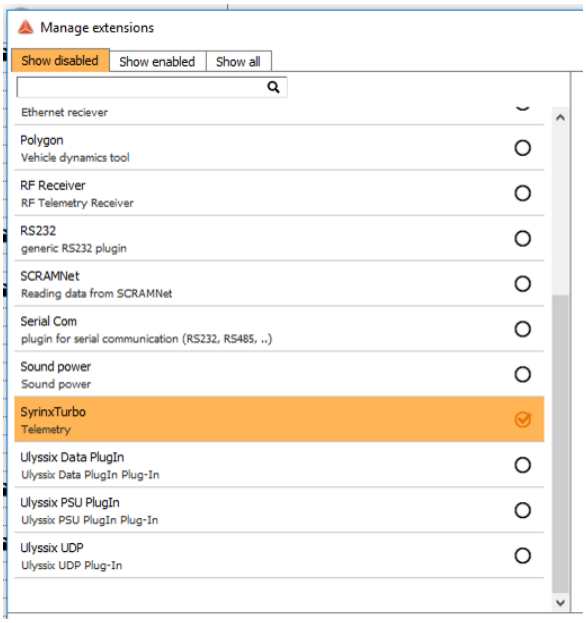
When the DeweSoft application is started, it will automatically scan this directory and register any DLL's that it finds. The plug-in must still be activated, but it will be registered within Windows automatically.

3.2 Activation of the Syrinx3

After the Syrinx3 Plug-in has been properly installed, you must activate it within the DeweSoft application. To do this, please run DeweSoft. Go to the Settings menu in the top right of the screen and then select **Settings**. When you do this, the Settings dialog box will appear.



Click on Extensions in the upper left corner to show the list of Extensions. Click the icon of a plus sign in the upper left corner to launch the Manage Extensions window. Find the entry for Syrinx3 and check the circle to the right. If Syrinx3 is not listed under the Plug-ins, then you have not copied the SyrinxTurbo.dll into the /addon directories. Click the OK button in the Manage Extensions window.



DeweSoft automatically attempts to register any plug-ins that it finds in this directory when it starts. There is no need to register them additionally with Windows, except in special cases.

Click the OK button at the bottom the Settings window.

3.3 Locating the Syrinx3

First you need to access the Channel page and then there are two options for getting to the Syrinx3 channel setup screens. When DeweSoft first opens the Setup Files tab is opened where all pre-stored setups should be located. By double clicking on the New Setup button or a previously created setup DeweSoft will automatically take you to the Channel Setup tab. If not, hit F2 or just click on the Ch. Setup tab at the top of the screen.

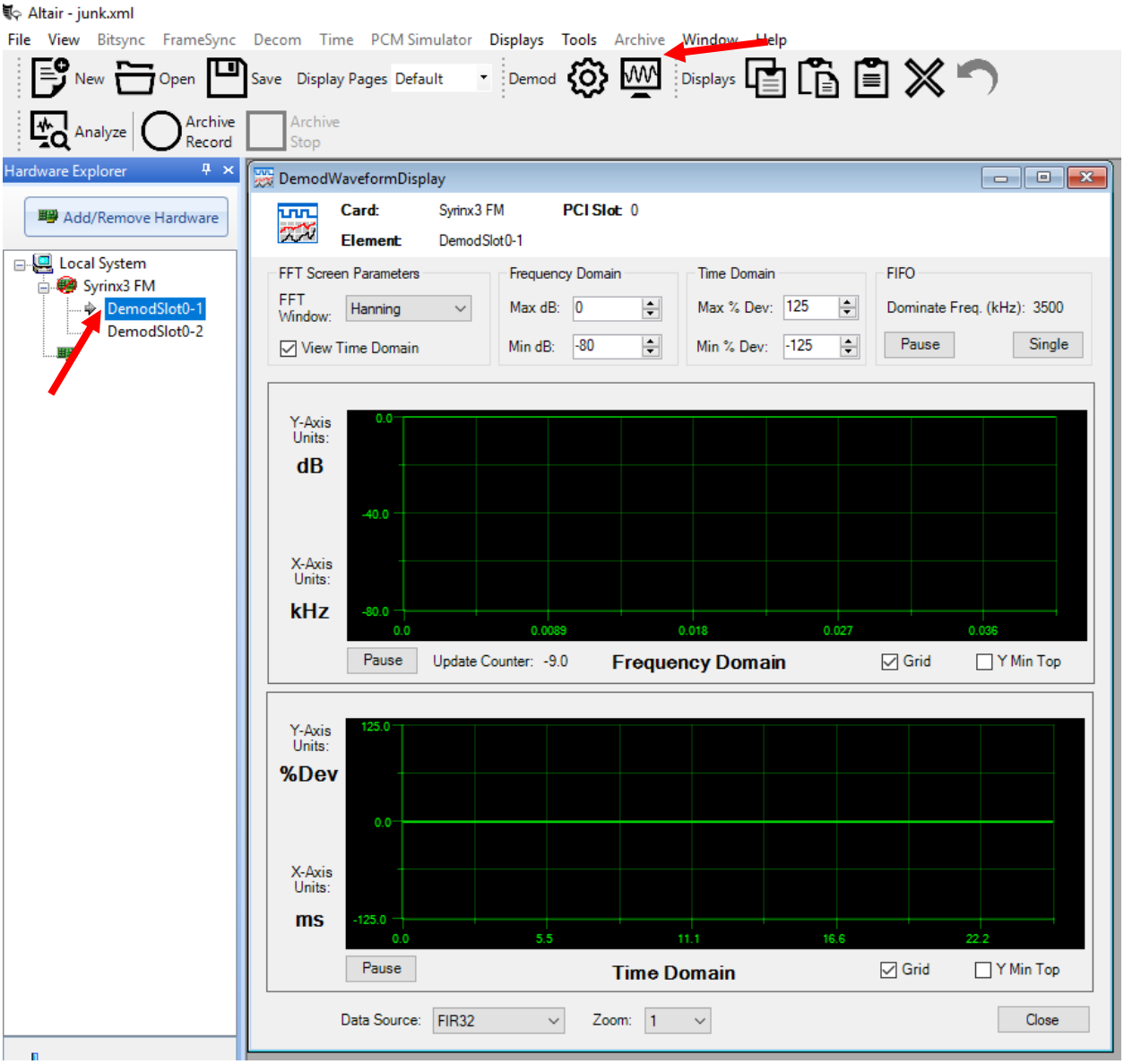
The setup screen will be shown. By default, it will show you the ANALOG tab, which consists of any analog inputs that your system may have.

Note the tabbed interface which shows what interface is installed in your system. In the case of the screen below, they are Analog, Syrinx3, Tarsus, and Math:

Chapter 4 Configuring the Hardware

4.1 Configuring the Syrinx3 Demodulator using ALTAIR

Go to the Demod setup screen by double clicking Demod1 or Demod2 located in the Hardware Explorer (see red arrow below). A single channel Syrinx3 will only have Demod1. The setup screen will then automatically appear.



On this screen you set up the entire demodulator card including selecting the Subcarrier Type, Frequency, Deviation, Input Impedance and more. The FFT spectral display is shown prominently on as a reference along with selectable waveform display to analysis your signal at different points in the

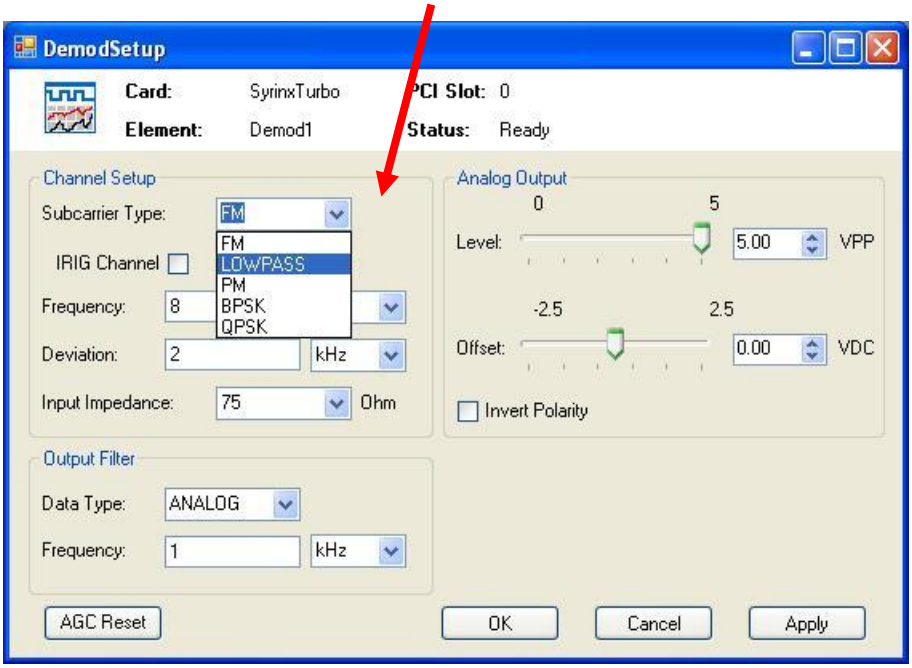
hardware. To access the Demod Waveform Display press the Waveform button located in the toolbar above (see red arrow above).

In a multiple card system, each card and Demod Channel are independent. Each card can be selected in the Hardware Explorer shown above.

Channel Setup

Subcarrier Type:

Users can select FM, Lowpass Filter or PAM (if optionally purchased).



4.1.1 FM Type Setup

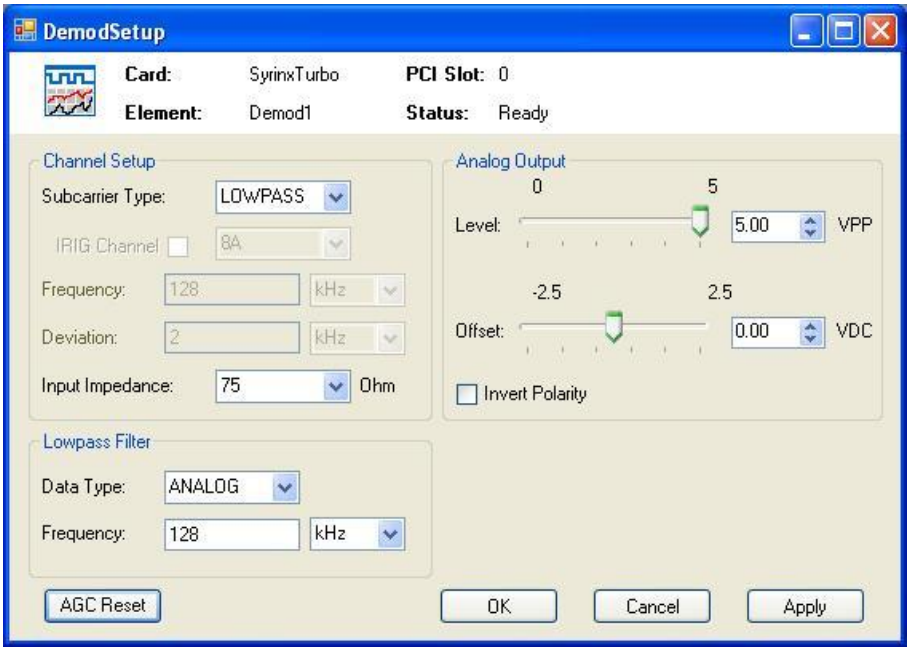
If FM is selected as the carrier type, then the following selections are available.

Frequency and Deviation or IRIG Channel:

Users can select between entering the input FM channel center frequency and deviation or use the standard IRIG channel values as stated in the RCC IRIG106 CH3 for either constant bandwidth (CBW) or proportional bandwidth (PBW).

4.1.2 Lowpass Filter Type Setup

If Lowpass Filter Type is selected, then the Channel Setup section is not used and the lowpass filter setting is entered in the Output Filter section.



4.1.3 PAM Type Setup (optional)

If PAM is selected as the carrier type, then the following selections are available.

Channel Frequency:

Users can select between 25 kHz, 25.5 kHz, 41.67 kHz and 100 kHz.

4.1.3.1 PAM Demodulator Sync

The output from the PAM demodulator is a PCM bit stream consisting of the demodulated PAM output. Each PAM channel is sampled eight times between the beginning and end of the channel. Each sample is converted into a 16-bit PCM word and inserted into the PCM stream. Each PAM channel appears in the PCM stream in eight consecutive 16-bit PCM words. The first PAM demodulator channel after the five PAM sync levels (word 60 (LO), word 61 (MID), word 62 (MID), word 63 (MID) and word 64 (HI) is considered the first PAM word. The PCM stream is synchronized to the PAM stream by the insertion of the 32-bit FE6B2840 sync pattern for samples 7 and 8 of the final PAM sync channel (word 64). The PCM frame sync words are the last two 16-bit PCM words in the frame. A PAM Lock word is inserted into the first PCM word after the PCM frame sync pattern. This is PCM Word 1 in most decommutation software. PAM Demodulator Lock is 0x7FFF. PAM Demodulation Search is 0x8000.

4.1.3.2 PAM Demodulator PCM Output stream

The output from the PAM demodulator is a PCM stream. As previously stated, the PCM stream is created by outputting eight PCM 16-bit words per PAM demodulator channel. Therefore, the PCM output bit rate is 128 times the PAM selected channel frequency (3.2 Mbps for 25 kHz,

3.264 Mbps for 25.5 kHz, 5.333760 Mbps for 41.67 kHz and 12.8 Mbps for 100 kHz). In order to synchronize the bit rate to the PAM rate, which is not totally stable during an entire mission, the PCM clock generator has a sliding bit rate generator to track the varying PAM rate. In order to correctly bit sync this PAM/PCM output, the corresponding bit sync loop bandwidth should be set to 2.0%. When decommutating the PCM stream, it is recommended to use the fifth of the eight samples per PAM channel. For example, PAM channel 1 will be PCM word 5, PAM channel 2 will be PCM word 13, PAM channel 3 will be PCM word 21 etc.

4.1.3.3 PAM Demodulator Low Pass Filter

Before the PAM signal is demodulated, it is routed through a FIR low pass filter (see section 4.1.6). This filter is intended to separate any higher frequency signals that might be multiplex on the same RF carrier. A typical application for this would a Doppler signal translated to a frequency higher than the PAM signal. Typical low pass filter settings for PAM are: 25 kHz PAM 60 kHz Digital Low Pass Filter, 25.5 kHz PAM 80 kHz Digital Low Pass Filter, and 41.67 kHz PAM 90 kHz Digital Low Pass Filter.

4.1.4 Input Impedance Setup

Input Impedance:
Select 50 Ohm, 75 Ohm or 10 kOhm high impedance.

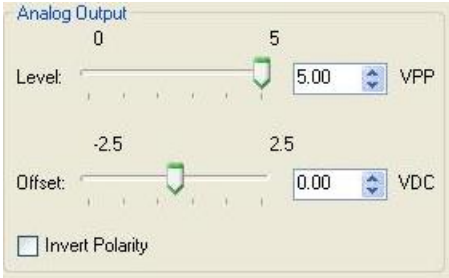
4.1.5 Input / Output Filter Setup

1. Data Type:
   Off, Analog or Digital. For wide band data, the filter can be turned off to give the widest capability. Analog or Digital data type refers to the shape of the digital FIR filter. The Analog selections sets the filter to within 0.1 dB at user entered frequency and the filter is down -60 dB 2 times the filter frequency. The digital filter is -3 dB at the entered frequency and is down -50 dB at 2.5 times the filter frequency. The digital filter doesn't exhibit Gibbs phenomenon ringing for PCM or digital data and the analog filter is more used for continuous waveforms.

2. Frequency:
   Select the cutoff filter frequency of the filter. This output frequency is fully programmable to

allow the user to generate the cleanest output from either the FM or PAM demodulator. For PAM demodulation, it has been determined that between 2 and 3 times the PAM channel rate is a good setting for this frequency for standard PAM output. If the PAM signal is very noisy, opening the filter may be helpful.

4.1.6 Analog Output Setup



1. Analog Output Level:
   Select the voltage level for the RCVR output BNC.

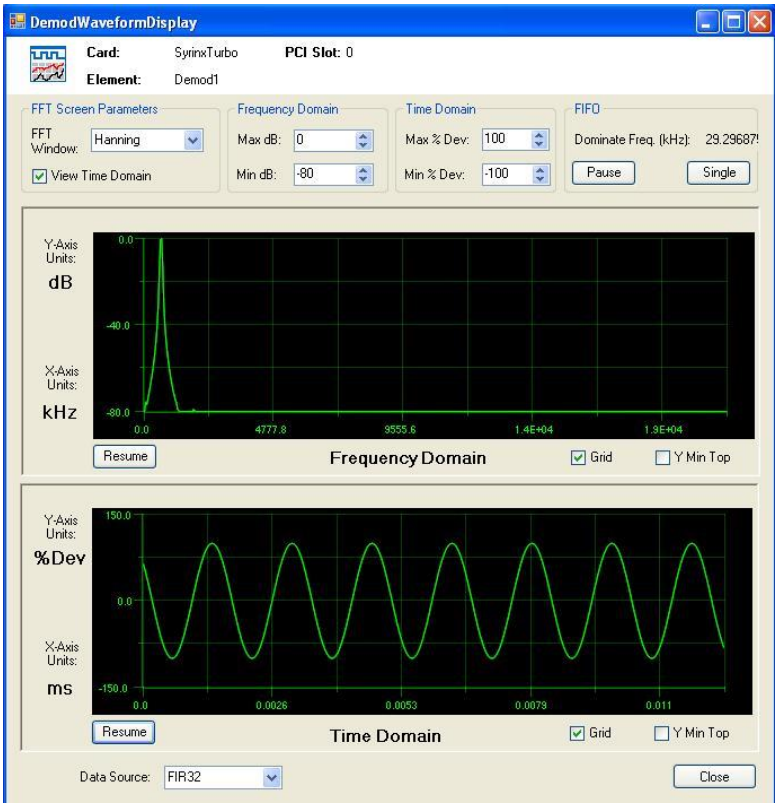
2. Analog Output Offset:
   Select the Voltage offset for the output voltage.

3. Invert Polarity:
   Enable this to invert the polarity on the out signal.

4.2 Graphical Displays

4.2.1 FFT Diagram

This display shows the output demodulator data in an 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)



You can move the mouse over the waveform and the display will calculate the magnitude in dB (vertical Y axis) and frequency (horizontal X axis) and show them numerically at the bottom of the graph.

You may select the window type for the FFT display and the zoom level from the drop-down menu.

Rectangular does not influence the FFT decomposition at all, while 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.

4.3 Configuring the Syrinx3 Demodulator using DeweSoft

Go to the Ch. setup screen either by clicking the Ch. setup tab in the top tool bar or by pressing F2 on your keyboard. The setup screen will be shown and then click the Syrinx3 tab.

On this screen you set up the entire demodulator card including selecting the Subcarrier Type, Frequency, Deviation, Input Impedance and more. The FFT spectral display is shown prominently on as a reference along with selectable waveform display to analysis your signal at different points in the hardware.

If there are multiple cards inside the system, they will run and are setup independent of each other. Each card can be selected by the drop-down menu shown below:

4.3.1 Channel Setup

Subcarrier Type:

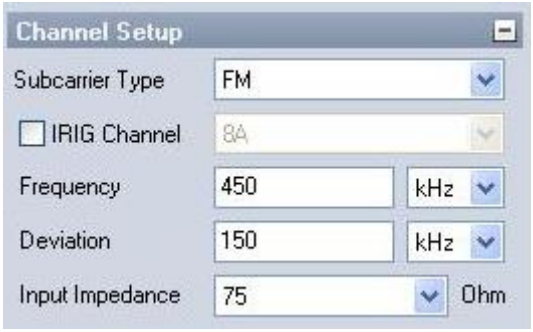
Users can select FM, Lowpass Filter or PAM (if optionally purchased).

4.3.2 FM Type Setup

If FM is selected as the carrier type, then the following selections are available.

1. Frequency and Deviation or IRIG Channel:

   Users can select between entering the input FM channel center frequency and deviation or use the standard IRIG channel values as stated in the RCC IRIG106 CH3 for either constant bandwidth (CBW) or proportional bandwidth (PBW).



4.3.3 Lowpass Filter Type Setup

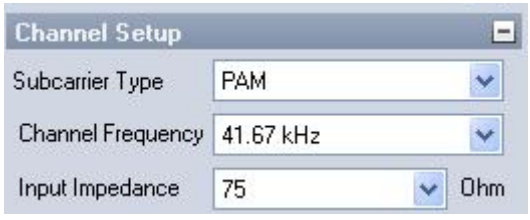
If Lowpass Filter Type is selected, then the user input section is not used and the filter setting is done in the output filter section.

4.3.4 PAM Type Setup (optional)

If PAM is selected as the carrier type, then the following selections are available.

Channel Frequency:

Users can select between 25 kHz, 25.5 kHz, 41.67 kHz and 100 kHz.



4.3.4.1 PAM Demodulator Sync

The output from the PAM demodulator is a PCM bit stream consisting of the demodulated PAM output. Word 1 of the output PCM stream corresponds to the first PAM demodulator channel after the five PAM sync levels (word 60 (LO), word 61 (MID), word 62 (MID), word 63 (MID) and

word 64 (HI). Each PAM channel is sampled eight times, equally spaced in time between the start and end of the channel. Each sample of the PAM channel is converted into a Two's Compliment 16-bit integer and inserted into the PCM stream, resulting in each PAM channel occupying eight consecutive 16-bit PCM words. When setting up a decommutator, please use the fifth sample of the PAM channel. The PCM stream is synchronized to the PAM stream by the insertion of the 32-bit FE6B2840 sync pattern for words 7 and 8 of the final PAM sync channel (word 64).

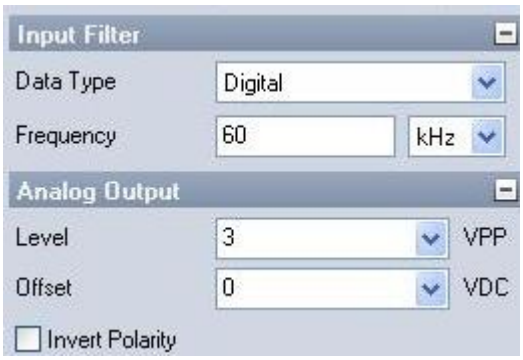
4.3.4.2 PAM Demodulator PCM Output stream

The output from the PAM demodulator is the PCM stream generated from the PAM demodulator. As previously stated, the PCM stream is created by outputting eight PCM 16-bit words per PAM demodulator channel. Therefore, the PCM output bit rate is 128 times the PAM selected channel frequency (3.2 Mbps for 25 kHz, 3.264 Mbps for 25.5 kHz, 5.333760 Mbps for 41.67 kHz and 12.8 Mbps for 100 kHz). In order to synchronize the bit rate to the PAM rate, which is not totally stable during an entire mission, the PCM clock generator has a sliding bit rate generator to track the varying PAM rate. In order to correctly bit sync this PAM/PCM output, the corresponding bit sync loop bandwidth should be set to 2.0%.

4.3.5 Input Impedance Setup

Input Impedance:
Select 50-Ohm, 75-Ohm or 10K high impedance.

4.3.6 Input / Output Filter Setup



1. Data Type:
   Off, Analog or Digital. For wide band data, the filter can be turned off to give the widest capability. Analog or Digital data type refers to the shape of the digital FIR filter. The Analog selections sets the filter to within 0.1 dB at user entered frequency and the filter is down -60 dB 2 times the filter frequency. The digital filter is -3 dB at the entered frequency and is down -50 dB at 2.5 times the filter frequency. The digital filter doesn't exhibit Gibbs phenomenon ringing for a PCM signal or digital data. The analog filter is more used for continuous waveforms.

2. Frequency:
   Select the cutoff filter frequency of the filter. This output frequency is fully programmable to allow the user to generate the cleanest output from either the FM or PAM demodulator. For PAM demodulation, it has been determined that between 2 and 3 times the PAM channel rate is a good setting for this frequency for standard PAM output. If the PAM signal is very noisy, opening the filter may be helpful.

4.3.7 Input / Output Filter Setup

1. Analog Output Level:
   Select the voltage level for the RCVR output BNC.

2. Analog Output Offset:
   Select the Voltage offset for the output voltage.

3. Invert Polarity:
   Enable this to invert the polarity on the out signal.

4.4 Graphical Displays

4.4.1 FFT Diagram

This display shows the output demodulator data in an 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)

You can move the mouse over the waveform and the display will calculate the magnitude in dB (vertical Y axis) and frequency (horizontal X axis) and show them numerically at the bottom of the graph.

You may select the window type for the FFT display and the zoom level from the drop-down menu.

Rectangular does not influence the FFT decomposition at all, while 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 your reference.

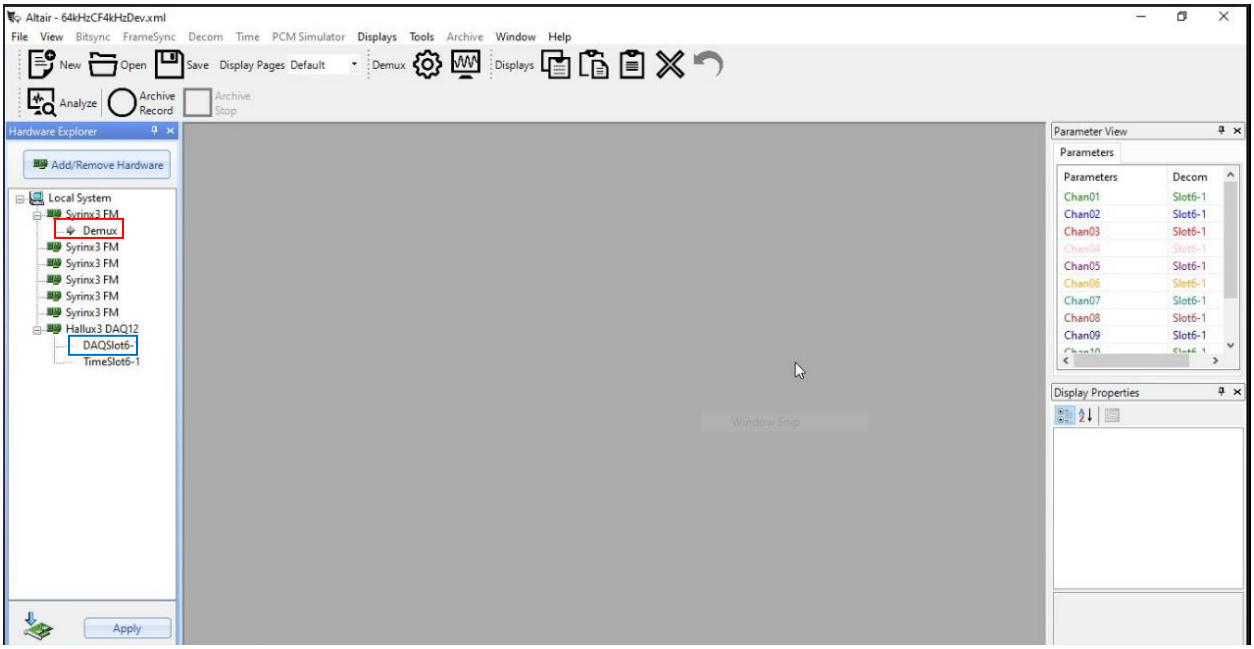
4.5 Syrinx3 BNC Pigtail

BNC Label	Description
CH1 IN	Channel 1 input to the demodulator or filter
CH1 OUT	Channel 1 analog output of the FM demodulator/lowpass filter or PAM/PCM bit stream output
CH2 IN (optional)	Channel 2 input to the demodulator or filter
CH2 OUT (optional)	Channel 2 analog output of the FM demodulator or filter

Chapter 5 Syrinx FM Demux System

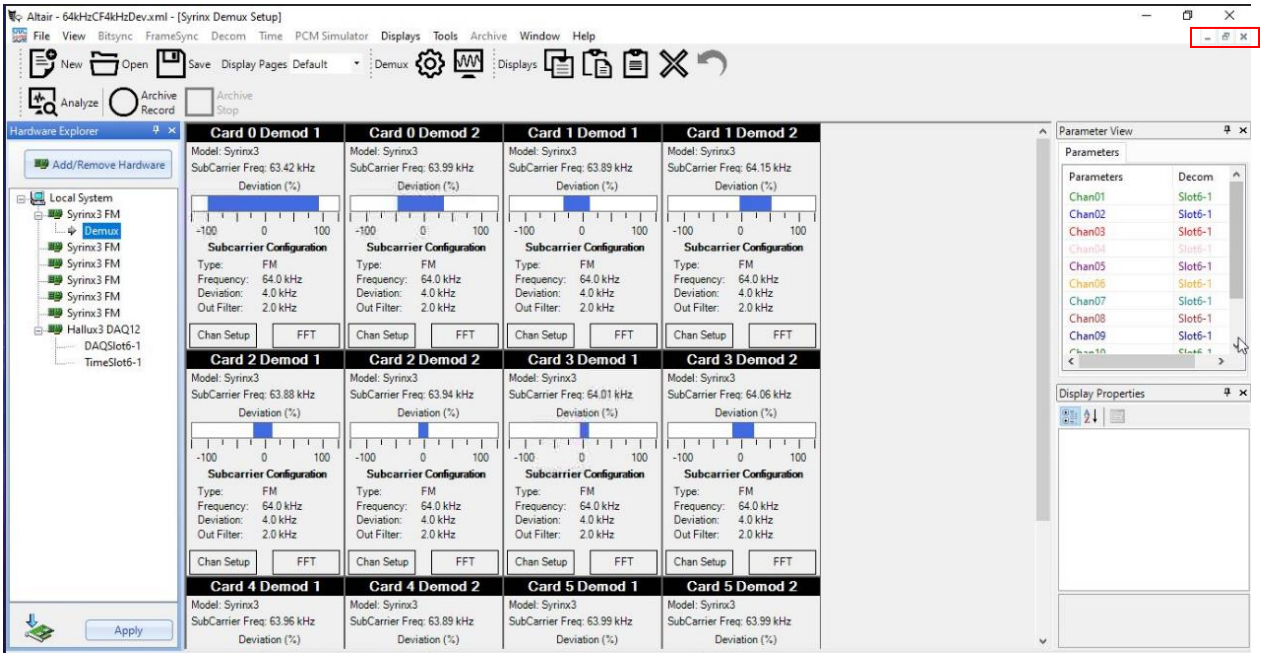
A Syrinx FM Demux System is a computer with a multiple Syrinx3 FM Demodulators and a Hallux3 DAQ12 card. The Syrinx3 cards demodulate an incoming FM multiplexed stream into their baseband components. The baseband components are the input the Hallux3 DAQ12 card, which digitizes the signals and combines them into a PCM Frame. The PCM frame is output as clock and data signals from the Hallux3 DAQ12 card. The Syrinx3 Demux System is only available in the ALTAIR software.

In the image below, the ALTAIR Hardware Explorer is on the left side. In the Hardware Explorer, the Syrinx Demux System has six Syrinx3 Dual Demod cards and one Hallux3 DAQ12 cards for a total of twelve channels of FM demodulation. The settings for all twelve channels of FM demodulation are accessed through double clicking the “Demux” text (red box below). The settings for the Hallux3 DAQ12 are access via the “DAQSlot0-1” text (blue box below).



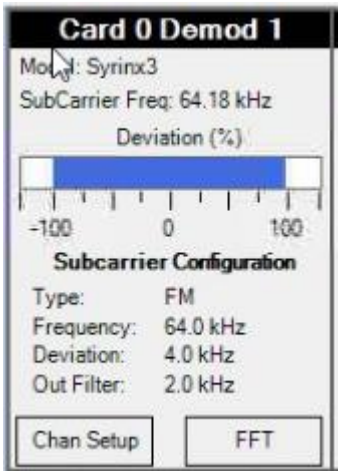
4.1 Syrinx3 Demux Setup

To setup the Syrinx3 cards, double click on the word “Demux” in the hardware explorer. The setup window contains an entry for each Demodulation channel on each Syrinx3 card. When first launched, the Demux Setup window is maximized in the workspace. The standard Windows controls for minimize, maximize, and close are in the upper right corner on the toolbar (red box below). This placement is slightly abnormal, but it is a construct of the drag and drop window format of the ALTAIR software.



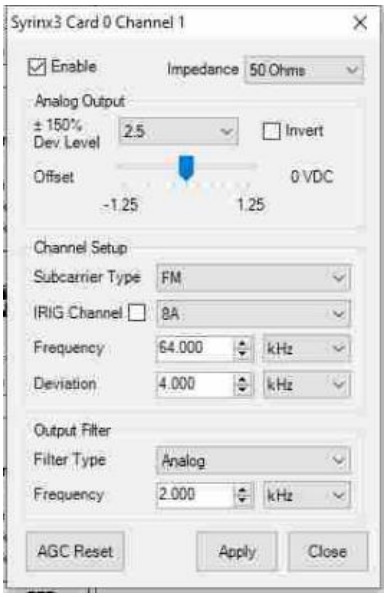
In the Syrinx Demux Setup widow each Demod Chanel is represented by a Demod Channel control with a header that defines the channel by the card number and the demod channel number. The card number corresponds to the number of LEDs illuminated on Syrinx3 card. Each card has two demod channels, they are numbered Demod 1 and Demod 2.

Each Demod Channel control display pertinent information about the configuration of the Demod Channel as well as an indicator for the measured deviation of the incoming signal. The bottom of the control has two buttons. The Chan Setup button launches the Demod Channel Setup window. The FFT button launches the Demod Waveform window.



4.1.1 Syrinx3 Demux Setup

To change the settings for the Demod Channel, click the Chan Setup button to launch the Demod Setup window.



The Demod Channel Setup window has controls for the following:

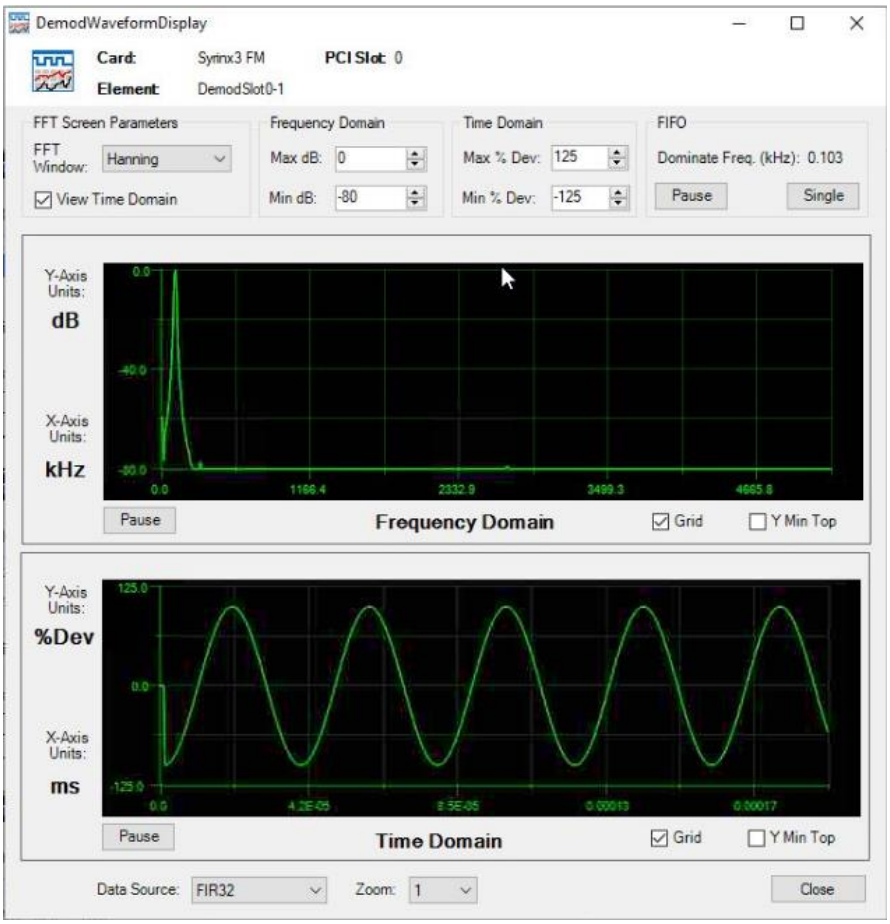
1. General Controls
    a. Enable – turns the signal processing on and off.
    b. Impedance – sets the impedance of the input BNC to 50 Ohms, 75 Ohms, or 10 kOhms.
2. Analog Output – settings for the output signal from the Demodulator
    a. ±150% Deviation Level – the peak to peak voltage level that represents 150% of the deviation setting. In order to prevent clipping, the setting uses 150% of the deviation encase the incoming signal is over deviated.
    b. Offset – adjusts the voltage level up or down. This feature is typically used to adjust a signal that is not centered at zero.
    c. Invert – inverts the signal if there.
3. Channel Setup
    a. SubCarrier Type – selects the type of the incoming signal. The options are FM or Lowpass Filter.
    b. IRIG Channel – this control consists of a check box to enable the IRIG Channel features and a combo box to select the desired IRIG Channel. Enabling the check box disables the Frequency and Deviation controls. The settings for these controls are determined from the list of IRIG Channels in the combo box.
    c. Frequency – a numeric input control for the value and a combo box for the units. This is the center frequency for the FM channel.
    d. Deviation – a numeric input control for the value and a combo box for the units. This is the expected deviation for the FM signal. The deviation cannot be greater than one half of the center frequency.
4. Output Filter

a. Filter Type – there are two options Analog, Digital, or Off. The Digital filter is sharper than the Analog. The selection depends on the input signal and the desired frequency response of the output filter.
b. Frequency – this is the cutoff frequency for the Output Filter. The Output Filter must between Deviation Ratio of 2 (Deviation divided by 10) and a Deviation Ratio of 10 (Deviation divided by 1024).

5. AGC Reset – this button causes a forced recalculate the Syrinx3 Demod Channels auto gain control settings.
6. Apply – downloads the settings to the Syrinx3 hardware.
7. Close – closes the Demod Channel Settings windows without making any changes the Syrinx3 hardware.

4.1.2 Syrinx3 Demod Waveform Window

To see the Demod Waveform window, click the FFT button in the Demod Channel control. Each channel has its own Demod Waveform window, but it recommended to only open one Demod Waveform window at time due to constraints of space on the computer monitor.

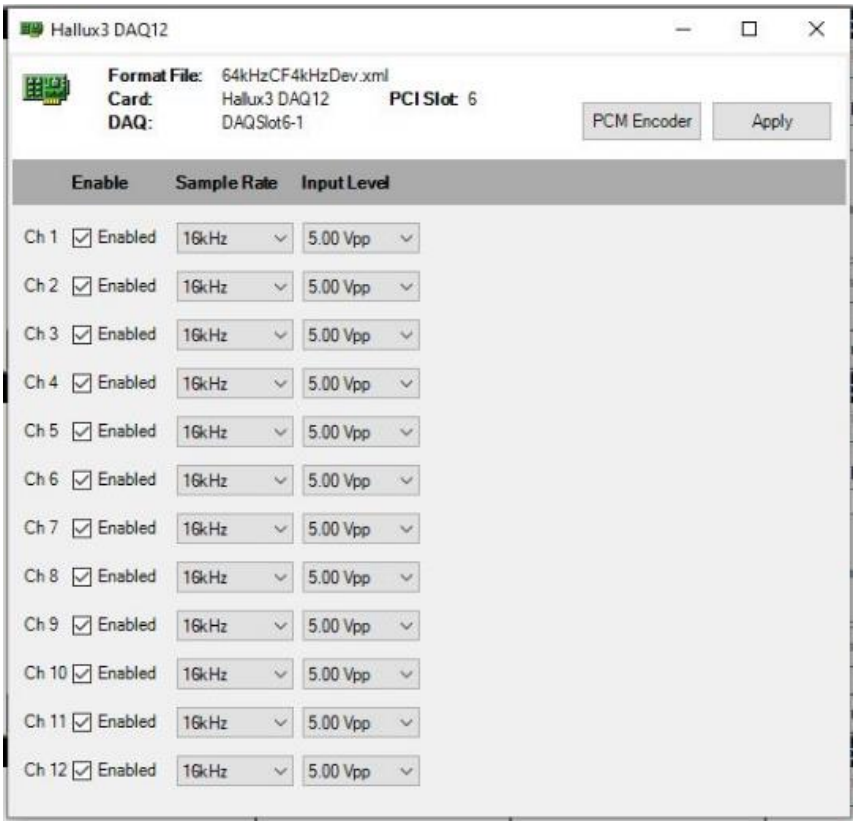


The Demod Waveform window has multiple controls for display and analysis of the signal processing of the Demod Channel in both the time and frequency domains. Many of discussions about the analysis techniques associated with this window are outside the scope of this manual. The most important control to discuss is the Data Source combo box at the bottom of the window. The Data Source control selects where in the signal path of the Syrinx3 Demod Channel that the data is extracted. The three common uses selections are:

1. AD Input – this is the input signal to the Syrinx3 Demod Channel. The only change to this signal is from the gain and offset applied by the Auto Gain Control.
2. FIR32 – this is the signal on the output of the Output filter. This signal is the output when the Syrinx3 Demod channel is setup as an FM Demodulator or a Lowpass Filter.
3. Interpolate Out – after the output of the Output Filter, the signal is interpolated before being routed out of the Syrinx3 card on a BNC. The number of interpolations is based on the Output Filter frequency. Higher frequency signals have fewer or no interpolations.

4.2 Hallux3 DAQ12 Setup

The Hallux3 DAQ12 is a twelve-channel data acquisition and PCM encoder card. More information about the Hallux3 DAQ12 is available in the Hallux3 DAQ12 Manual. To launch the Hallux3 DAQ12 Setup window, double click on the DAQ12 in the Hardware Explorer.



The Hallux3 DAQ12 Setup window has controls to setup each of the twelve channels. Each channel has the following controls: Enable, Sample Rate, and Input Level.

1. Enable – When a channel is enabled, it is added to the PCM Frame. Disabled channels are not used in the calculation of the PCM Frame for the PCM Encoder.
2. Sample Rate
    a. The options for the Sample rate are 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 16 kHz, 32 kHz, 64 kHz, 128 kHz, 256 kHz, and 512 kHz.
    b. The Hallux3 DAQ12 can support two channels at 512 kHz, five channels at 256 kHz, or all twelve channels at 128 kHz.
    c. The Sample Rate determines not only the timing of when card samples the incoming data, but also the placement and commutation of the channel in the PCM Frame of the PCM Encoder.
    d. The Sample Rate should be set to a value between 1x and 10x the value of the output filter.
3. Input Level – The Input level determines the maximum allowed voltage for the input signal. The options for Input Level are 5 Vpp, 2.5 Vpp, and 1.25Vpp.

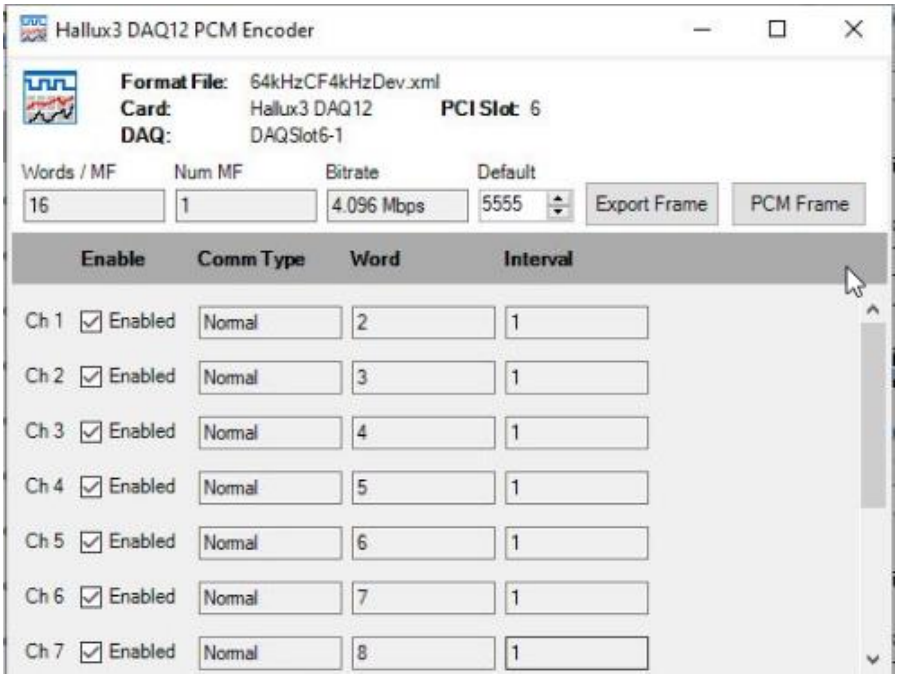
The PCM Frame is calculated on the based on the following criteria, listed in order of importance. For details on how the PCM Encoder Frame, please contact Ulyssix.

1. Lowest Bit Rate
2. Least percentage of filler words
3. Fewest Minor Frames

The PCM Frame for the PCM encoder is calculated when the Apply button is pressed. Also, the settings are downloaded to the Hallux3 DAQ12 card when the Apply button is pressed. The PCM Encoder button launches the PCM Encoder window which displays the calculated settings for the PCM Frame.

4.2.1 PCM Encoder Window

The PCM Encoder button launces the PCM Encoder window. This window displays the parameters for the PCM Encoder as well as a couple of configurable settings.



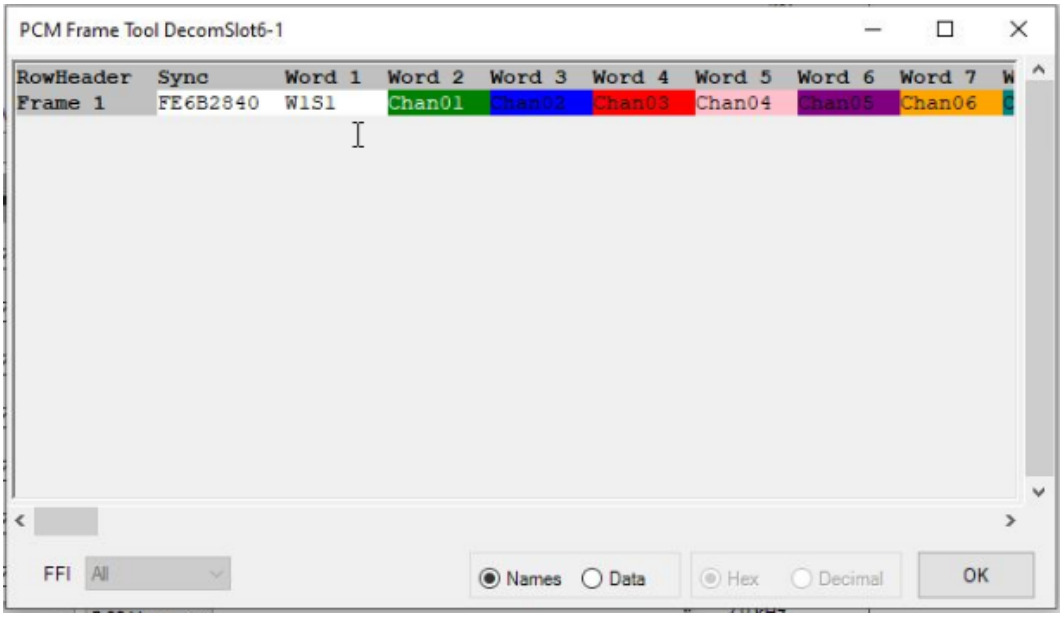
The top row displays the Words Per Minor frame, Number of Minor Frames, and Bitrate. The PCM Frame always uses the IRIG standard 32-bit Frame Sync Pattern of 0xFE6B2840. Each word is always 16-bits. The first word after the Frame Sync Pattern is always the Sub Frame ID, even when there is only one minor frame. The first DAQ Channel in the minor frame is always the second word after the Frame Sync Pattern.

Bits 0 to 15: 0xFE6B
Bits 16 to 31: 0x2840
Bits 32 to 47: SFID
Bits 48 to 64: First channel of data

The Default numeric input is a 16-bit number in hexadecimal format. It determines the value of filler word that is used when a position in the frame does not have data from a DAQ Channel.

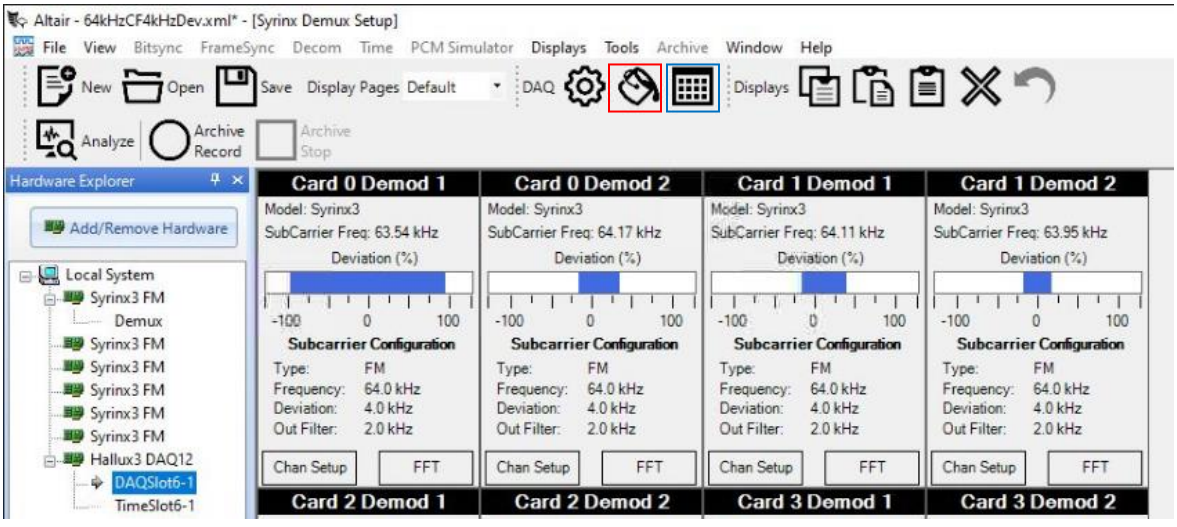
The Export Frame button launches a Save File Dialog window to choose the location to save a Comma Separated Variable (CSV) file with the PCM Frame Format. This file is intended to help program the Decom that will process the output of the PCM Encoder.

The PCM Frame button launches the PCM Frame Tool window. This window displays a layout of the PCM Frame with either the live data or the channel names displayed. The radio buttons at the bottom determine if the Channel Names or the Data is displayed in the window. In the image below, the SFID is labeled as W1S1.



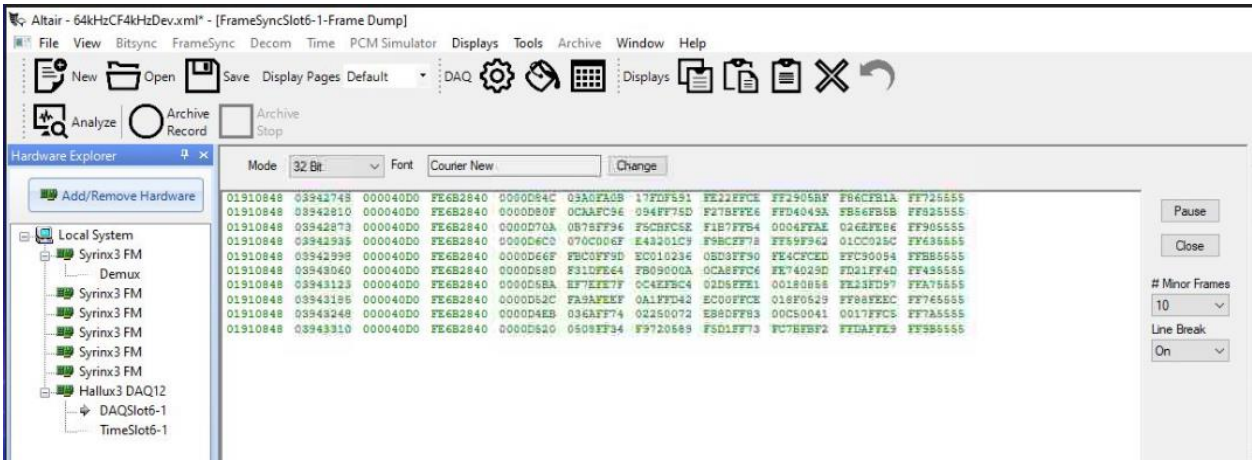
4.2.2 Other Hallux3 DAQ12 Controls

When the Hallux3 DAQ12 is selected in ALTAIR's Hardware Explorer, there are other buttons in the toolbar for the Frame Sync Dump (red box below) and the PCM Frame Tool (blue box below). The Frame Sync Dump toolbar icon looks like a paint bucket. The PCM Frame Tool toolbar icon looks like a calendar. Clicking either of these buttons result in the new window displayed maximized in the workspace. As mentioned previously, the Windows minimize, maximize and close buttons are in the upper right side of the toolbar.



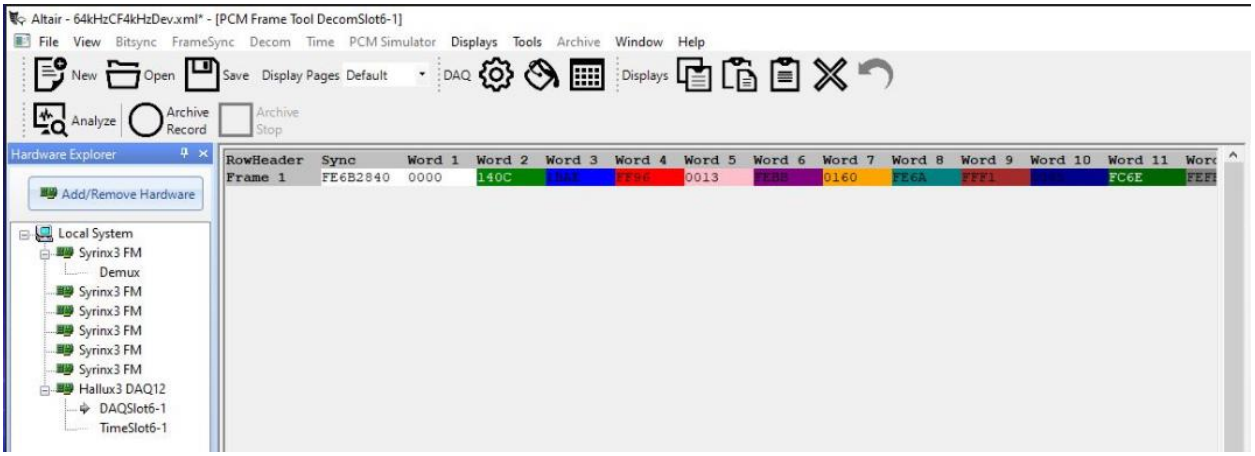
The Frame Sync Dump displays the raw binary data from the PCM Encoder. The raw data is in the Tarsus Archive Data format (TAD). The TAD format has a 96-bit minor frame header. The TAD minor frame

header includes 64-bits of IRIG Time Stamp in BCD format, 16-bits of Frame Counter, and 16-bits of Hardware Status. For more information on the TAD format, please refer to the Ulyssix ALTAIR Manual.



The Frame Sync Dump has controls on both the top and right side. On the top, there are controls to change the number formatting for how the hexadecimal values are displayed. The default is 32-bit grouping. There is also a control change the Font and Font Size. Click the Change button to launch the Font selection window. On the right side there are controls to Pause the Frame Sync Dump as well controls to select the number of minor frames displayed and if there is a line break added after each minor frame.

The PCM Frame Tool can be launched from the toolbar as well as from the PCM Encoder window. When launched from the toolbar, the PCM Frame Toolbar window is maximized across the entire workspace.



Chapter 6 Saving and Loading Setups

Dewesoft makes it easy to save and load any hardware configuration. The setups can be stored to the local hard drive to be used by the unit or transferred to other measurement units.

In Dewesoft, a "Setup" contains the settings which are active at the moment you save it, except for the few global parameters which are restored automatically when the software is started. Global parameters are those which are set using the Hardware Settings and General Settings dialog boxes, which are selected under the Settings menu.

6.1 Starting a New Setup

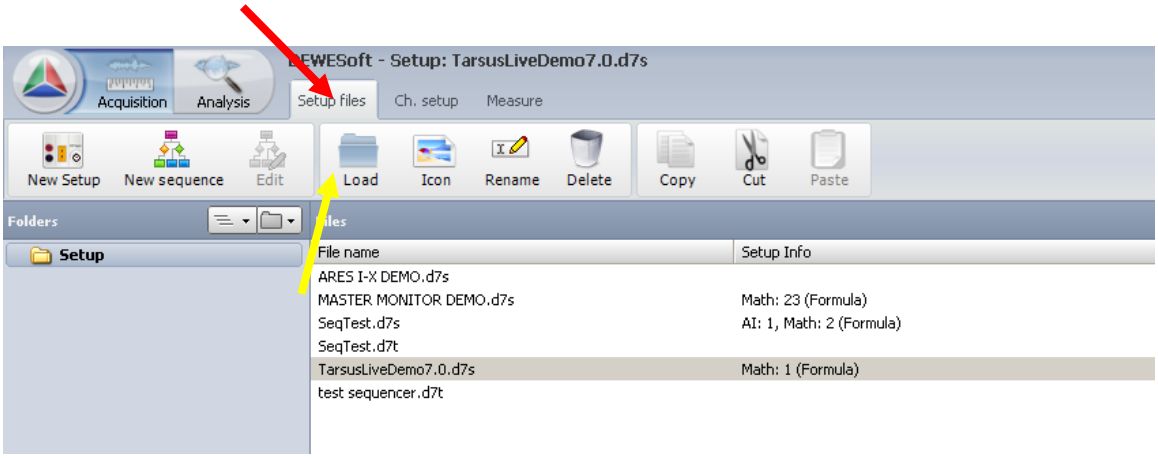
There are times when you will want to clear away the current setup and start completely fresh. Simply select the New setup menu item to accomplish this.

New setup: select this menu item and a new blank setup will be created. All existing setup parameters will be lost, so be sure that you have saved any changes before executing a new setup file.

A setup contains all aspects of your configuration which are available using the SETUP screen and the DISPLAY screens of DeweSoft.

6.2 Loading Previous Setups

Once you have saved a setup, you can reload it at any time. Setups are stored to the hard disk in your system, so they remain on the system until you delete them or change the hard drive. To load a new setup, click the Setup Files tab in the horizontal toolbar.



The default project folder will be displayed with any setup files located inside. To browse the hard drive for setups saved in a different location use the folder button (yellow arrow) to navigate to the folder. Double click on the setup file or click the load button to open the file.

6.3 Saving Setup Configuration

At any time on the Ch. Setup tab the current configuration can be saved. This will also save the displays under the measure tab to the same setup file. Simply click on the Save or Save as buttons in the main tool bar