ULYSSIX TECHNOLOGIES, INC.

ARCHI / Gryphon User's Manual

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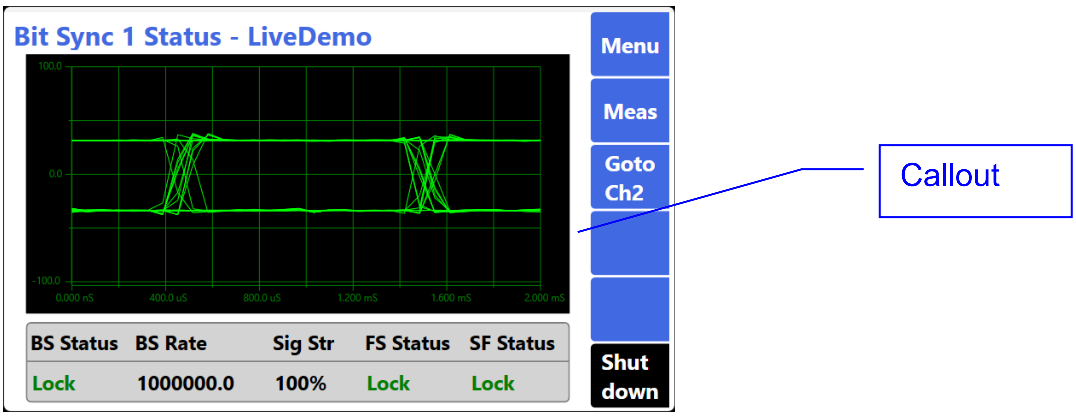
About This Manual

Screen Instructions

This manual uses images of software screens. The images are Windows screen shots of the Touch screen Displays on the software. There are callouts on the left and right sides and lines pointing to specific features. The callouts indicate features and controls not explained in the step-by-step instructions for the screen.



Caution Notes

The caution icon helps to clarify operational procedures and result from operations that may not be intuitively clear. The intent is to save the user time and eliminate frustration during the setup and operation of the system.

Special Features

The light bulb indicates a special feature. These special features are advanced options that the Ulyssix engineers have developed to help customers solve complex problems, minimize setup problems, help in troubleshooting, and bring PCM equipment to the forefront in technology. Special features are indicated throughout the manual by the light bulb icon.

Menus Paths

Menus are a set of hierarchal commands used to open windows or perform commands. Using menus consists of a multi-step process of selecting the top-level menu, then a sub-menu, and possibly a sub-sub-menu. This manual refers to the multi-step menu process is as the “menu path.”

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Chapter 1 Introduction

1.1 Overview

The Gryphon product line comes in two models: Gryphon PCM and Gryphon RF. The Gryphon RF has all the features of the Gryphon PCM, plus dual multi-band RF Receivers and an optional single multi-band RF Transmitter.

The Gryphon Dual Bit Synchronizer, Dual, Frame Synchronizer, Dual Decom, Single PCM Simulator, and Single IRIG Time Code Reader system is a fully integrated chassis solution. The Gryphon system utilizes the Ulyssix Tarsus Dual Bit Synchronizer / Frame Synchronizer with IRIG time code reader product which is a state-of-the-art Digital Signal Processing (DSP) based PCM processor board. The chassis is a 2U rack-mount system containing dual capacitive touch screen displays and integrated keypad with an advanced computer board running an embedded operating system.

The Gryphon archives frame synchronized data from each channel via .Tad files. The internal IRIG time code reader time stamps the archived data at the beginning of each minor frame for enhanced post-processing analysis.

The user navigates the Gryphon system via dual touchscreen LCD displays. The Gryphon's main graphic display allows for easy viewing of the Bit Sync Lock Indicators, Bit Rate, Eye Patterns, Frame Lock Indicators, Hexadecimal Frame Data, and Sub Frame Lock Indicators for both channels as well as user selectable meters and strip charts for displaying Decom Parameters.

Bit Synchronizer Features:

- Full Bit Sync design using all DSP filter algorithms in FPGA technology for maximum performance capability.
- Output PCM code types including: NRZ-L/M/S, RNRZ-L, Bi-Φ L/M/S.
- Bit Sync programmable input rates from 1 bps up to 40 Mbps for NRZ-L/M/S, and RNRZ-L code types as well as 1 bps to 20 Mbps for Bi-Φ L/M/S code types.
- DC Level IRIG-B and AM Modulated IRIG A, B, G, & NASA-36.
- Less than 1 dB theoretical bit sync BER performance for bit rates up to 25 Mbps, less than 2 dB to theoretical from 25 Mbps to 40 Mbps.
- Bit Sync PCM Output capability for IRIG code types.

Frame Synchronizer and System Features

- Frame sync patterns from 16 to 64 bits.
- User programmable Frame Sync Search / Check / Lock output display strategies.
- Minor frame lengths up to 2^{24} bits with up to 1024 minor frames.
- Programmable number of Frame Sync Bit Slips and allowable Sync Errors.
- Set up and controlled by dual high-resolution color LCD touchscreen displays for complete flexibility using the front panel touch screen interface. The Gryphon solution

is powered by the latest INTEL/Altera FPGA technology with user upgradable DSP firmware algorithms.
- Fully integrated 2U rackmount chassis solution including dual touch screens.

Receiver Features
- FM, BPSK, QPSK, and SOQPSK demodulation types.
- No tuning and preventative maintenance required.
- Fully digital Demodulator for enhanced capabilities.
- C Band, S Band, L Band, Extended P Band, P Band, and IF frequency ranges.
- DSP implemented IF data bandwidth filtering from 20 kHz to 56 MHz.
- Fully programmable digital FIR output filter, which can be bypassed for higher PCM data rates.
- FPGA-based architecture allows for rapid enhancements and customization.
- Digital time synchronized and sampled output data available for FFT analysis and direct capture.
- Software enable/disable for demodulation of PCM signals without Pre-Mod filters.

Transmitter Features
- FM, BPSK, QPSK, and SOQPSK modulation types.
- No tuning and preventative maintenance required.
- Fully digital modulator for enhanced capabilities.
- C Band, S Band, L Band, Extended P Band, P Band, and IF frequency ranges.
- FPGA-based architecture allows for rapid enhancements and customization.
- Software enable/disable Pre-Mod filter for PCM signals.
- Variable output power using a programmable attenuator. Output power from 0dBm to -90dBm depending on selected frequency band.

1.2 Specifications

Bit Synchronizer Input Specifications

Number of Bit Syncs	Two independent inputs per Bit Sync.
Input Source	Two single ended BNC (option to replace one single ended with a Differential Twinax).
Input Data Rate	Bit Sync programmable input tunable rates from 1 bps to 40 Mbps for NRZ-L/M/S, RNRZ-L and 1 bps to 20 Mbps for Bi-Φ L/M/S.
Input Impedance	Hi-Z / 75Ω / 50Ω program selectable for BNC1 input. 120 ohms fixed for Differential input.
IRIG Time Code Reader	Accepts IRIG time codes A, B, G and NASA36.
Maximum Safe Input	± 35 VDC.
Input Signal Level	30 mVp-p to 5 Vp-p.
DC Input Level	+/- 5 VDC.
Input PCM Code Types Modes	NRZ-L/M/S, RNRZ-L, Bi-Φ L/M/S program selectable (consult Ulyssix for other Code Types).

Derandomizer Input	RNRZ-11/15, Forward / Reverse, program selectable.
Input Polarity	Normal, Inverted, or Auto Polarity (using Frame Sync correlation).

Bit Synchronizer Data Specifications

Loop Bandwidth	0.01% to 3.0%, to the programmed Bit Rate.
Capture Range	+/- 3 times of the programmed Loop Bandwidth.
Data Tracking Range	+/- 3 times of the programmed Loop Bandwidth.
Bit Error Probability	Less than 1 dB theoretical bit sync BER performance for Bit Rates up to 25 Mbps, less than 2 dB to theoretical from 25 Mbps to 40 Mbps.

Bit Synchronizer Output Specifications

Clock Output	0°, 90°, 180°, 270°.
Output Signal Levels	TTL and RS-422 Level driven.
PCM Encoder Code Types	NRZ-L/M/S, RNRZ-L, Bi-Φ L/M/S, or RNRZ 11/15, program selectable.
Output Polarity	Normal or inverted on channel-by-channel basis.

Frame Synchronizer Specifications

Input Data Rate	Up to 50 Mbps.
Input Signals	Direct from Bit Sync. Data (NRZ-L) and Clock inputs via TTL Level single ended or RS-422 differential.
Minor Frame Length	3 to 16,777,216 bits.
Major Frame Length	1 to 1024 Minor Frames per Major Frame.
Frame Sync Pattern	16 to 64 bits.
Frame Sync Strategy	Search-Check-Lock, programmable counts per step.
Subframe Sync	SFID or FCC.
Sync Error Tolerance	0 to 8 bits, program selectable.
Sync Slip Window	0 to 9999 bits, program selectable.
Frame Sync Archive	Ulyssix .Tad Frame Synchronized binary file or optional Chapter 10.

PCM Simulator Specifications

Output Data Rate	1 bps to 40 Mbps for NRZ-L/M/S, RNRZ 11/15, or 20 Mbps for Bi-Φ L/M/S.
Output PCM Code Types	NRZ-L/M/S, RNRZ-L, Bi-Φ L/M/S, RNRZ 11/15.
Output Signal Levels	Data and Clock, TTL, and RS422 level driven.
Word Lengths	3 to 64 bits, variable.
Frame Length	Same as decommutator specs.
Data Words	Fixed or math functions (Sine Wave, Triangle, Square Wave, Sawtooth, Counter) with programmable sample rate.

DAC Out Specifications

Number of Channels	2
Output Level	0 Vp-p to 5.0 Vp-p, selectable in 0.1 Vp-p steps, ± 2.5V offset in 0.1 VDC steps

Time Code Reader Specifications

IRIG Code Types	DC Level IRIG-B and AM Modulated IRIG A, B, G & NASA-36

Receiver Demodulator Specifications

Data Rates	Up to 20 Mbps (FM) Up to 10 Mbps (BPSK) Up to 40 Mbps (SOQPSK)
Output Linearity	Less than 0.05% of the programmed full deviation bandwidth measured from best 3-point straight line
Output Harmonic Distortion	All harmonic terms are below -56 dB for single carrier sinewave modulation
Output Filtering Modes	Filter Mode: The FIR filter is flat within 0.1 dB in the programmed passband and -60 dB attenuation at two times the programmed cutoff frequency. Bypass Mode: The digital and analog reconstruction filters are bypassed for maximum digital data throughput. The data frequency throughput is equal to the programmed deviation filter frequency.
Output Filter Range	Programmable from 1/64 to 1/2 times the IF Bandwidth, four-digit resolution with a total range of 100 Hz to 56 MHz.
Wide Bandwidth Signal Tolerant	Software enable/disable for demodulation of PCM signals without Pre-Mod filters.

Transmitter Specifications

Data Rates	Up to 20 Mbps (FM) Up to 10 Mbps (BPSK) Up to 40 Mbps (SOQPSK)
Modulation Modes	FM, BPSK, QPSK, and SOQPSK
Output Dynamic Range	30 dB
Pre-Mod Filter	PCM signals have a software-enabled Pre-Mod filter.
Output Impedance	50 Ohm N Connector
Power Range	Output power controlled by programmable attenuator from 0 dBm to -90 dBm

System Specifications

Operating System	Windows 10 IOT.

Displays	Two 800 x 480 LCD Capacitive Touchscreen Display.
Input	Two Capacitive Touch Screen Displays.
Dimensions	2U rackmount 19” x 3.5” x 20”.
Ethernet	10/100/1000 RJ45 Ethernet with TCP/IP.
Power	Less than 300 Watts.
Temperature Range	Operating: 0°C to 50°C. Storage: -20°C to 60°C.

1.3 Warranty

Ulyssix Technologies, Inc. warrants its products to be free from defects in material and workmanship under normal use and service for one year from the date of shipment to the original purchaser. The equipment must be returned, transportation prepaid to the factory, and if found to be defective, at the company’s option, will be repaired or replaced free of charge and returned transportation prepaid. If inspection by Ulyssix does not disclose any defects in material or workmanship, a Ulyssix standard repair service charge will apply. This warranty does not extend to any products that have been subject to misuse, negligence, modifications, abnormal operating conditions, or cover expendable items such as lamps, batteries, fuses, etc. Customer furnished equipment and hardware purchased for resale included in systems are covered by the original manufacturer’s warranty. Ulyssix makes no express or implied warranties beyond those described herein, and in no event will Ulyssix be responsible for consequential damage, of any nature arising out of, or connected with, the use of its products.

1.4 Repair Service Charges

Please call the Ulyssix Customer Service Department at 301-846-4800 for a quotation, return authorization number, and shipping information. Ulyssix warranties all repaired units repaired for 90 days from the date of said repair. Equipment must be shipped to the factory with transportation prepaid.

Chapter 2 Gryphon Hardware

This chapter explains how to configure your Gryphon prior to first turn on and use. The following sections will explain how to set up your hardware and to determine if your hardware is functioning.

2.1 Connecting the Hardware

Baseband PCM inputs and outputs through Single Ended 75-ohm BNC rackmount connectors or Differential Twinax.

RF inputs and output through N-Type 50-ohm connectors.

CAUTION When using the Gryphon's hardware, always remember to practice safe electrostatic discharge precautions. Electrostatic Discharge or (ESD) is the sudden and momentary electric current that flows between two objects at different electrical potentials. The term describes the momentary unwanted currents that may cause damage to electronic equipment.

2.1.1 Gryphon PCM Rear Panel

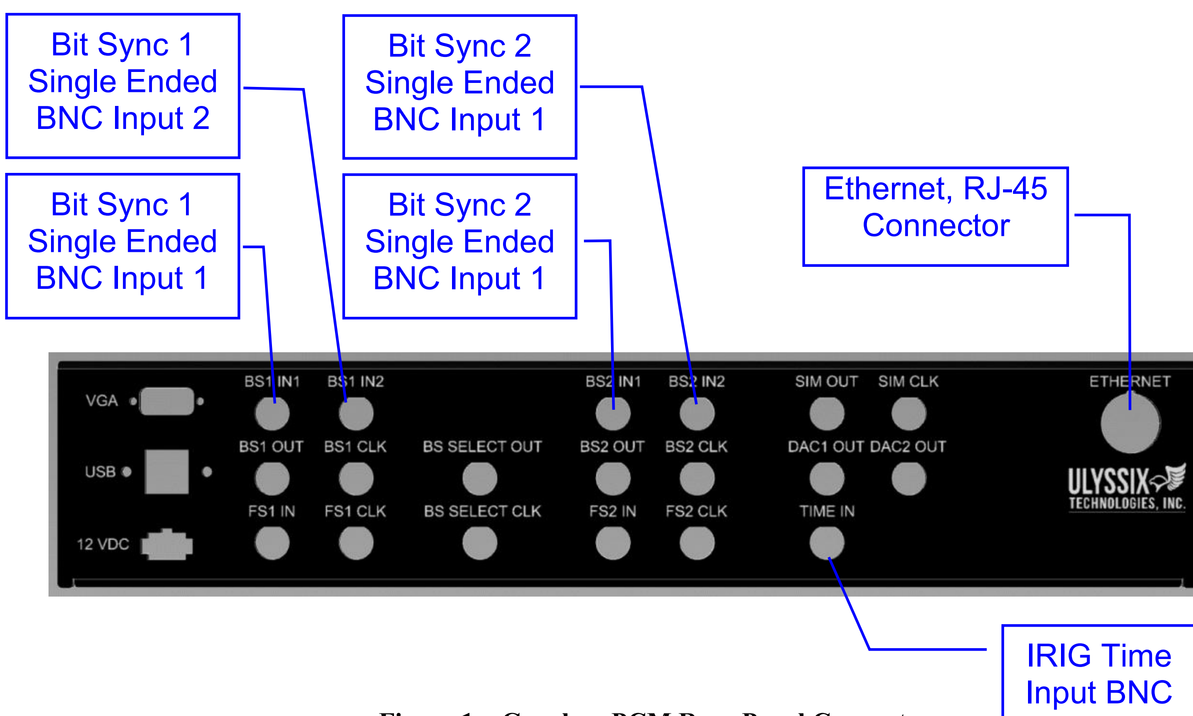

Figure 1 – Gryphon PCM Rear Panel Connectors

Connection Location\Label	Connection Function
VGA	Video Graphics Array Connector
USB	2 USB 2.0 Connectors
12 VDC	12 Volt DC Input to connect to external AC/DC Converter (12V Model ONLY)
BS1 In1	Bit Sync1 Input 1
BS1 Out	Bit Sync1 Output
FS1 In	Frame Sync 1 Input
BS1 In2	Bit Sync1 Input 2
BS1 CLK	Bit Sync1 Clock
FS1 CLK	Frame Sync 1 Clock
BS Select Out	Frame correlator best source data out
BS Select Clk	Frame correlator best source clock out
BS2 In1	Bit Sync2 Input 1
BS2 Out	Bit Sync2 Output 1
FS2 In	Frame Sync 2 Input
BS2 IN2	Bit Sync2 Input 2
BS2 Clk	Bit Sync2 Clock
FS2 Clk	Frame Sync 2 Clock
SIM Out	Simulator Out
DAC1 Out	Analog output words selector 1
Time In	Time Input
SIM Clk	Simulator Clock
DAC2 Out	Analog output words selector 2
Ethernet	Ethernet RJ-45 connector

2.1.2 Gryphon RF Rear Panel

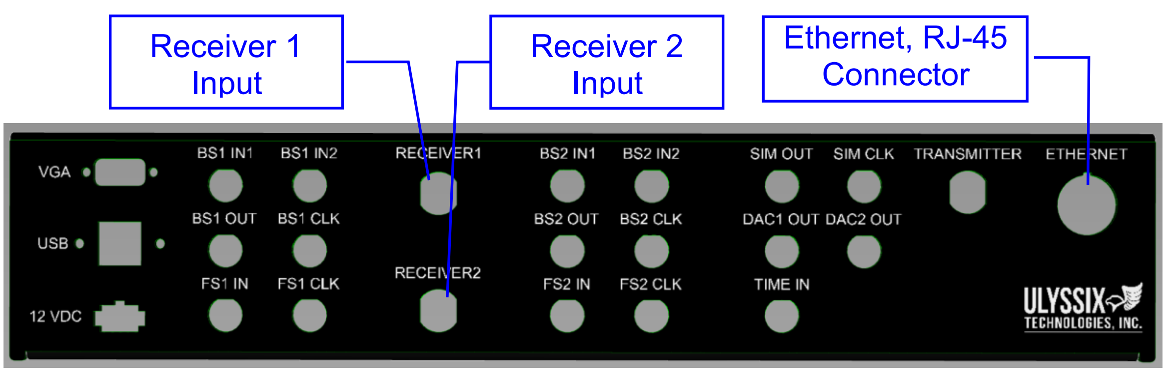

Figure 2 – Gryphon RF Rear Panel Connectors

Connection Location\Label	Connection Function
VGA	Video Graphics Array Connector
USB	2 USB 2.0 Connectors
12 VDC	12 Volt DC Input to connect to external AC/DC Converter (12V Model ONLY)
BS1 In1	Bit Sync1 Input 1
BS1 Out	Bit Sync1 Output
FS1 In	Frame Sync 1 Input
BS1 In2	Bit Sync1 Input 2
BS1 CLK	Bit Sync1 Clock
FS1 CLK	Frame Sync 1 Clock
Receiver 1	RF Input for Receiver 1
Receiver 2	RF Input for Receiver 2
BS2 In1	Bit Sync2 Input 1
BS2 Out	Bit Sync2 Output 1
FS2 In	Frame Sync 2 Input
BS2 IN2	Bit Sync2 Input 2
BS2 Clk	Bit Sync2 Clock
FS2 Clk	Frame Sync 2 Clock
SIM Out	Simulator Out
DAC1 Out	Analog output words selector 1
Time In	Time Input
SIM Clk	Simulator Clock
DAC2 Out	Analog output words selector 2
Transmitter	RF Transmitter Output (Optional Licensed Feature)
Ethernet	Ethernet RJ-45 connector

2.1.3 Gryphon PCM Front Panel

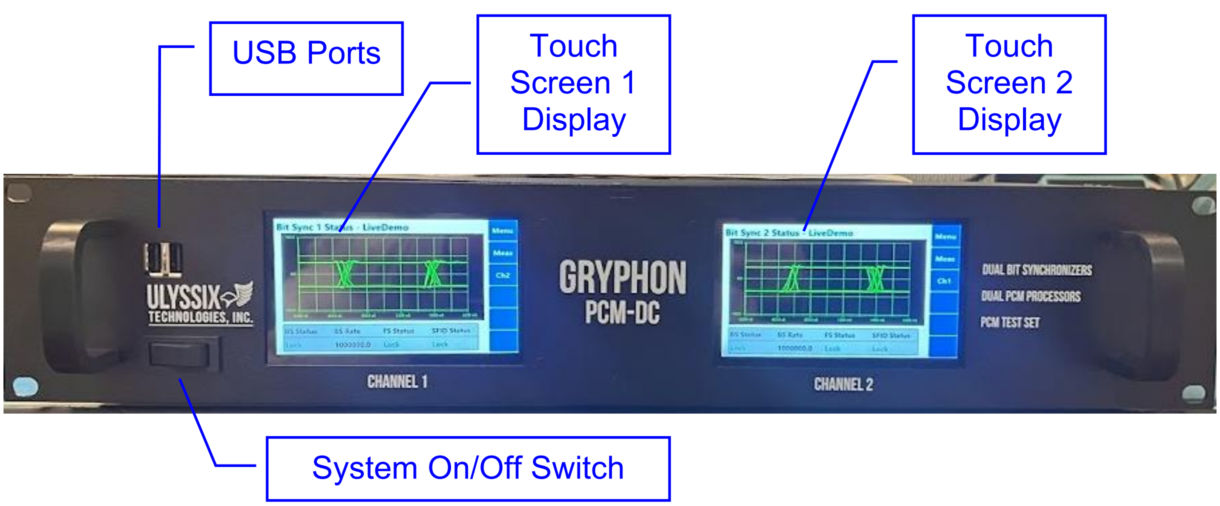

Figure 3 – Gryphon PCM Front Panel

2.1.4 Gryphon RF Front Panel

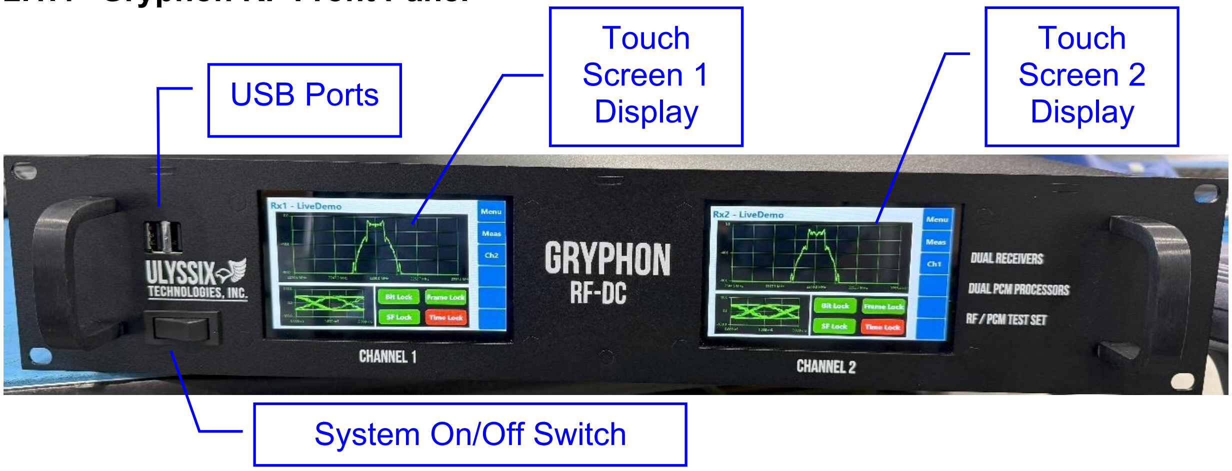

Figure 4 – Gryphon RF Front Panel

2.2 Identifying Internal Hardware

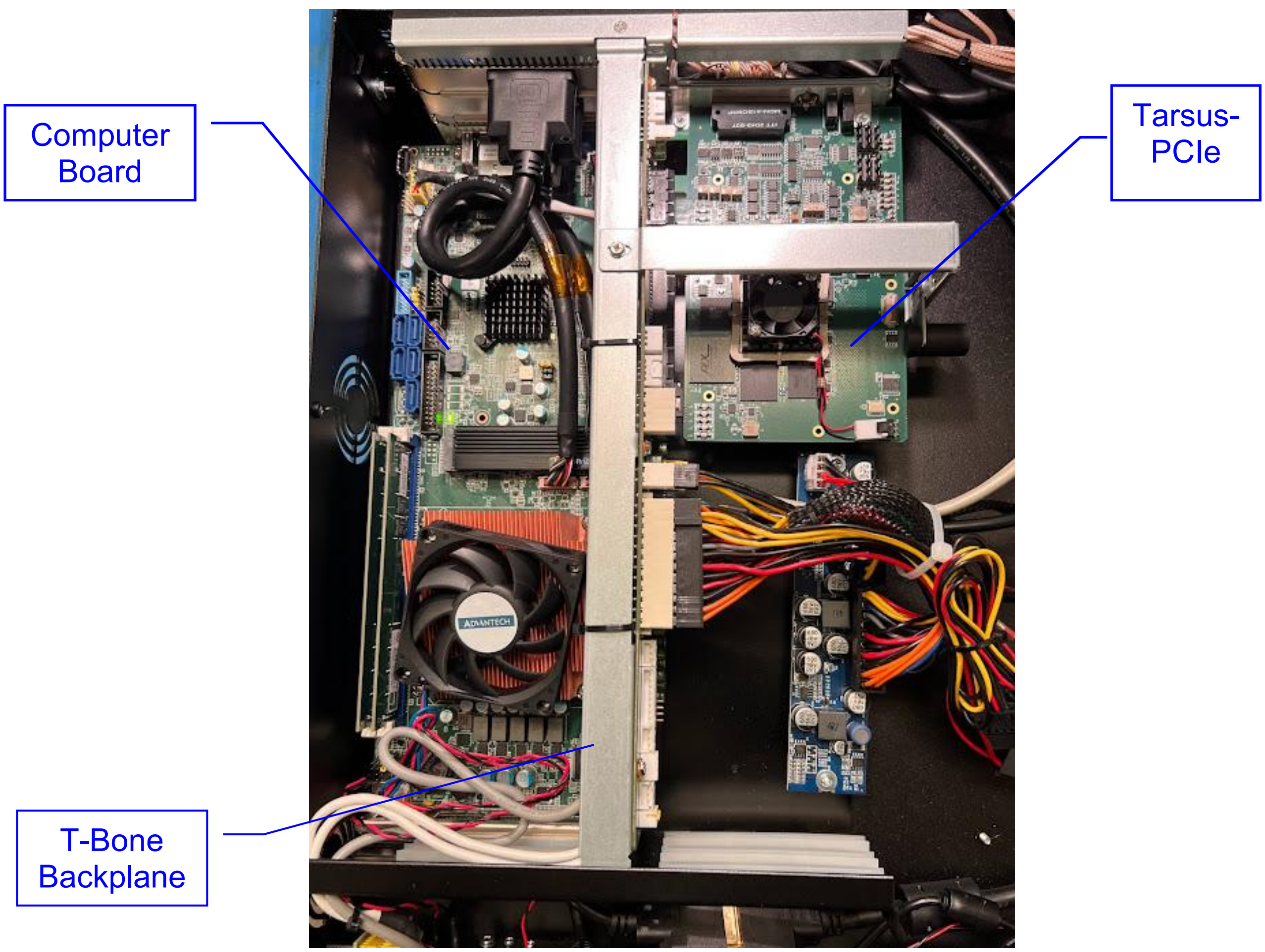

Figure 5 – Gryphon PCM Internal View

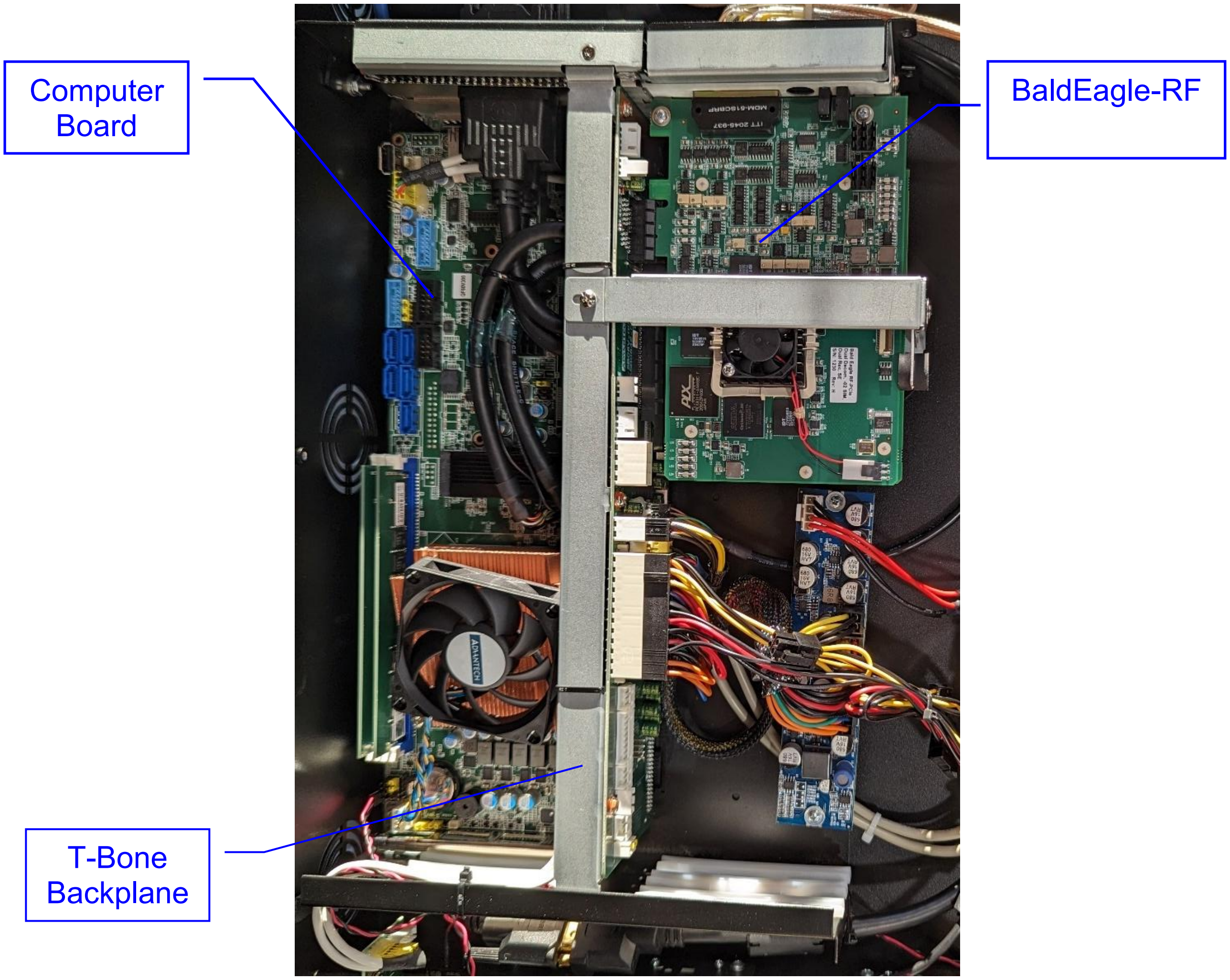

Figure 6 – Gryphon RF Internal View

Chapter 3 Gryphon Basic Operation

3.1 Startup

3.1.1 Power Switches

The switch on the back panel of the Gryphon PCM and Gryphon RF chassis is located above the power cord. The switch is marked with the symbols "–" (on) position and "o" (off) position for AC Powered models. To turn on the power switch make sure the "-" (on) side is depressed.

n

Figure 7 – Gryphon Rear Panel Power Switch

The Gryphon PCM-DC and Gryphon RF-DC chassis has a 12 Volt DC Input to connect to external AC/DC Converter then the front momentary rocker switch.

Figure 8 – Gryphon Front Panel Rocker Power Switch

3.1.2 Startup Display Sequence

1. Black Screen
2. Ulyssix Windows Back Drop (purple and black star background with white Ulyssix logo)
3. Gryphon SW
4. Gryphon Splash Screen

3.2 Power Off

To power off the Gryphon, hold the rocker switch on the front panel down until the computer starts to power off. Then the Gryphon shutdown process takes about thirty seconds. The user can also power off the Gryphon via software. Starting at the Main Menu, touch the System Menu text to navigate to the System Menu. In the System Menu touch the "Shutdown" text.

Chapter 4   ARCHI Hardware

This chapter explains how to configure your ARCHI prior to first turn on and use. The following sections will explain how to set up your hardware and to determine if your hardware is functioning.

4.1   Connecting the Hardware

Baseband PCM inputs and outputs through Single Ended 75-ohm BNC rackmount connectors or Differential Twinax. RF inputs and output through N-Type 50-ohm connectors.

When using ARCHI hardware, always remember to practice safe electrostatic discharge precautions. Electrostatic Discharge or (ESD) is the sudden and momentary electric current that flows between two objects at different electrical potentials. The term describes the momentary unwanted currents that may cause damage to electronic equipment.

4.1.1   ARCHI PCM Top

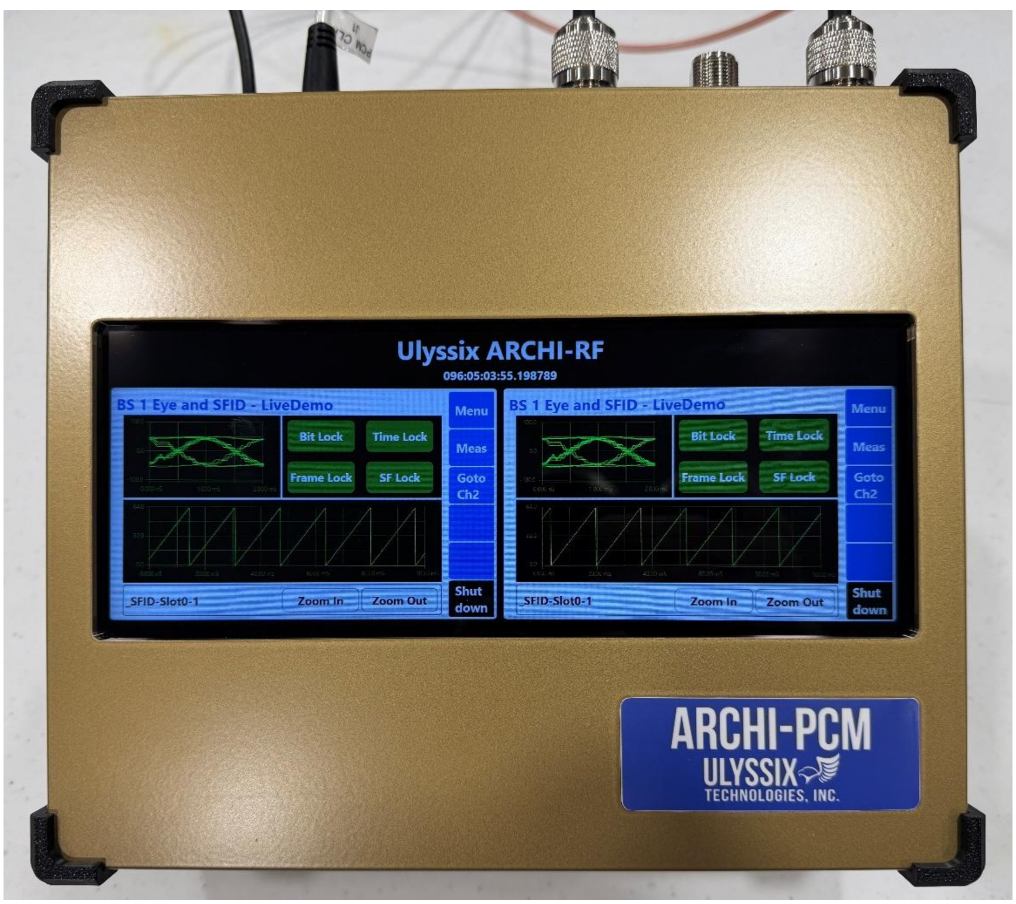

Figure 9 – ARCHI PCM Top

4.1.2 ARCHI PCM Front Panel

Figure 10 – ARCHI PCM Front Panel

Connection Location\Label	Connection Function
BS1 IN1	Bit Sync1 Input 1
FS1 IN	Frame Sync 1 Input
BS1 OUT	Bit Sync1 Output
BS1 IN2	Bit Sync1 Input 2
FS1 CLK	Frame Sync 1 Clock
BS1 CLK	Bit Sync1 Clock
DAC1	Analog output words selector 1
UART1	
BS2 IN1	Bit Sync2 Input 1
FS2 IN	Frame Sync 2 Input
BS2 OUT	Bit Sync2 Output 1
BS2 IN2	Bit Sync2 Input 2
FS2 CLK	Frame Sync 2 Clock
BS2 CLK	Bit Sync2 Clock
DAC2	Analog output words selector 2
UART2	
SIM OUT	Simulator Out
TINE	Time Input
SIM CLK	Simulator Clock
GPS	Input for GPS Antenna
ETHERNET	Ethernet RJ-45 connector
PWR	USB-C 60watt Input

4.1.3 ARCHI RF Top

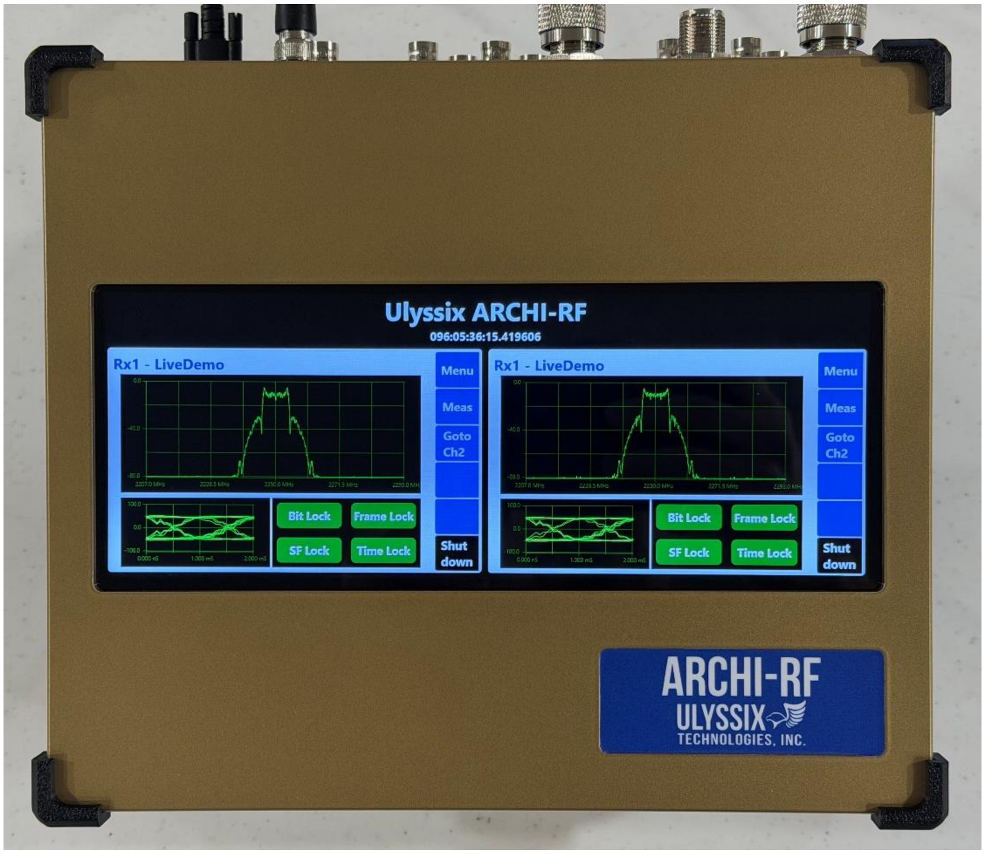

Figure 11 – ARCHI RF Top

4.1.4 ARCHI RF Front Panel

Figure 12 – ARCHI RF Front Panel

The ARCHI RF has the same connectors as the ARCHI PCM plus additional connectors for the RF front end.

Connection Location\Label	Connection Function
RX1	Input for Receiver 1
RX2	Input for Receiver 2
TX	Output for Transmitter
UART3	
UART4	

4.1.5 ARCHI Identifying Internal Hardware

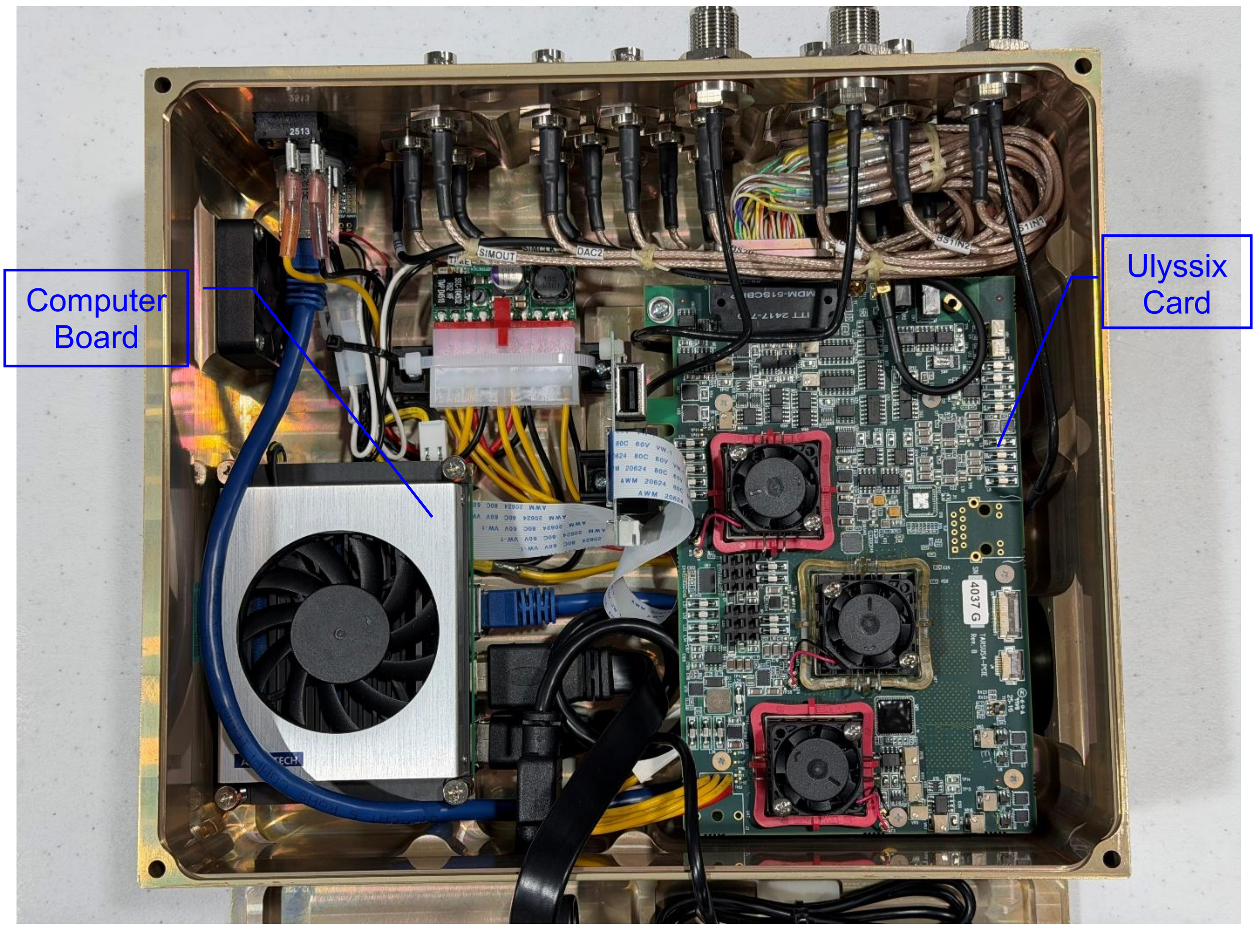

Figure 13 – ARCHI Internal View

4.1.6 ARCHI Power Supply

The ARCHI power input is USB-C Power Deliver 2.0. The default power supply is USB-C 65W. The ARCHI expects power delivery at 20V with a maximum of 3Amps (60Watts). Typically power consumption is much less, but power varies with use case.

Chapter 5 ARCHI Basic Operation

5.1 Startup

5.1.1 Power Switch

The power switch is located on the front panel of the ARCHI PCM and ARCHI RF chassis above the ethernet jack. The flip the switch to the ON position, denoted by the 1 on the switch, to power on the ARCHI.

Figure 14 – ARCHI Internal View

5.1.2 Startup Display Sequence

1. Black Screen
2. ARCHI SW
3. ARCHI Loading Screen

5.2 Power Off

In the software, press the Shutdown button. Wait for the software to display the "It is now safe to power off the system" image. And then flip the power switch to the OFF position, denoted by the 0 on the switch.

Figure 15 – ARCHI Power Off Screen

Chapter 6 Software Introduction

6.1 Graphical User Interface Layout

The GUI design follows simple rules to help the user understand touch interface. Text with a gray background is not touch sensitive. These are simple labels or text to display information. Text with a white background is touch sensitive.

Many of the custom controls appear to be simple text until the user touches the area near the text. For example, in the Touch Combo Box a simple text string becomes a drop-down list when the user touches the text. There are four major touch sensitive controls: Buttons, Touch Combo Boxes, Touch Textboxes, and Touch Value and Units. When any of those controls are set to Read Only, the background changes to gray.

The software interface layout has three zones: Tile Bar, Multiuse Buttons, and the Display Area. The Title Bar is located at the top of the display. It shows the title of the current display. The Multiuse Buttons are the six blue buttons located on the right side of the display. They navigate between displays, accessing submenus, applying user settings to the Tarsus card, and other functions. The Display Area contains different content based on the type of display.

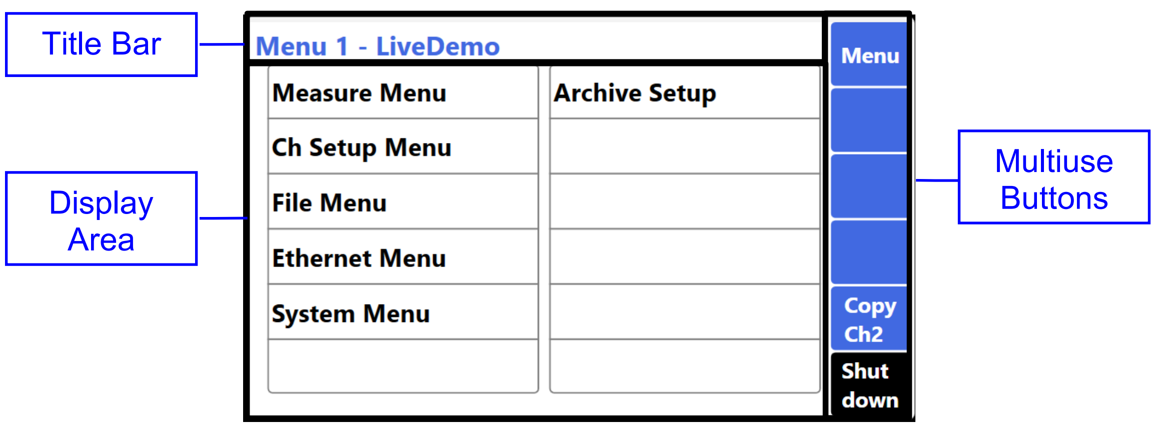

Figure 16 – Main Menu

The Display Area has three types of content: Menu GUIs, Settings GUIs, and Measurement GUIs. Menu GUIs navigate between different Settings GUIs and Measurement GUIs.

The Settings GUIs configure the Tarsus card or the software. The software downloads the settings to the Tarsus card when the user touches the **Apply** multipurpose button or navigates to another display.

The Measurement GUIs show information read back from the Tarsus card. Some of the Settings GUIs also display status from the Tarsus card. For example, the Bit Sync Setup GUI displays Bit Sync Lock Status, the current measured Bit Rate, and the Signal Strength. This feedback is useful for the user to enter the correct settings.

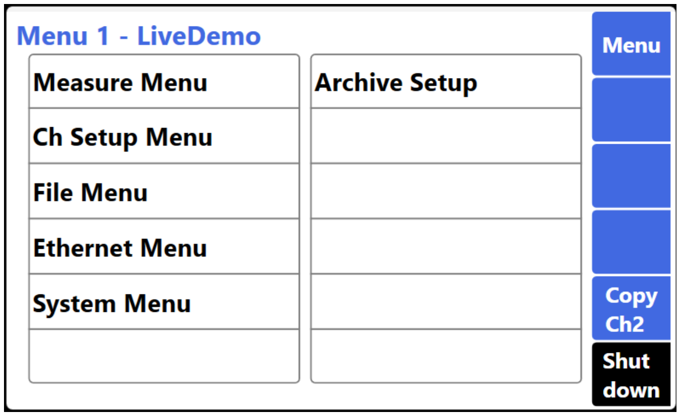

Figure 17 – Main Menu GUI

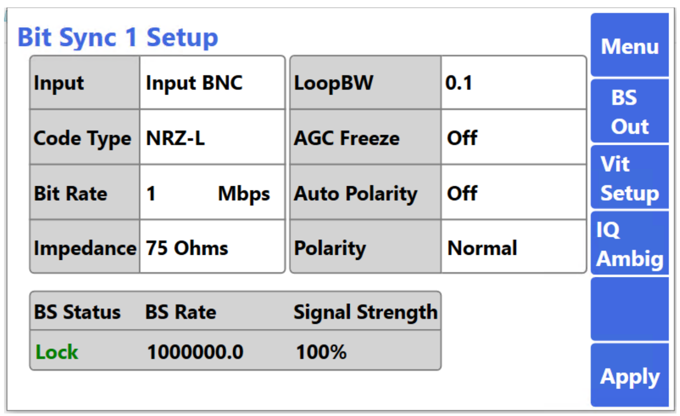

Figure 18 – Settings GUI

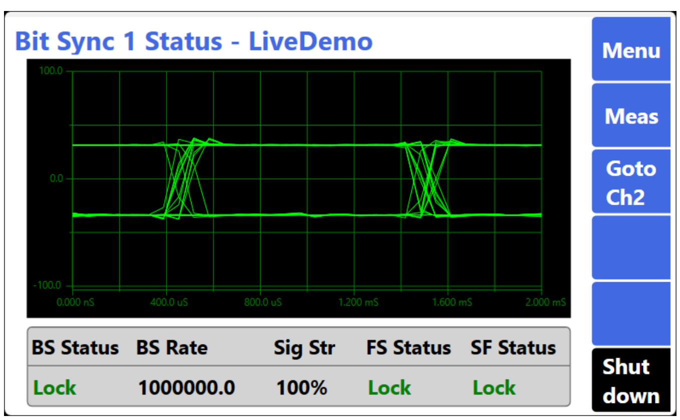

Figure 19 – Measurement GUI

4.1 LCD Displays

The Gryphon has two capacitive touchscreen LCD displays. The software designates the display on the left for Channel 1: Bit Sync 1, Frame Sync 1, Decom 1, Simulator, Time, and Archive 1. Channel 1 includes the Simulator and Time settings displays. The software designates the LCD display on the right for Channel 2: Bit Sync 2, Frame Sync 2, and Decom 2.

The software limits the settings displays to the designated LCD display. For example, the settings for Bit Sync 1 are only accessible from the left LDC display. However, the software allows Measurement displays on either LCD display. When you select the Bit Sync Status Measurement display on the left LCD display, the default source is for Bit Sync 1. Touching the Multiuse button **Goto Ch2** swaps the Bit Sync Status Measurement display on the left LCD display to be Bit Sync 2. Swapping measurement displays allows the user to change settings on display while watching the effect of the setting on the other LCD display.

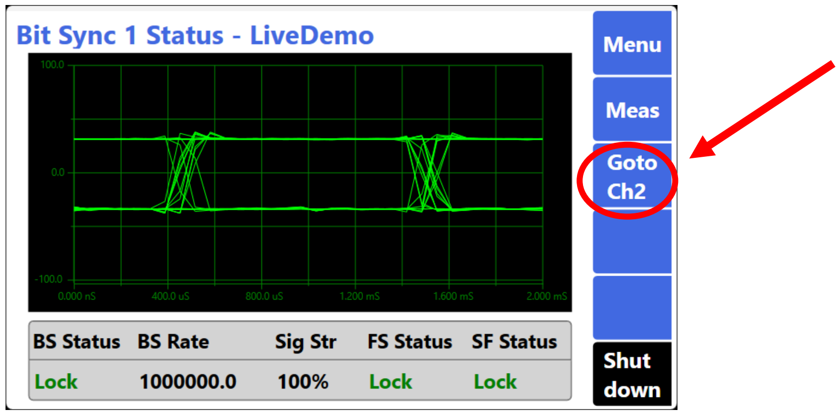

Figure 20 – Measurement Display Channel Swap

4.2 Main Menu

The software is a graphical user interface to configure the Tarsus card and analyze telemetry data. The base level of the software is the Main Menu. This menu provides access to the Settings Displays to configure the Tarsus card and to other Menu Displays.

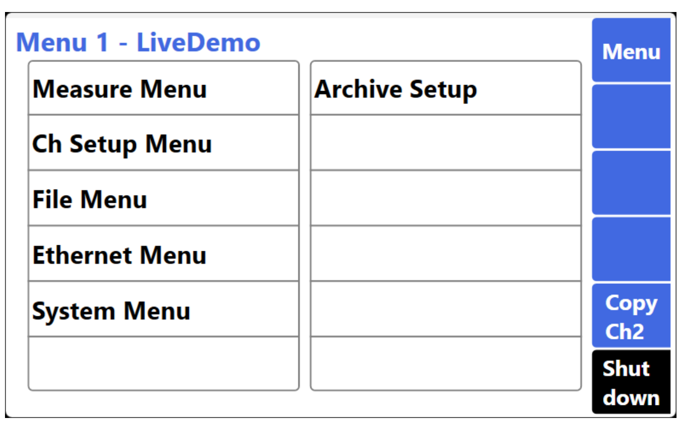

Figure 21 – Main Menu

1. **Measure Menu** – The Measure Menu is for navigation to Measurement displays like Eye Patterns and Frame Dumps.

2. **Channel Setup Menu** – The Channel Setup Menu contains the user interfaces to configure the hardware for the telemetry stream.
3. **File Menu** – The File Menu is for saving and opening configuration files as well as Importing and Exporting files to an external drive.
4. **Ethernet Menu** – The Ethernet Menu contains settings for configuring the hardware for the network as well as any licensed features for exporting Telemetry data via the network.
5. **System Menu –** The System Menu is for navigation to various system settings and software / hardware configurations. The System Menu contains the System Info display for examining the current versions of software and firmware, License Display, access for updating software and firmware, and other features.
6. **Archive Setup** – The Archive Setup is the configuration for storing acquired telemetry data to a file.

4.3 Measure Menu

The Measure Menu display allows navigation to the Measurement displays. Each Measurement display provides measurements from the PCM stream. The Next Page and Prev Page buttons navigate to additional entries in the Measure Menu.

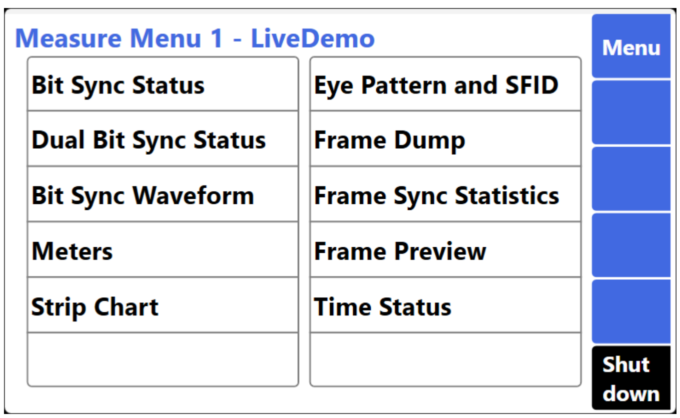

Figure 22 – PCM Measure Menu Display

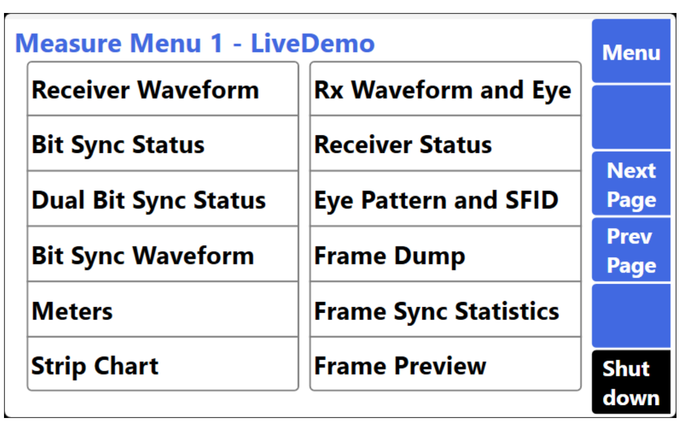

Figure 23 – RF Measure Menu Display

Receiver Waveform Status – A large RF Spectrum display with the current values of RF Power, Bit Sync Lock Status, and Frame Sync Lock Status.

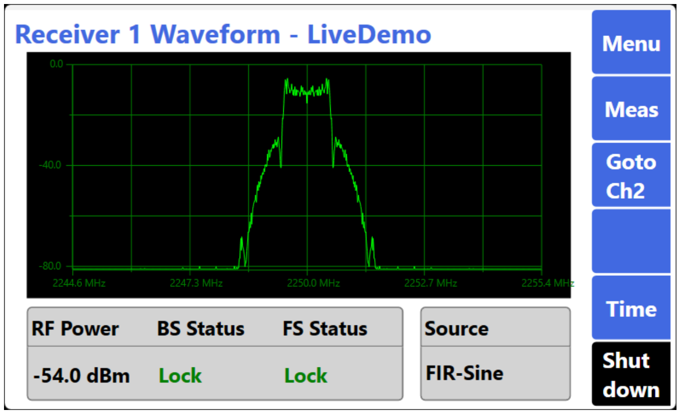

Figure 24 – Receiver Waveform Status Measurement Display

Bit Sync Status – A large Eye Pattern display with the current values of the Bit Sync Lock Status, Measured Bit Rate, Frame Sync Lock Status, and SFID Status (if configured).

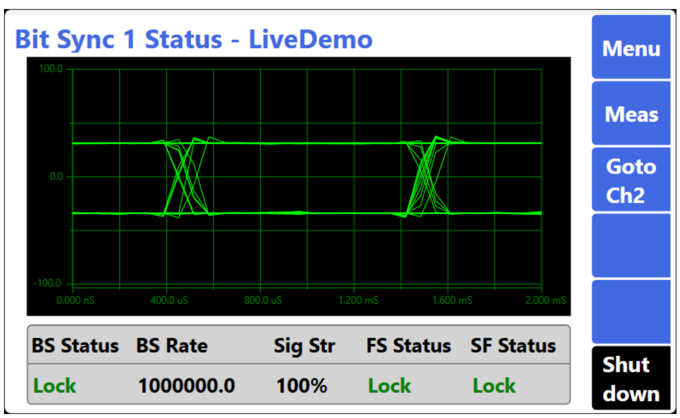

Figure 25 – Bit Sync Status Measurement Display

Dual Bit Sync Status – The Eye Pattern and Bit Sync Status for two Bit Syncs in one LCD display, freeing up the other for a different Measurement display.

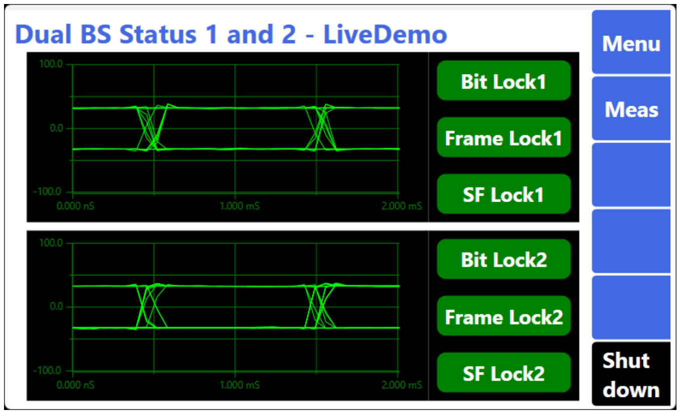

Figure 26 – Dual Bit Sync Measurement Display

Bit Sync Waveform – Displays a snapshot of the incoming PCM data to the Bit Sync. When this display is used, the Frame Dump, Meter, and Strip Chart displays are not available.

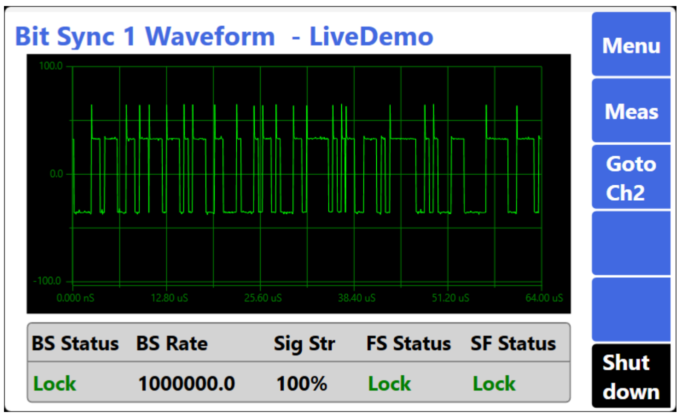

Figure 27 – Bit Sync Waveform Measurement Display

Meters – There are eight Meter displays for user selectable Decom Parameters. The Meter displays data in a user selectable radix (Binary, Octal, Decimal, or Hexadecimal). Each page shows four meters. The Next Page and Prev Page multipurpose buttons navigate between Meter pages.

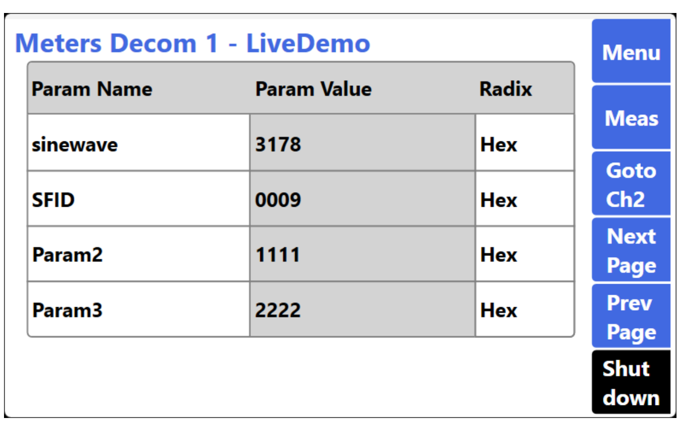

Figure 28 – Meters Measurement Display

Strip Chart – A plot of one user selectable Decom Parameter versus time.

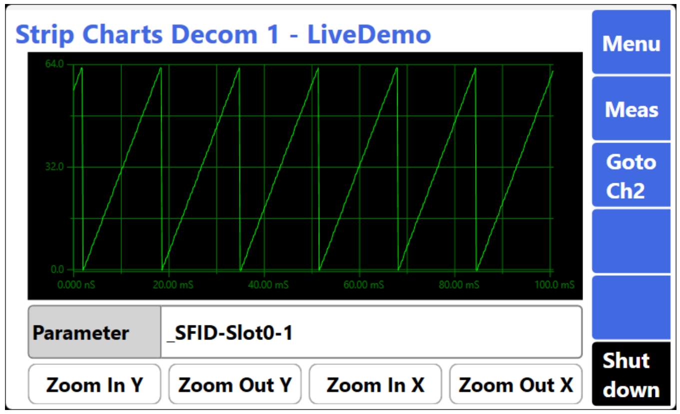

Figure 29 – Strip Chart Measurement Display

Rx Waveform and Eye – This display has three parts. A large RF Spectrum display. A small Eye Pattern display. Lock indicators for Bit Lock, Frame Lock, Sub Frame Lock, and IRIG Time Lock.

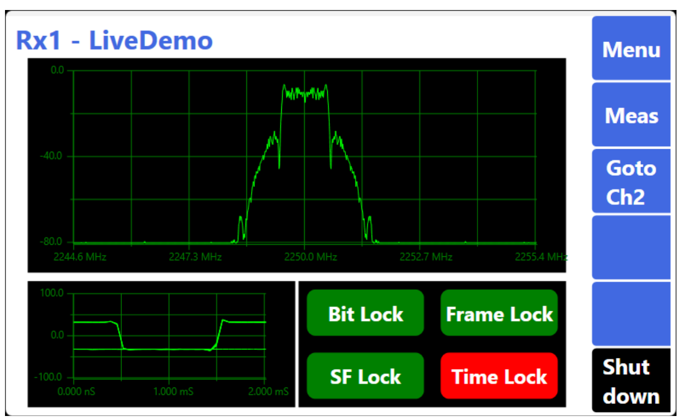

Figure 30 – Rx Waveform and Eye Measurement Display

Receiver Status – This display has three parts. A large RF Spectrum display. Lock indicators for Bit Lock, Frame Lock, Sub Frame Lock, and IRIG Time Lock. Current values of RF Power, Frequency Offset, and Bit Rate.

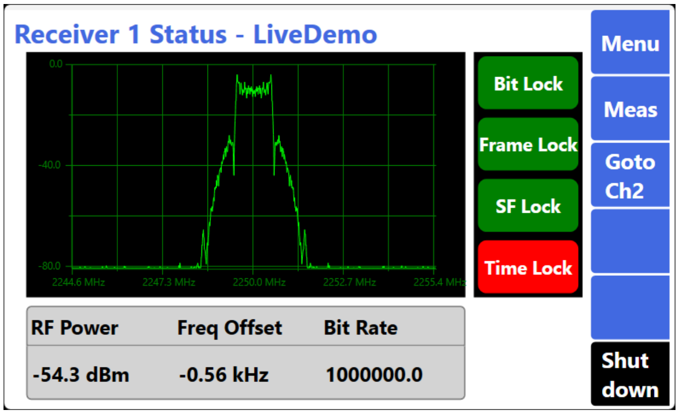

Figure 31 – Receiver Status Measurement Display

Eye Pattern and SFID – This display has three parts. A small Eye Pattern display. Lock indicators for Bit Lock, Frame Lock, Sub Frame Lock, and IRIG Time Lock. A Strip Chart that defaults to the SFID (user selectable to another Decom Parameter).

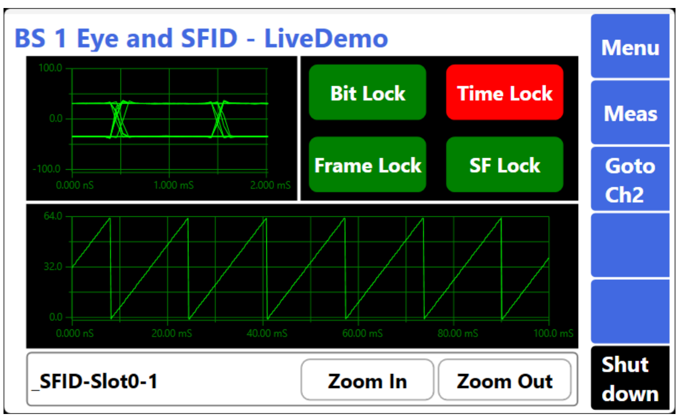

Figure 32 – Eye Pattern and SFID Measurement Display

Frame Dump – Display of ten minor frames of data from the output of the Frame Synchronizer. The data is in TAD format (see Chapter 10 Archive Data Files Explained). The data is hexadecimal grouped by 32-bit words. The first two 32-bit words are the Time Stamp. The third 32-bit word is the Tarsus Status Word. The Frame Sync Pattern begins in the fourth 32-bit word.

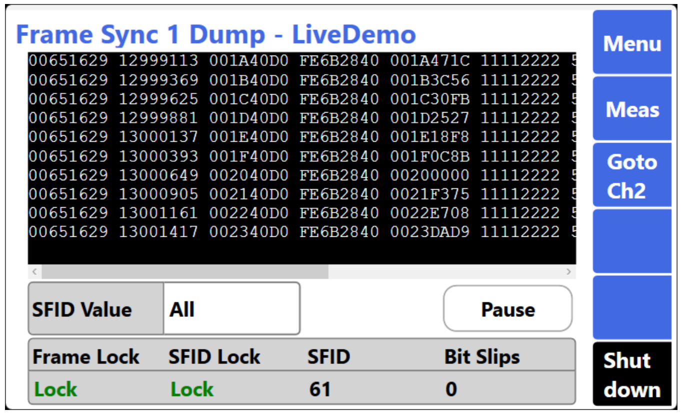

Figure 33 – Frame Dump Measurement Display

Frame Sync Stats – Accumulating statistics of locked minor frames and SFID counter values.

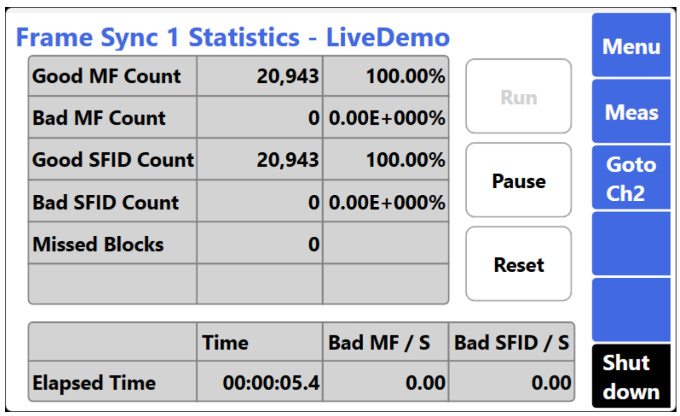

Figure 34 – Frame Sync Statistics Measurement Display

Frame Preview – Display of one major frame of telemetry data broken up into words as defined in the Decom.

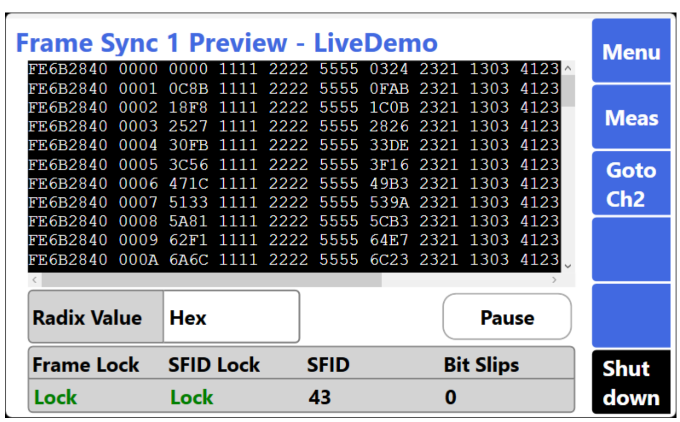

Figure 35 – Frame Preview Measurement Display

Time Status – An indicator for IRIG Time Lock as well as the current Decom Time, IRIG Time, and Computer Time.

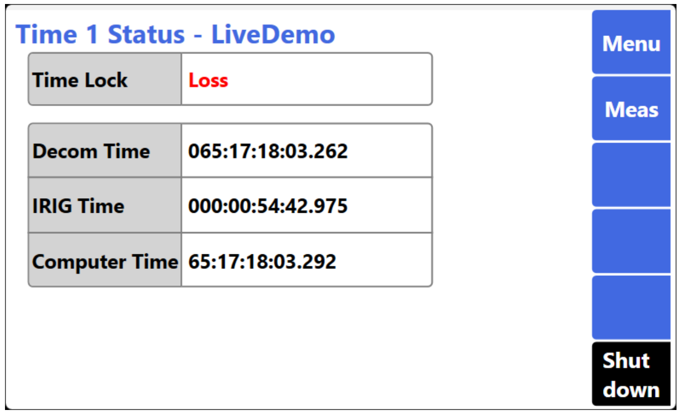

Figure 36 – Time Status Measurement Display

4.4 Channel Setup Menu

The Channel Setup Menu contains the interface to configure the hardware for the telemetry setup. Please note that the description below includes optional licensed features. Please contact Ulyssix to discuss adding optional features in your system.

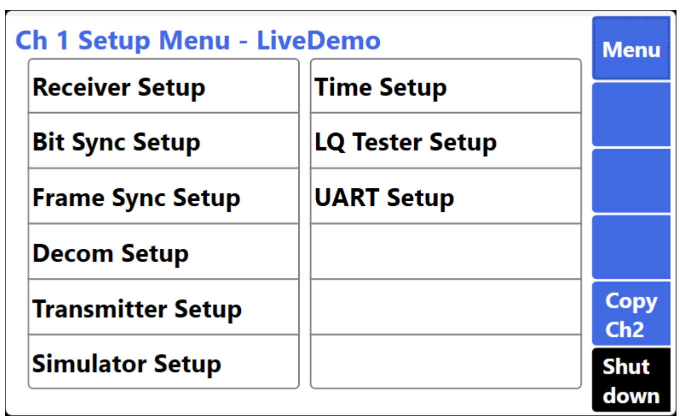

Figure 37 – Channel Setup Menu

1. **Receiver Setup (optional) –** Receiver Settings display configures the Receiver settings for the BaldEagleRF card.
2. **Bit Sync Setup –** Bit Sync Settings display configures the Bit Sync Settings for the Tarsus card.
    a. The Bit Sync Settings display allows access to the Bit Sync Output Settings display as well as the optional Viterbi Settings display and optional IQ Ambiguity Settings display.
3. **Frame Sync –** Frame Sync Settings display configures the Frame Sync settings for the Tarsus card.

   a. The Frame Sync Settings display allows access to the Sub Frame Sync Settings display and the Frame Sync External Input Settings display.
4. **Decom Setup –**Decom Settings displays configures the Decom Frame setup and the Decom Parameters.
   a. The Decom Setup display allows access to the Decom Parameter Settings display and the DAC Output Settings display.
5. **Transmitter (optional) –** Transmitter Settings display configures the Transmitter settings for the BaldEagleRF card.
6. **Simulator Setup –** Simulator Settings display configures the Simulator settings for the Tarsus card.
   a. The Simulator Settings display allows access to the Simulator Sub Frame Settings and the Simulator Parameter Settings display as well as the optional Viterbi Simulator Settings display.
7. **Time Setup –** IRIG Time Code Reader Settings display configures the IRIG Time Code Reader settings for the Tarsus card.
8. **Archive Setup –** Archive Settings display configures the software settings for archiving frame synchronized binary data files.
   a. The Archive Settings display allows access to the Ch10 Archive Settings Display (optional).
   b. The Archive Settings display multipurpose buttons start and stop Archive Recording.
9. **LQ Tester Setup (optional)** – LQ Tester Settings display configures the Bit Error Rate Tester feature. This is a licensed option.
   a. The LQ Tester Setup Settings display has a multipurpose button to start the LQ Test to measure the Bit Error Rate.

6.2 File Menu

The File Menu is the user interface to open and save configuration and TMATS files, Import and Export files to an external drive, save Diagnostic files, and view the archive files on the system.

1. **New** – Creates a new configuration file with default settings.
2. **Open** – Opens an existing configuration file.
3. **Save As** – Save the current configuration file with a new name.
4. **Save** – Save the current configuration file.
5. **Import Export** – Menu to import and export various categories of files to an external drive.
6. **Open TMATS** – Uses a IRIG 106 TMATS file to create a new configuration file.
7. **Save As TMATS** – Saves the current configuration file to the TMATS format.
8. **Save Diagnostic** – Save the current diagnostic file for troubleshooting.
9. **Archive File List** – Lists the archive files currently stored on the system.

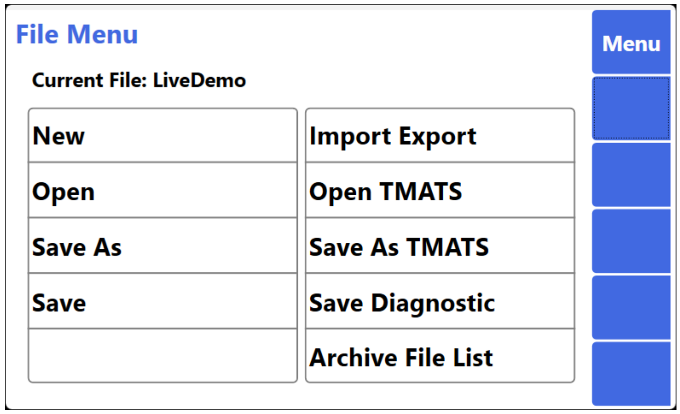

Figure 38 – File Menu

6.3 Ethernet Menu

The Ethernet Menu contains settings for configuring the hardware for the network as well as any licensed features for exporting Telemetry data via the network.

1. **UDP Broadcast** – Licensed feature to configure the broadcast of telemetry data via UDP in TAD or TMoIP format.
2. **Ch10 UDP Broadcast** – Licensed feature to configure the broadcast of telemetry data via UDP in Ch10 format.
3. **TMATs Listener** – Settings for the IRIG 106 Chapter 6 Recorder TCP Interface.
4. **Network Setup** – Configuration for the network hardware in the system.

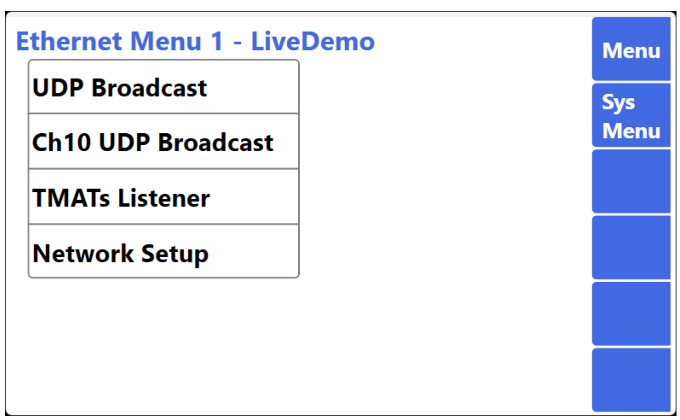

Figure 39 – Ethernet Menu

6.4 System Menu

The System Menu is for navigation to various system settings and software / hardware configurations. The System Menu contains the System Info display for examining the current versions of software and firmware, License Display, access for updating software and firmware, and other features.

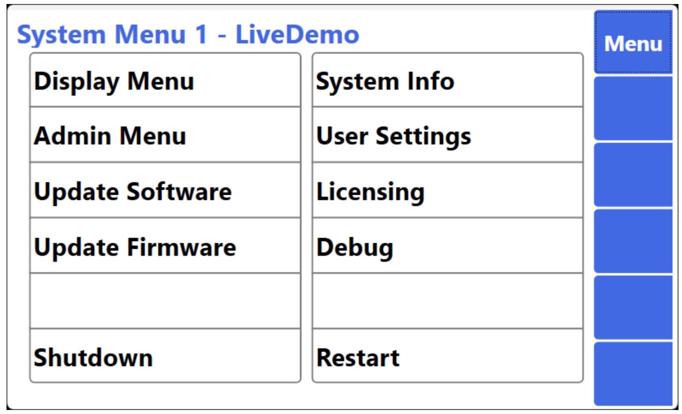

Figure 40 – System Menu

1. **Display Menu** – Contains information about the attached displays and option to rotate the displays 180 degrees.
2. **Admin Menu** – Contains administrative options used for troubleshooting hardware.
3. **Update Software** – Updates the software and the Ulyssix Update App.
4. **Update Firmware** – Updates and verifies the firmware of the Tarsus card.
5. **System Info** – Displays the current hardware, firmware, and software versions.
6. **User Settings** – User configurable settings like which Measure display is used at startup.
7. **Licensing** – Lists the current licensed features and accepts a Ulyssix Pass Key to update the license features.
8. **Debug** – Low level access to troubleshoot hardware.
9. **Shutdown** – Shuts down the system.
10. **Restart –** Restarts the system.

6.5 Archive Setup

The Archive Setup is the configuration for storing acquired telemetry data to a file.

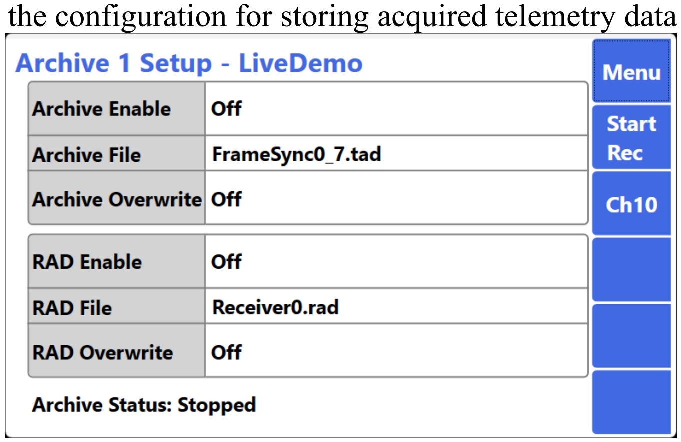

Figure 41 – Archive Setup

Chapter 7 Configuring the Hardware Settings

Ulyssix designed he Channel Setup Menu for quick sequential setup of the hardware. The Channel Setup Menu is accessed from the Main Menu by selection Channel Setup or by selecting the multipurpose Ch Setup button.

7.1 Configuring the Bit Sync

To configure the Bit Sync, follow the procedure below. To access the Bit Sync Setup, press Bit Sync Setup from the Channel Setup Menu screen:

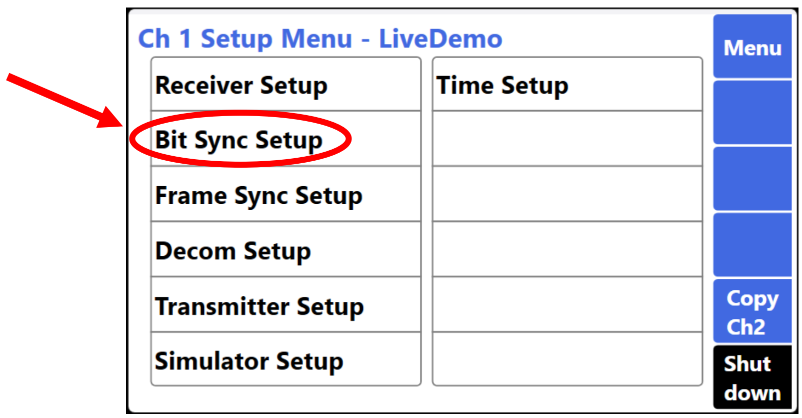

Figure 42 – Select Bit Sync Setup from Channel Setup Menu

Use this Bit Sync Setup window as a reference while following the step-by-step setup.

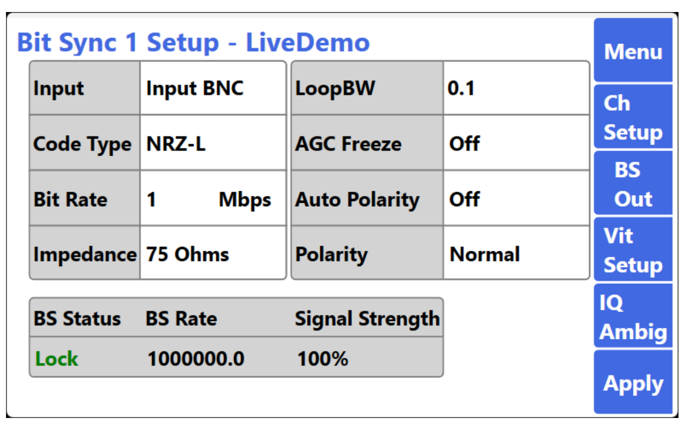

Figure 43 – Bit Sync Setup

1. **Input** – Select an input connection; either **Input BNC 1 or Input BNC 2**. Each input references a rear BNC connector. The Bit Sync receives data via the corresponding rear panel connection for the user selected input.
2. **Code Type** – Select the appropriate Code Type for the incoming PCM stream.

3. **Bit Rate** – Enter the value of Bit Rate of the incoming PCM stream. Set the units for the Bit Rate (Mbps, kbps, or bps).
4. **Impedance** – Select an Impedance. The typical value is 75Ω. The other options are 50Ω and 10kΩ.
5. **LoopBW** – Enter a Loop BW setting in the range of 0.1% to 3.0%. A smaller Loop BW setting achieves a better bit error performance out of the Bit Sync, however if the input PCM data rate is slightly low or high a lock may not occur.
6. **Polarity** – If the polarity is known, select the desired setting: Normal or Inverted. If the polarity is unknown, select Auto Polarity. The software will determine the polarity based on frame lock status.

Modifying a setting does not save the changes to the computer hard drive or send them to the hardware. The software downloads the setting when the user either presses the Apply button or navigates to another display screen.

7.2 Configuring Bit Sync Outputs

The system has one Data and Clock output per Bit Sync. The Data and Clock outputs are TTL. To access the Output Setup, select BS Out from the Bit Sync Setup form.

In the Bit Sync Settings display, select the BS Out multipurpose button on the right side of the display.

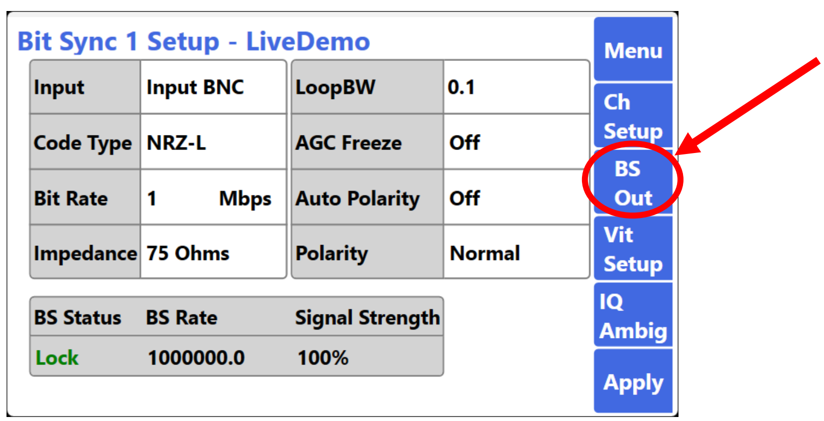

Figure 44 – Select BS Out in Bit Sync Setup

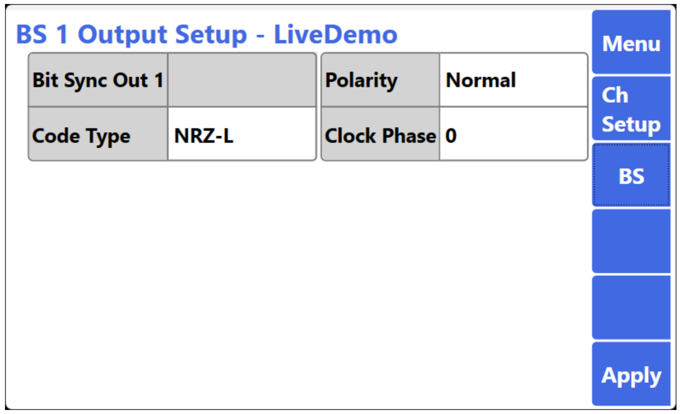

Figure 45 – Bit Sync Out Setup

1. **Code Type** – Select the PCM code type for the first output of the Bit Sync. The output code type is independent of the input code type.
2. **Polarity** – Select either Normal or Inverted polarity for the output PCM data.
3. **Clock Phase** – Select a clock phase of 0, 90, 180 or 270 degrees. This setting will change the relationship between the PCM data and the PCM clock rising edge. The proper setting depends on the equipment receiving the signals.

7.3 Configuring I & Q Ambiguity

Quadrature phase modulation techniques can result in I & Q ambiguity. A signal vulnerable to I & Q ambiguity has four possible states for each channel. The system determines the stream identity (I or Q) and Polarity using Frame Sync correlation.

Channel
I
-I (inverted)
Q
-Q (inverted)

In the software, the user selects which states are possible for a given channel. Enabling Auto Polarity tells a channel to flip polarity when not in frame lock. Enabling I & Q Ambiguity tells the channels to swap inputs (BS1 receives the input from BS2 and vice versa). Both features are independent, the user can enable Auto Polarity, I & Q Ambiguity, or both.

Setting the IQ Priority tells the unit how to cycle through the states. A Priority of I & Q attempts swapping inputs prior to polarity; vice versa is true for a priority of Polarity. If zero or one ambiguity is enabled (I & Q or Auto Polarity) then the priority is not applicable.

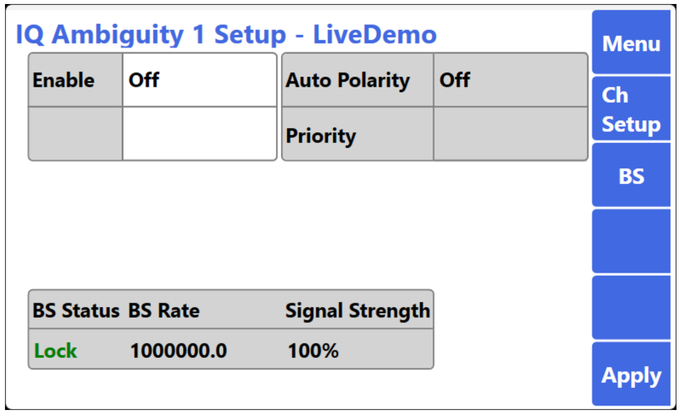

Figure 46 – I & Q Ambiguity Setup

7.4 Configuring the Frame Sync

To configure the Frame Sync, follow the step-by-step procedure below. In the Channel Setup menu, touch the Frame Sync Setup menu item.

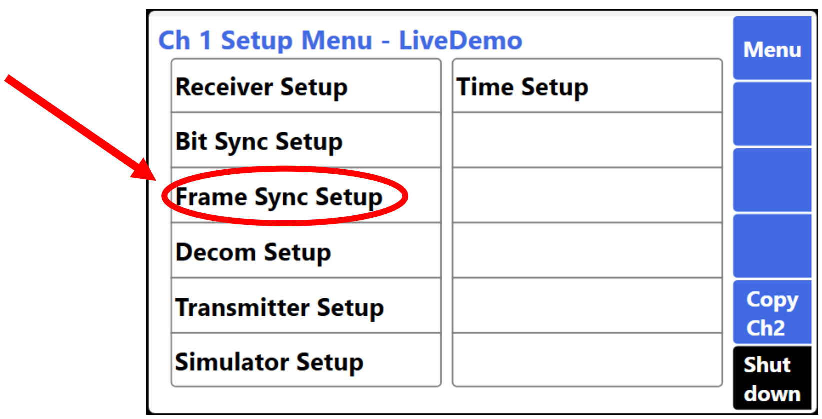

Figure 47 – Select Frame Sync Setup from Channel Menu

Use this Frame Sync Setup image as a reference while following the step-by-step setup.

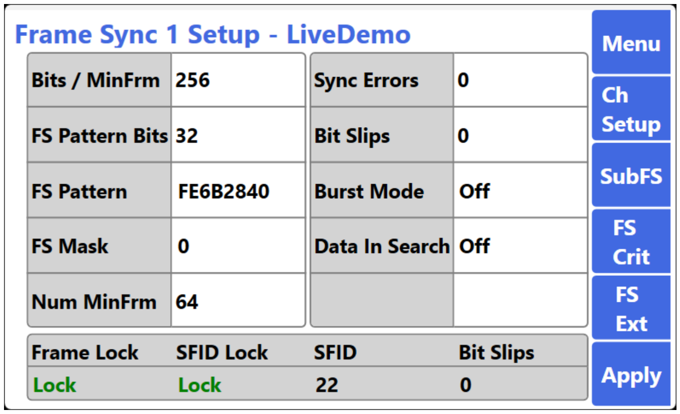

Figure 48 – Frame Sync Setup

1. **Bits /MinFrm** – Enter the total number of bits in a minor frame <u>including</u> the bits in the Frame Sync Pattern.
2. **FS Pattern Bits** – Enter the number of Frame Sync Pattern bits from **16** to **33** bits.
3. **FS Pattern** – Enter or select the appropriate sync pattern for the incoming PCM stream.
4. **FS Mask** – Enter the mask value that will cause the Frame Sync circuitry to ignore certain bits of the sync word.
    a. If not using a Frame Sync Mask, enter 0.
    b. Enter a mask value using the following logic rules: logic high or '1' in any bit position will cause the Frame Sync circuitry to ignore that bit. For example:
        FS Pattern Bits: 32
        FS Pattern: FE6B2840 (in Hexadecimal)
        FS Mask: 0000F000 (in Hexadecimal)
    c. This example will cause the Frame Sync circuit to ignore bits 12 through 15 during sync detection. Any value in the PCM stream where the **"2"** in the FE6B2840 pattern is located would cause a valid frame lock.
5. **Num MinFrm** – Enter the Number of Minor Frames in a Major Frame. The allowed range is 1 to 1024.
6. **Sync Errors** – Enter the number of Frame Sync Pattern errors that the frame sync circuitry allows in the incoming PCM stream before declaring the frame is not in lock.
    a. A sync error is defined as any bit within the frame sync pattern data that is not masked and does not match the entered frame sync pattern. A non-allowed sync error will cause a transition in the sync criteria.
7. **Bit Slips** – Enter the number of Bit Slips that the frame sync circuitry should allow in the incoming PCM stream before declaring the frame is not in lock. A non-allowed bit slip will cause a transition in the sync criteria explained in steps 9-12 below.
8. **Burst Mode** – Use the Burst Mode selection if the expected data is a limited number of minor frames in a burst followed by filler data.
9. **Data In Search** – Use the Data In Search Mode selection if the user desires data regardless of the Frame Lock status.

7.4.1 Frame Sync Criteria

The Frame Sync Criteria determines the number of frames required to transition between the frame synchronizer states of Seach, Check and Lock. In Search, the frame synchronizer searches every bit looking for the frame sync pattern. When the frame synchronizer finds the frame sync pattern, it promotes its state to Check. In Check, the frame synchronizer verifies that the frame sync patterns are located the exact number of bits apart as specified in the Bits per Minor Frame setting. Once the frame synchronizer verifies the frame sync pattern spacing, the frame synchronizer promotes its state to Lock. In Lock, the frame synchronizer guarantees that the frame sync pattern appears at the correct bit spacing. Please note that in both Check and Lock, the frame synchronizer only checks if the frame sync pattern is located Bits per Minor Frame apart. The frame synchronizer uses the reverse process to demote state from Lock to Check and from Check to Search.

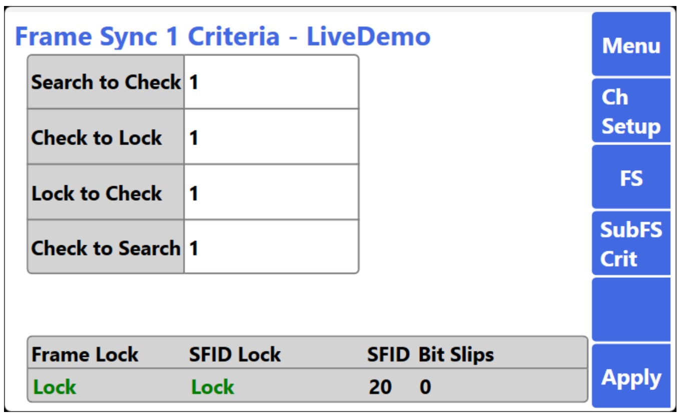

Figure 49 – Frame Sync Criteria Setup

1. **Search to Check** – Sets the transitions that the hardware requires before changing the frame status from Search to Check.
2. **Check to Lock** – Sets the transitions that the hardware requires before changing the frame status from Check to Lock.
3. **Lock to Check** – Sets the transitions that the hardware requires before losing the Lock status and changing it to Check.
4. **Check to Search** – Sets the transitions that the hardware should requires before losing the Check status and changing it Search.

7.5 Configuring the Sub Frame Sync

To configure the Sub Frame Sync, follow the step-by-step procedure below. In the Frame Sync Setup display touch the multipurpose **SubFS** button.

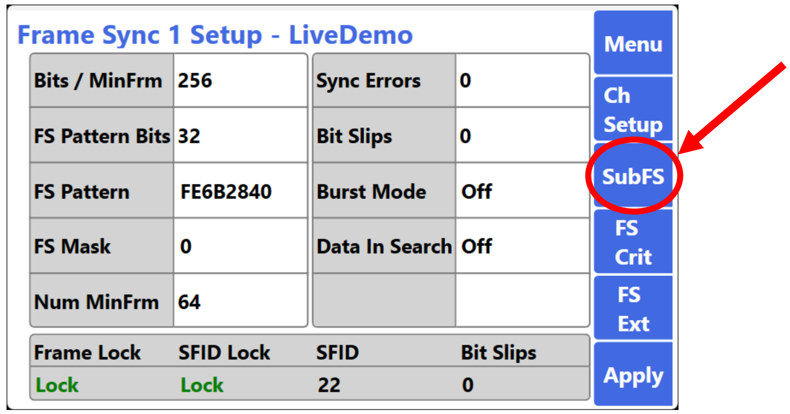

Figure 50 – Select SubFS from Frame Sync Setup

Use this Sub Frame Sync Setup image as a reference while following the step-by-step setup.

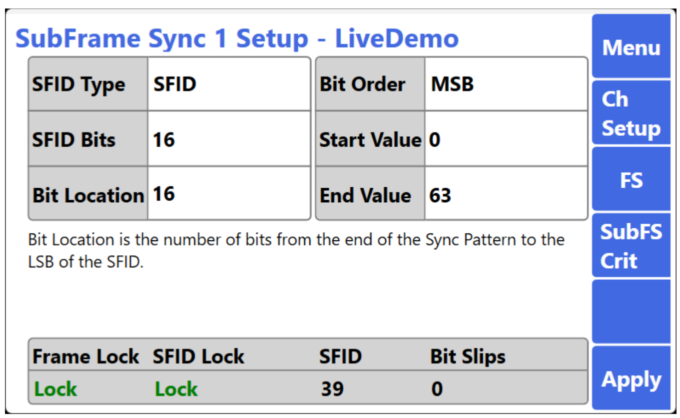

Figure 51 – Sub Frame Sync Setup

1. **SFID Type** – Select the Sub Frame synchronization method. Select either “SFID” or “None.” If the SFID Type is “None,” then the following steps are not required.
2. **SFID Bits** – Enter the number of bits in the SFID.
3. **Bit Location** – Enter the number of bits from the beginning of the frame to the least significant bit (LSB) of the SFID word, not including the Frame Sync Pattern. For example, if the SFID word was located at word location one and the data is Most Significant Bit first (MSB), then the number of bits would simply be the size of the SFID word.
4. **Bit Order** – Select either MSB or LSB to set the bit order of the SFID transmission in the PCM stream.
5. **SFID Start** – Enter the starting value for the SFID. Typically, this value is zero. and end at the number of minor frames minus one.
6. **SFID End** – Enter the ending value for the SFID. Typically, this value is the number of minor frames minus one.

7.5.1 Sub Frame Sync Criteria

The Sub Frame Sync Criteria determines the number of frames required to transition between the sub frame sequencer states of Seach, Check and Lock. For a more detailed description of the Ulyssix Frame Synchronizer operation, please see the Frame Sync Criteria section.

5. **Search to Check** – Sets the transitions that the hardware requires before changing the frame status from Search to Check.
6. **Check to Lock** – Sets the transitions that the hardware requires before changing the frame status from Check to Lock.
7. **Lock to Check** – Sets the transitions that the hardware requires before losing the Lock status and changing it to Check.
8. **Check to Search** – Sets the transitions that the hardware should requires before losing the Check status and changing it Search.

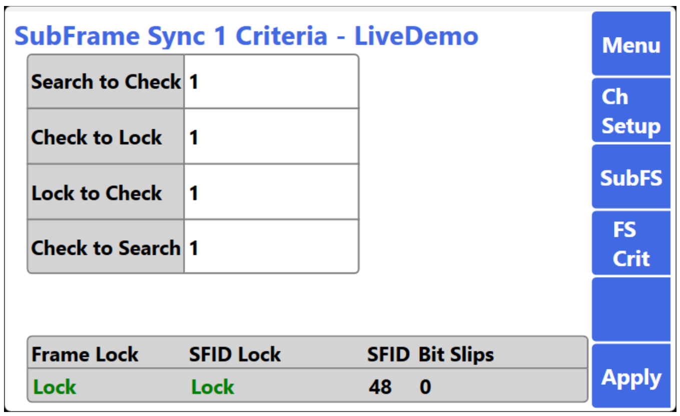

Figure 52 – Sub Frame Sync Criteria

7.6 Configuring the Decom

To configure the Decom, follow the step-by-step procedure below. In the Channel Setup menu, select Decom Setup.

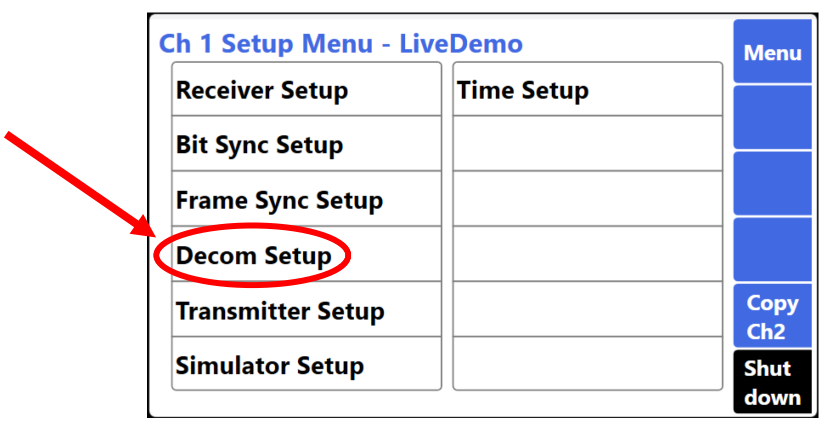

Figure 53 – Select Decom Setup from Channel Setup Menu

Use this Decom Setup image as a reference while following the step-by-step setup.

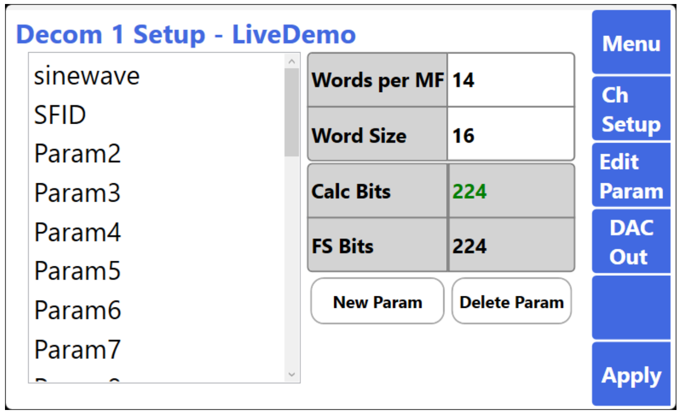

Figure 54 – Decom Setup Menu

The Decom Setup display is divided into two sections. On the left, there is a list of the defined Decom Parameters. For a new configuration, this list will only contain the predefined Status Parameters like Bit Lock, Frame Lock, etc. Next to the list, there are two tables. The top table is the user entry for the Decom Frame Settings. The bottom table compares the calculated bits in the Decom Frame Settings to the number of bits from the Frame Sync Settings. When these values match, the Calculated Bits text turns green.

The Decom configuration process is comprised of two steps. The first step is to configure the Decom Frame Settings. The second step is to define the Decom Parameters.

7.6.1 Configuring Decom Frame Settings

1. **Words per MF** – Enter the number of words in the minor frame. This value does not include the Frame Sync Pattern as a word.
2. **Word Size** – Enter the number of bits in each word.
3. **Calc Bits** – The value is the Words per MF multiplied by the Word Size. If the Calc Bits matches the value for the FS Bits, then the text is green. If the values do not match, then the text is red.
4. **FS Bits** – This value is from the Frame Sync Settings. FS Bits equals the Bits Per Minor Frame minus the number of bits in the Frame Sync Pattern.

7.6.2 Define Decom Parameters

Decom Parameters are entities which define how the system extracts raw data from the PCM frame, scaled / processed, and visualized. Once defined, the system displays Parameters can in the Measure displays.

To define the Decom Parameters, use the buttons New Param or Edit Param or the multipurpose button Delete Param.

1. **New Param** – Creates a new Decom Parameter and adds it to the Decom Parameter list.
2. **Edit Param** – Edits the Decom Parameter selected the list.
3. **Delete Param** – Deletes the Decom Parameter selected in the list.

To add a new Decom Parameter, follow the instructions below.

1. In the Decom Setup Menu touch the button **New Param**. This creates a new Decom Parameter and adds it to the bottom of the list. The new Decom Parameter will have a default name that begins with Param and ends with a number. In this example, the new Decom Parameter is **Param38**.

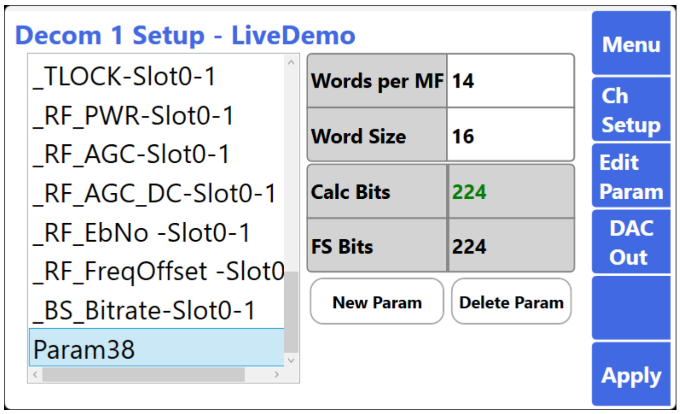

Figure 55 – Add a New Decom Parameter

2. In the Decom Parameter list, select the new Decom Parameter and then touch the **Edit Param** multipurpose button. This will navigate the software to the Decom Edit Parameter Setup display.

There are three pages of Decom Parameter Setup. The Next Page and Prev Page buttons navigate between the pages.

7.6.2.1 Decom Parameter Setup Page 1

Decom Parameter Setup Page 1 has five tables. Enter the Name in the top table first, then values in the two upper tables first, and finally the finally the bottom two tables. Data entry for this display will be from left to right and then to the next row.

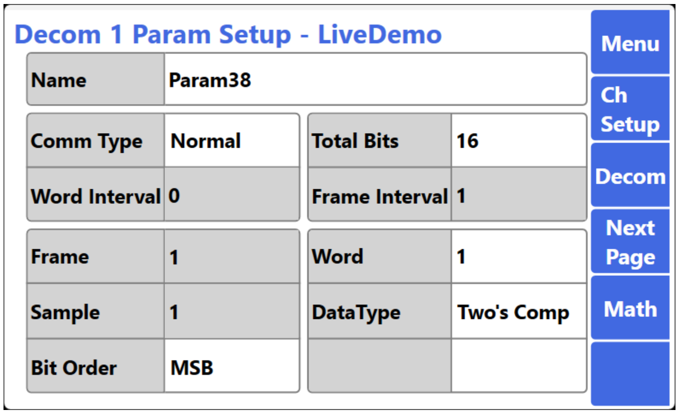

Figure 56 – Decom Parameter Setup Page 1

Decom Parameter Setup top table:

1. **Name** – Enter the Decom Parameter Name. The Name can include any combination of characters and symbols. The Name does not have a character limit; however, the displays have screen space limitations for Parameter Name text.

CAUTION **Names** must be unique. The software will not allow duplicate names and will not save a new parameter with a duplicate name.

Decom Parameter two upper tables

1. **Comm Type** – Select the parameter Commutation Type from the combo box. The possible commutation types are: Normal, Super Comm, or Sub Comm.
    a. In Normal Commutation, the parameter occurs once per minor frame and always occurs in the same word number. Normal Commutation does not use Word Interval or Frame Interval entries.
    b. In Super Commutation, the parameter occurs multiple times in each minor frame. The space between occurrences of the parameter must be a fixed number of words called the Word Interval. Super Commutation does not use the Frame Interval entry.
    c. In Sub Commutation, the parameter occurs in the same word number but not in every minor frame. In Sub Commutation, the Frame Interval is the number of minor frames between occurrences of the parameter. Sub Commutation does not use the Word Interval entry.
2. **Total Bits** – Enter the total number of bits in the Decom Parameter. The allowed range is 1 to 64 bits. The Decom Parameter Total Bits does not have to match the Decom Word Size.
3. **Word Interval** – Fixed number of words between instances of a Super Commutated Word.
4. **Frame Interval** – Fixed number of minor frames between instances of a Sub Commutated Word.

Decom Parameter Setup lower two tables:

1. **Frame** – Enter the first Minor Frame number where the Sub Commutated Decom Parameter occurs.
2. **Word** – Enter the first word location where the Decom Parameter occurs.
3. **Sample** – Currently unused.
4. **Data Type** – Select how the bits extracted from the Minor Frame are interpretated. The options are Two's Compliment, Binary, One's Compliment, and Binary Coded Decimal (BCD).
5. **Bit Order** – Select either MSB or LSB. MSB is when the most significant bit is farthest to the left. LSB is when the least significant bit is farthest to the left.
6. **Param MSB** – Enter the bit location of the most significant bit in the frame word. For example, if the Decom Word Size is 16-bits, but the Decom Parameter is only the bottom 4-bits, then the Param MSB is 3.
7. **Param LSB** – Enter the bit location of the least significant bit in the frame word. For example, if the Decom Word Size is 16-bits, but the Decom Parameter is only the bottom 4-bits, then the Param LSB is 0.

7.6.2.2 Decom Parameter Setup Page 2

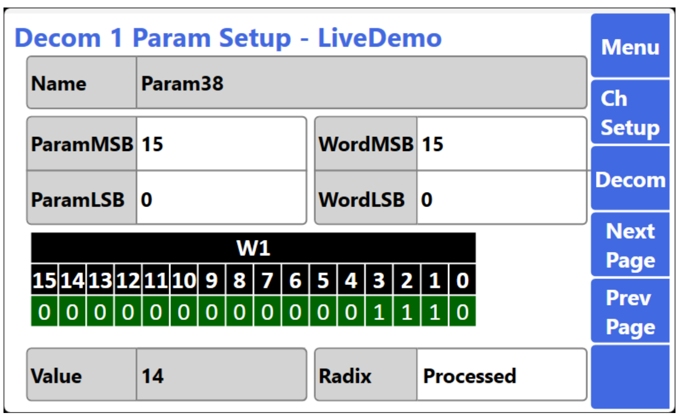

Figure 57 – Decom Parameter Setup Page 2

Decom Param Setup Page 2 contains the definitions for determining which bits in the predefined frame word locations are used to build the value of the Decom Parameter as well as a display of the bits in the output word and the current output value.

The decommutator uses ParamMSB and ParamLSB to determine the destination of the data in the output word. The decommutator uses WordMSB and WordLSB as the source of the data from the frame word. In most cases, ParamMSB and WordMSB are the number of bits in the word minus one: for a 16-bit word both will be 15 and ParamLSB and WordLSB are 0.

Below are advanced examples:

1. Use the bottom 8-bits of a 16-bit frame word location. The valid output range is 0-255.
   a. Set ParamMSB to 15 and Param LSB to 0. Use the entire output value.
   b. Set WordMSB to 7 and WordLSB to 0.
2. Use the top 8-bits of a 16-bit frame word location. The valid output range is 0-255.

a. Set ParamMSB to 7 and Param LSB to 0. Use the bottom 8-bits of the output value.
b. Set WordMSB to 15 and WordLSB to 8. Use the top 8-bits of the frame word.

7.6.2.3 Decom Parameter Setup Page 3

Decom Parameter Setup Page 2 has five tables. The top table is read only and displays the Parameter Name. There are four tables for user entry. Data entry for this display will be from left to right and then to the next row.

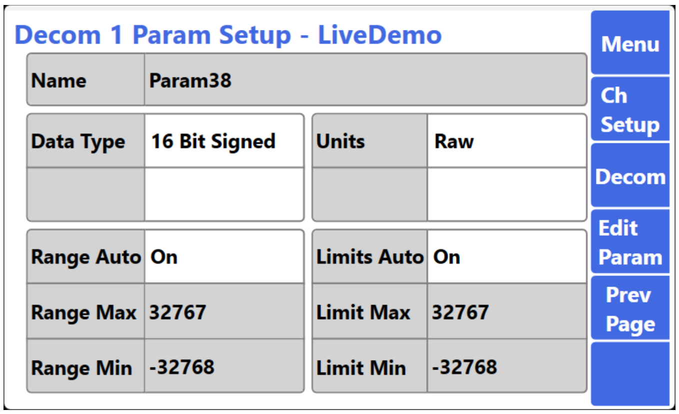

Figure 58 – Decom Parameter Setup Page 3

Top two tables:

1. **Data Type** – The data type for displaying the Decom Parameter. This includes signed and unsigned integers, floating point nomenclature, and embedded time.
2. **Units** – User entered string to display the unites of the Decom Parameter.

The Rage is used to set the Y-axis of Strip Charts. The Limits are used to provide control lines on Strip Charts and to change the color of the text on Meters.

Lower two tables:

1. **Range Auto** – The software automatically calculates the Range Maximum and Range Minimum for the Strip Chart displays based on the largest range possible for the selected Data Type.
2. **Limits Auto**– The software automatically calculates the Limits Maximum and Range Minimum for the Strip Chart displays based on the largest range possible for the selected Data Type
3. **Range Max** – The maximum value for the Y-axis on the Strip Chart.
4. **Limits Max** – The maximum value for the Limit.
5. **Range Min** – The minimum value for the Y-axis on the Strip Chart
6. **Limits Min** – The minimum value for the Limit.

7.6.3 Decom DAC Output Setup

The DAC Output is a digital to analog converter on the Tarsus card. The DAC Output is used for many purposes, including outputting a user specified Decom Parameter.

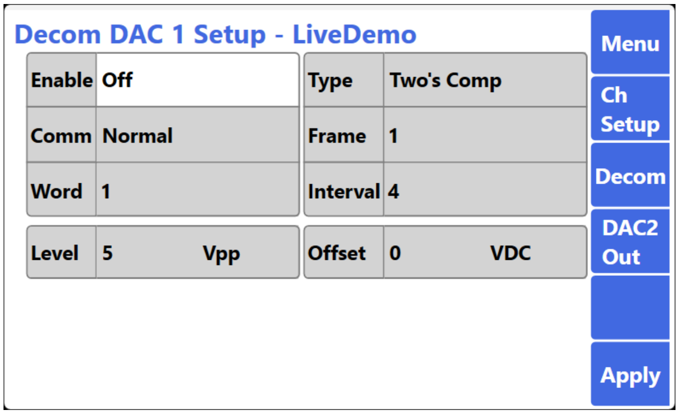

Figure 59 – Decom DAC Output Setup

1. **Enable** – Enable or disable the usage of the DAC for the Decom.
2. **Type** – Formatting of the binary data into an integer as either a Two's Compliment signed integer or a Binary unsigned integer.
3. **Commutation** - Commutation type of the specified decom parameter.
4. **Frame** – The Frame number of the desired decom parameter. Please note that Frame numbers begin at 1 and counts up to the number of minor frames in the major frame.
5. **Word** – The Word number of the desired decom parameter. Please note that first word after the frame sync pattern is word 1.
6. **Interval** – Super Comm and Sub Comm decom parameters use Interval. For Super Comm decom parameters, it specifies the number words between samples. For Sub Comm decom parameters, it specifies the number of frames between samples.
7. **Level** – The output voltage measured peak to peak. For example, both -2.5V to 2.5V and 0V to 5V are 5Vp-p. The difference is the offset.
8. **Offset** – The offset for the output voltage. The output voltage is -2.5V to 2.5V when setting Level to 5Vp-p and Offset to 0V. The output voltage is 0V to 5V when setting Level to 5Vp-p and Offset to 2.5V.

7.7 Configuring the Simulator

The system has a programmable Simulator that generates up to 40Mbps PCM data and clock streams on output connectors.

The Simulator has two modes of operation: Simulator Mode and Archive Mode. Simulator Mode lets the user enter fixed data patterns and functions i.e., Sine Waves, Triangle Waves, and Square Wave patterns for one Major Frame. Archive mode that plays back previously archived data files (.Tad).

To configure the Simulator, follow the step-by-step procedure below. In the Channel Setup menu, select Simulator Setup.

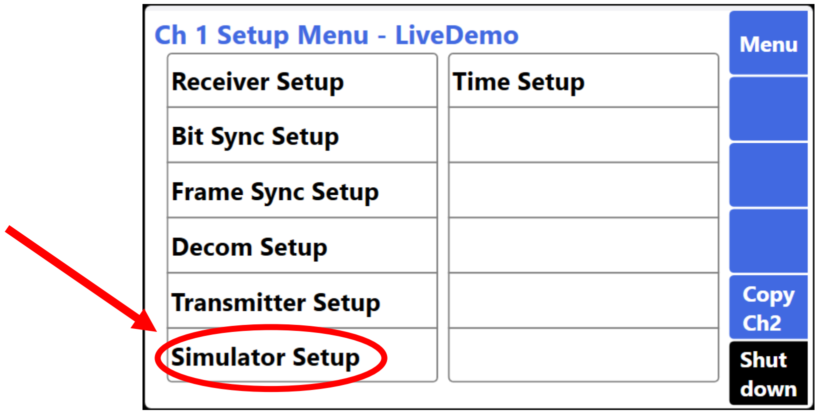

Figure 60 – Select Simulator Setup from Channel Setup Menu

Use this Simulator Setup window as a reference while following the step-by-step setup.

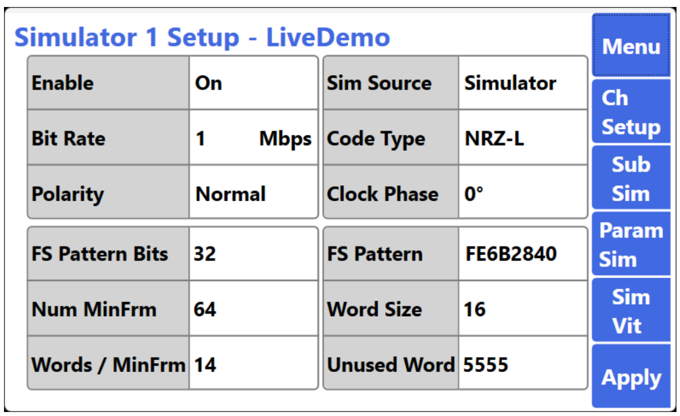

Figure 61 – Simulator Setup

7.7.1 Configuring the Simulator Sim Source

Configure the Simulator when the Simulator Source is Simulator.

1. **Enable** – Set to **On** to enable the simulator output.
2. **Sim Source** – Select Simulator or Archive for the source of simulated data.
    a. Simulator allows the user to enter Simulator Parameters with defined values.
3. **Bit Rate** – Enter a Bit Rate and Units.
4. **Code Type** – Enter the PCM code type for the output of the Simulator.
5. **Polarity** – Select the polarity as either Normal or Inverted
6. **Clock Phase** – Select the Clock Phase as either 0º or 180º.
7. **FS Pattern Bits** – Enter the number of bits in the Frame Sync Pattern.
8. **FS Pattern** – Enter the Frame Sync Pattern in hexadecimal.
9. **Num MinFrm** – Enter the number of Minor Frames in a Major Frame
10. **Word Size** – Enter the number of bits in the common word size.
11. **Words / MinFrame** – Enter the number of words within the minor frame. The Frame Sync Pattern does not count as a word for this entry.

12. **Unused Word** – Enter the default value for words in the simulator in hexadecimal. The Simulator assigns this value to every word location that is not defined as a Simulator Parameter.

Touch the Sub Sim multipurpose button to configure the Simulator Sub Frame Sync settings.

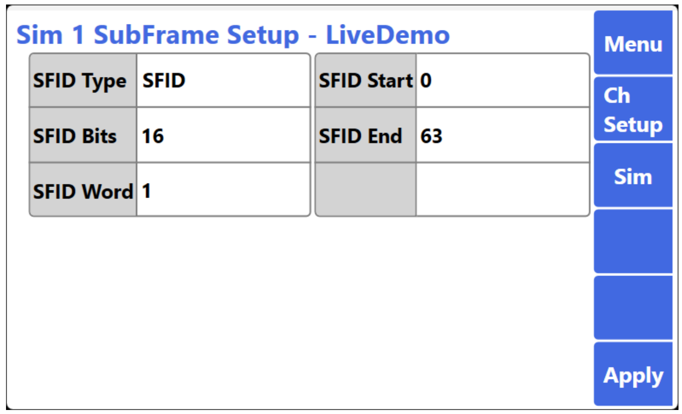

Figure 62 – Simulator Sub Frame Setup

1. **SFID Type** – If the simulator uses a Sub Frame ID, select SFID. If the simulator does not use a Sub Frame ID, then touch the Sim multipurpose button to return the Simulator Setup Display.
2. **SFID Bits** – Enter the number of bits in the SFID.
3. **SFID Word** – Enter the word number for the SFID location.
4. **SFID Start** – The starting value of the SFID counter. The value is usually 0.
5. **SFID End** – The ending value of the SFID counter. The value is usually the number of minor frames minus one.

Touch the Sim multipurpose button to return the Simulator Setup Display. Then touch the Param Sim multipurpose button to enter Simulator Parameters.

A Simulator Parameter defines the location within the frame, data type, and value. To enter data into the frame, double click on any word location in the frame to launch the Simulator Channel Setup form.

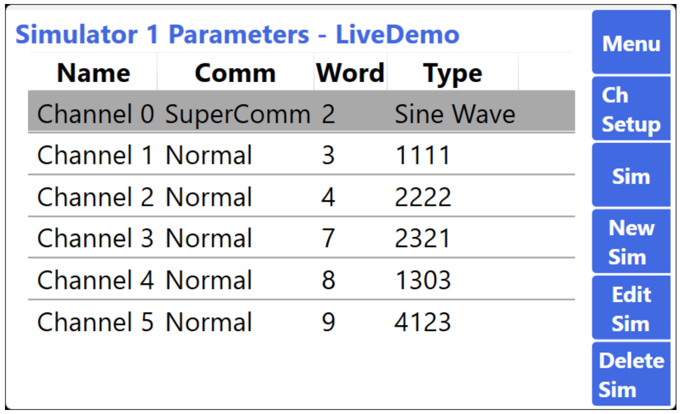

Figure 63 – Simulator Parameters

The Simulator Parameter display has a table that contains the Name, Commutation Type, Word Number, and Data Type. For a new configuration, the table will be empty. Use the multipurpose buttons to add new Simulator Parameters, edit existing Simulator Parameters, and delete existing Simulator Parameters.

1. **New Sim** – Creates a new Simulator Parameter and adds it to the bottom of the Simulator Parameter table. The new Simulator Parameter will have a default name of **Channel** plus a number.
2. **Edit Sim** – Navigates to the Simulator Parameter Setup display to edit the Simulator Parameter.
3. **Delete Sim** – Deletes the selected Simulator Parameter in the table.

To add a Simulator Parameter, use the following instructions.
1. Touch the **New Sim** button to a Simulator Parameter to the bottom of the table.
2. Select the new Simulator Parameter by touching its name and then touch the **Edit Sim** multipurpose button to navigate to the Simulator Parameter Setup display.

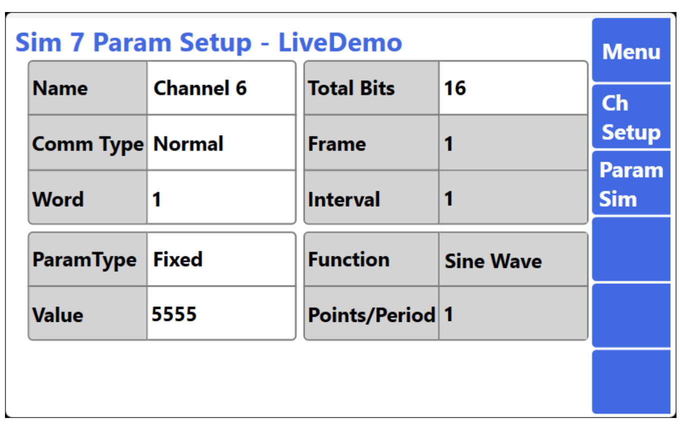

Figure 64 – Simulator Parameter Setup

3. **Name** – Set the Simulator Parameter name. The Name can include any combination of characters and symbols. The Name does not have a character limit; however, the displays have screen space limitations for Parameter Name text.
4. **Total Bits** – The number of bits in the Simulator Parameter.
5. **Comm Type** – Set the Commutation Type. The allowed values are Normal, Super Comm, and Sub Comm.
6. **Frame** – The Frame entry is used for Sub Comm only. The Frame is the first minor frame where the Sub Comm Parameter occurs.
7. **Interval** – The Interval is used for Super Comm and Sub Comm types only. For Super Comm, the Interval is the number of words between instances of the Super Comm parameter. For Sub Comm, the Interval is the number of minor frames between instances of the parameter.
8. **Word** – The word location of the first occurrence of the Parameter in the minor frame.
9. **ParamType** – Sets if the Simulator Parameter is calculated from a user selected function or is a fixed value. The options are Function and Fixed.
10. **Value** – If the user selects Param Type as Fixed, then this entry is the fixed value for the Simulator Parameter. The value is entered in hexadecimal.
11. **Function** – If the user selects Param Type as function, then this entry selects the function type. The options are Sine Wave, Square Wave, Triangle Wave, Sawtooth, and Counter.
12. **Points/Period** – If the user selects Param Type as function, then this entry determines the number of points per period are used in the calculation for the function value. For example, if the Param Type is Square Wave and the user sets Points per period at 16 then the Simulator Parameter will have eight values of the maximum value followed by eight values of the minimum value. Please note that the Points/Period applies to one major frame, so the entry must work in conjuncture with the Commutation Type and the number of minor frames.
13. Touch the **Param Sim** multipurpose button to return the Simulator Parameters menu to add the next Simulator Parameter.

7.7.2 Configuring the Archive Sim Source

Configure the Simulator when the Simulator Source is Archive.

1. **Enable** – Set to **On** to enable the simulator output.
2. **Sim Source** – Select Simulator or Archive for the source of simulated data.
    a. Archive feeds the Simulator data from a user selected binary file.
3. **Bit Rate** – Enter a Bit Rate and Units.
4. **Code Type** – Enter the PCM code type for the output of the Simulator.
5. **Polarity** – Select the polarity as either Normal or Inverted
6. **Clock Phase** – Select the Clock Phase as either 0^{o} or 180^{o}.
7. Touch the Archive File textbox to navigate to the Select File window. This window will list the available binary files for Archive Simulator playback.

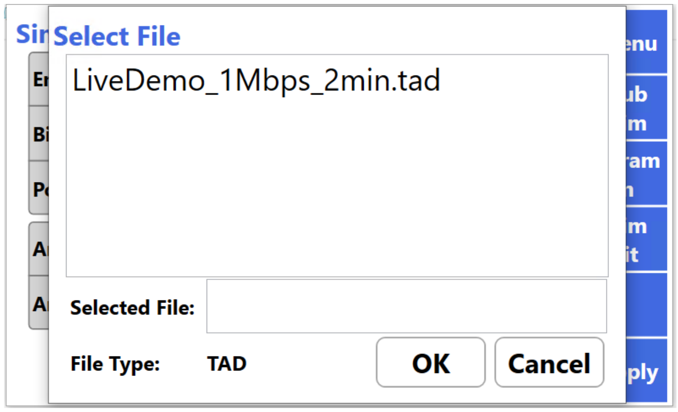

Figure 65 – Simulator Archived Data .Tad File

8. In the Select File window, the listed files are filtered by the File Type. To change the selected File Type, touch the text next to the label **File Types**. The options are TAD, Chapter 10, Padded Binary, and Packet Binary. The default option is TAD.
9. Select the desired file from the list in the Select File window and touch the OK button to accept.
10. Touch the **Apply** button to start playing the Archive Simulator file. The text next to Arc Sim Enable will change to **Running**.
11. To turn the Archive Simulator off, change the Enable to Off and touch the Apply button. The text next to Arc Sim Enable will change to **Stopped**.

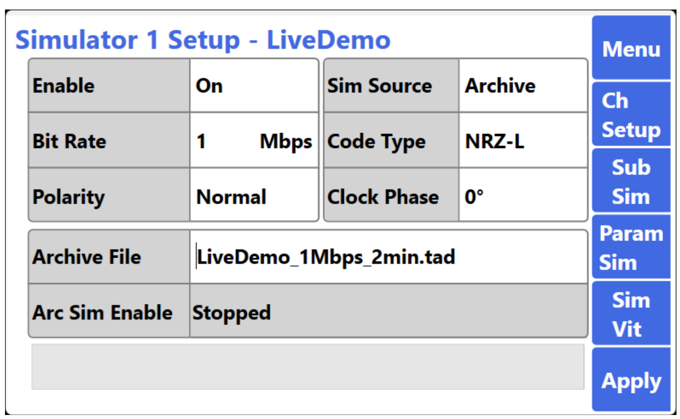

Figure 66 – Archive Simulator Running

7.8 Configuring the IRIG Time Code Reader

The system time stamps in the PCM data. There are two methods for acquiring time: IRIG Time or Computer Time. IRIG Time requires an external IRIG Time signal. Computer Time uses the clock on the internal computer. The time code reader is separate hardware circuitry in the system that reads DC IRG B or AM Modulated IRIG-A, IRIG-B, IRIG-G, and NASA-36 from an independent input. The system has one IRIG Time Code reader. Both channels use this time information.

At the Channel Setup menu, select the Time Setup window.

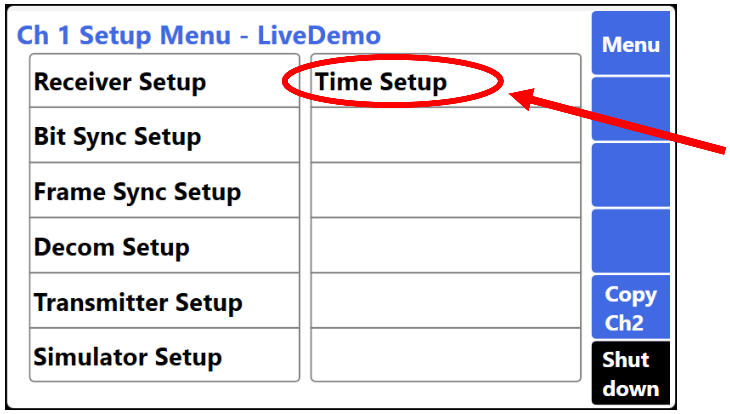

Figure 67 – Select Time Setup from Channel Menu

Use this Time Setup window as a reference while following the step-by-step setup.

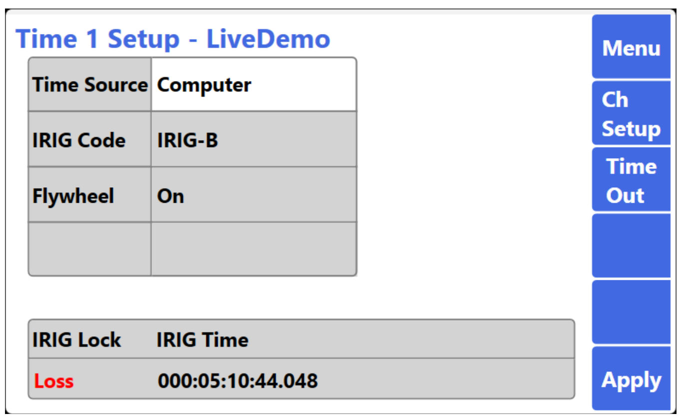

Figure 68 – IRIG Time Setup

1. **Time Source** - Select the Time Source as Computer, IRIG Reader, or Embedded Time.
   a. If the selection is Computer or Embedded Time, then the rest of the settings are not used.
2. **IRIG Code** – Select the IRIG Code from the four AM Modulated time formats IRIG-A, IRIG-B, IRIG-G or NASA-36 or the single DC time format IRIG-B DC TTL.
3. **Flywheel** – Select to turn on or off the Flywheel function. This function allows for the hardware to interpolate time if there is a loss of the signal.

7.9 Configuring the Receiver (Optional Licensed Feature)

To configure the Receiver, follow the step-by-step procedure below. In the Channel Setup menu, select Receiver Setup.

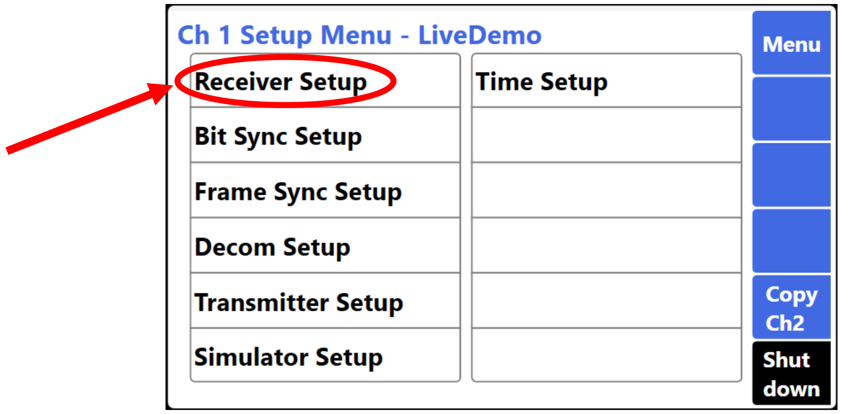

Figure 69 – Select Receiver Setup from Channel Setup Menu

Use this Receiver Setup image as a reference while following the step-by-step setup.

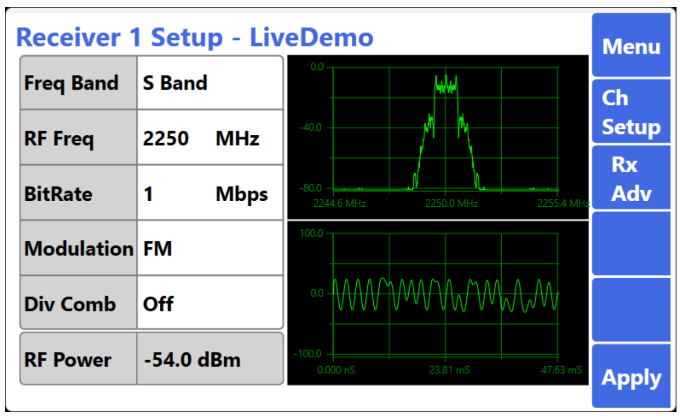

Figure 70 – Receiver Setup

1. **Freq Band** – Select the desired RF Band. This display automatically updates to display the correct band when the user changes the RF Frequency value.
   a. C Band – 4400 MHz to 5950 MHz
   b. S Band – 2185 MHz to 2485 MHz
   c. L Band - 1.420 MHz to 1850 MHz
   d. Extended P Band – 500MHz to 1250 MHz
   e. P Band – 200 MHz to 500.0 MHz
   f. IF Band - 70.0 MHz
2. **RF Freq** – Enter the value of RF Frequency of the incoming telemetry stream. The units for the RF Frequency are always MHz.
3. **Bit Rate** – Enter the value of Bit Rate of the incoming PCM stream. Set the units for the Bit Rate (Mbps, kbps, or bps). In standard Receiver Setup, the software uses the Bit Rate and Modulation to calculate the IF Bandwidth and Output Filter.
4. **Modulation** – Select the Modulation Type: FM, SOQPSK, BPSK, QPSK, GMSK, Wideband FM. In standard Receiver Setup, the software uses the Bit Rate and Modulation to calculate the IF Bandwidth and Output Filter.

5. **Div Comb** – Set the Diversity Combiner to Off, Optimal Ratio, or Best Source. Optimal Ratio achieves the higher signal to noise ratio by using both RF channels. Best Source selects the RF channel with the best signal.
6. **RF Power** – Read only display for the measured incoming RF Power.

The multipurpose Rx Adv button displays the Receiver Advanced Setup, which gives the user more control over the receiver settings. In the standard Receiver Setup, the software determines the IF Bandwidth and Output Filter settings via calculations from the Bit Rate and Modulation inputs.

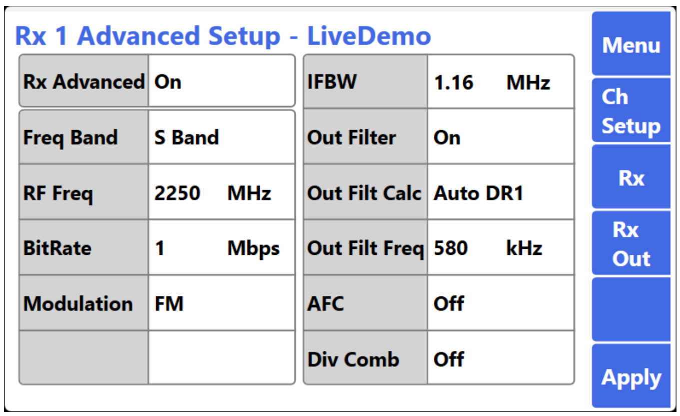

Figure 71 – Advanced Receiver Setup

1. **Rx Advanced** – Enables or disables the Receiver Advanced controls.
2. **Freq Band** – Select the desired RF Band. This display automatically updates to display the correct band when the user changes the RF Frequency value.
    a. C Band – 4400 MHz to 5950 MHz
    b. S Band – 2185 MHz to 2485 MHz
    c. L Band - 1.420 MHz to 1850 MHz
    d. Extended P Band – 500MHz to 1250 MHz
    e. P Band – 200 MHz to 500.0 MHz
    f. IF Band - 70.0 MHz
3. **RF Freq** – Enter the value of RF Frequency of the incoming telemetry stream. The units for the RF Frequency are always MHz.
4. **Bit Rate** – Enter the value of Bit Rate of the incoming PCM stream. Set the units for the Bit Rate (Mbps, kbps, or bps).
5. **Modulation** – Select the Modulation Type: FM, SOQPSK, BPSK, QPSK, GMSK, Wideband FM.
6. **RF Power** – Read only display for the measured incoming RF Power.
7. **IFBW** – Set the bandwidth for the IF filter. The suggested value is 1.2 * Bit Rate for FM PCM signals. The units are either kHz or MHz.
8. **Out Filter** – Set the Output Filter to on or off.
9. **Out Filt Calc** – Set the calculation method for the Output Filter: Manual, Auto DR1, Auto DR2, Auto DR4. When set to Manual, the user sets the Output Filter value in the Out Filt Freq entry. The Auto DR settings use the IF Bandwidth setting to determine

the Output Filter cut off frequency. Auto DR1 is one half the IF Bandwidth. Auto DR 2 is one quarter the IF Bandwidth. Auto DR 4 is one eight the IF Bandwidth.

10. **AFC –** Set the Auto Frequency Correction to on or off. Auto Frequency Correction tracks the changes in the RF Carrier Frequency and automatically adjusts the RF Tuner.
11. **Div Comb** – Set the Diversity Combiner to Off, Optimal Ratio, or Best Source. Optimal Ratio achieves the higher signal to noise ratio by using both RF channels. Best Source selects the RF channel with the best signal.

7.10 Configuring the Transmitter (Optional Licensed Feature)

To configure the Transmitter, follow the step-by-step procedure below. In the Channel Setup menu, select Transmitter Setup.

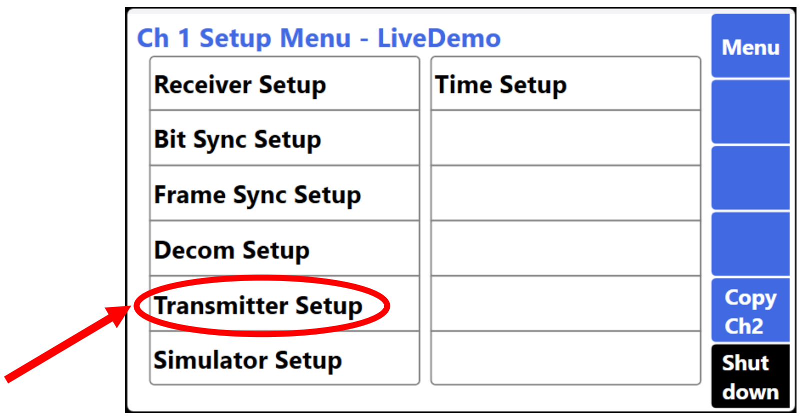

Figure 72 – Select Transmitter Setup from Channel Setup Menu

Use this Transmitter Setup image as a reference while following the step-by-step setup.

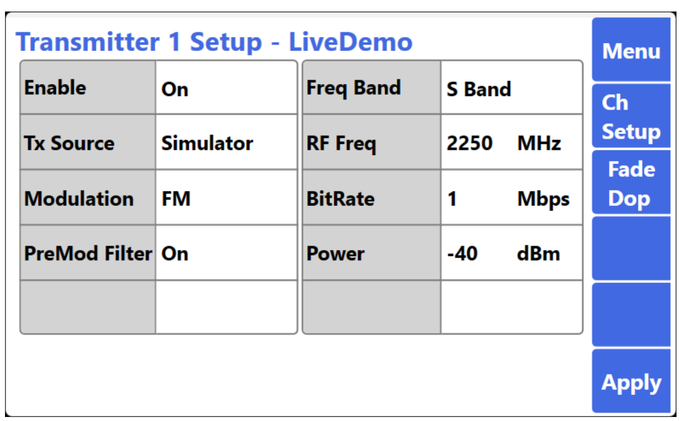

Figure 73 – Transmitter Setup

1. **Enable** – Turns the Transmitter output on or off.
2. **Tx Source** – Set the input source for the transmitter. There are three options: Freq Translator, Simulator, and TTL Input. The Freq Translator option uses the down

converted signal from the Receiver as the data source for the transmitter. The Simulator option uses the PCM data from the Bald Eagle RF's simulator and the modulator for the data source of the transmitter. The TTL Input uses the external Decom In BNC as an external PCM TTL input stream to modulate the transmitter.

3. **Modulation** – Set the modulation scheme for the transmitter. The options are CW (Continuous Wave), FM, BPSK, and QPSK. CW sets the transmitter to output an unmodulated continuous wave at the Tx Frequency. FM, BPSK, QPSK, and SOQPSK use a modulator to create the baseband modulated signal from the PCM Simulator data.
4. **PreMod Filter** – Turns on and off the pre-modulation filter for PCM Data. The pre-modulation filter is applicable for frequency modulation only.
5. **Freq Band** – Select the desired RF Band. This display automatically updates to display the correct band when the user changes the RF Frequency value.
    a. C Band – 4400 MHz to 5950 MHz
    b. S Band – 2185 MHz to 2485 MHz
    c. L Band - 1.420 MHz to 1850 MHz
    d. Extended P Band – 500MHz to 1250 MHz
    e. P Band – 200 MHz to 500.0 MHz
    f. IF Band - 70.0 MHz
6. **RF Freq –** Enter the value of RF Frequency of the incoming telemetry stream. The units for the RF Frequency are always MHz.
7. **Bit Rate** – Enter the value of Bit Rate for the incoming PCM stream. Set the units for the Bit Rate (Mbps, kbps, or bps).
8. **Power –** Sets the output power for the Transmitter. Allowed values are from 0 dBm to -100 dB even though the minimum power specification is -70 dBm. The selected frequency band limits the true output power.

The multipurpose Dop Fade button displays the Transmitter Fade Doppler Setup. Fade Doppler configures the Transmitter to sweep the output power (Fade) and sweep the RF Frequency / Bit Rate (Doppler). These sweeps apply stress to RF Receivers.

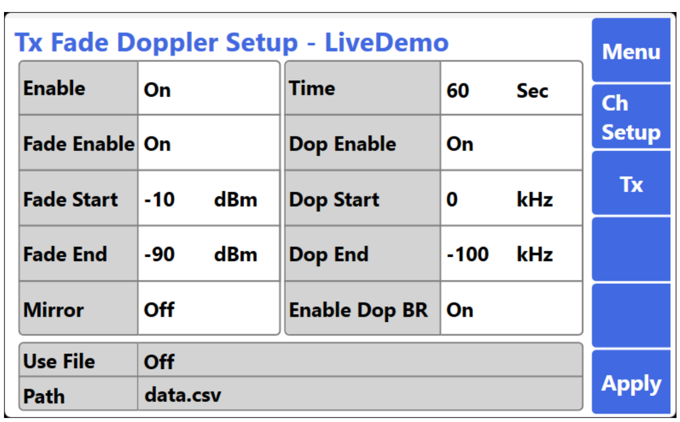

Figure 74 – Transmitter Fade Doppler Setup

1. **Enable** – Turns the Fade Doppler feature on or off.
2. **Fade Enable** – Turns the RF Power Fade on or off. Fade is a RF Power sweep.

3. **Fade Start** – The starting power for the RF Power Fade. The unit is always dBm.
4. **Fade End** – The ending power for the RF Power Fade. The unit is always dBm.
5. **Mirror** – Turn the RF Power Fade Mirror option on or off.
    a. When Mirror is off, the RF Power Fade sweeps from Fade Start to Fade End and then abruptly returns to Fade Start. This is a sawtooth wave.
    b. When Mirror is on, RF Power Fade sweeps from Fade Start to Fade End and then sweeps from Fade End back to Fade Start. This is a smoother triangle wave.
6. **Time** – The time span for the Fade and/or Doppler sweep. The units are always Sec. When Mirror is turned on, the sweep is double the Time entry.
7. **Dop Enable** – Turns the Doppler sweep on or off.
8. **Dop Start** – The starting frequency for the Doppler sweep. The units are always kHz.
9. **Dop End** – The ending frequency for the Doppler sweep. The units are always kHz.
10. **Enable BR** – Enables or disables the Doppler sweep changing the Bit Rate. The Doppler sweep always changes the Transmitter RF Frequency.

7.11 Configuring Archive

The system has the capability to record frame synchronized binary data to a file. Archive data files can be transferred to or from the system to an external drive via the USB port.

The Archive settings are independent for each Frame Sync. The Archive for Frame Sync 1 is configured on the left display. The Archive for Frame Sync is configured on the right display.

Select **Archive** from the Channel Setup Menu screen.

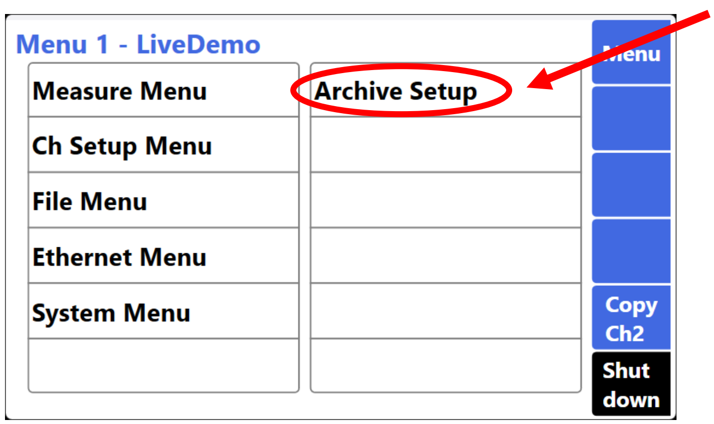

Figure 75 – Select Archive Setup from Main Menu

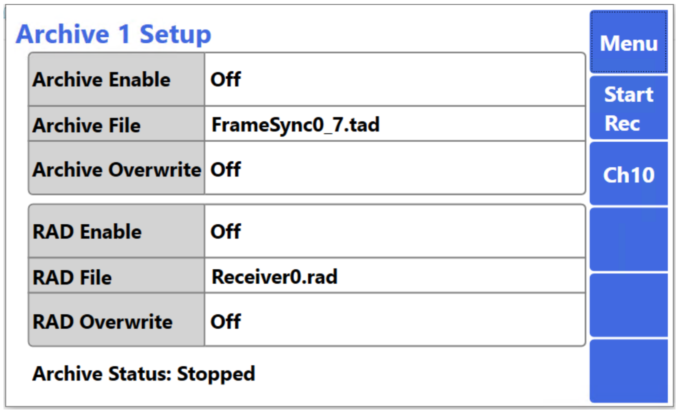

Figure 76 – Archive Setup

7.11.1 Configure the Archive to Record a TAD file.

1. **Archive Enable** – Set the value to **On** to record the data for this Frame Sync.
2. **Archive File** – Sets the file name for the archive file.
3. **Archive Overwrite** – This setting determines if subsequent records overwrite the current file or change the file name by adding an incrementing number to the end of the file name.
4. Press **Start Rec** to begin archiving all enabled streams.
5. Press **Stop Rec** to end archiving all enabled streams.

Channels must have Frame Sync lock to archive data unless Data In Search mode is enabled on the Frame Sync Setup.

7.11.2 Configure the Archive to Record a Chapter 10 file.

In the Archive Setup display, touch the Ch10 multipurpose button to navigate to the Chapter 10 Archive Setup display.

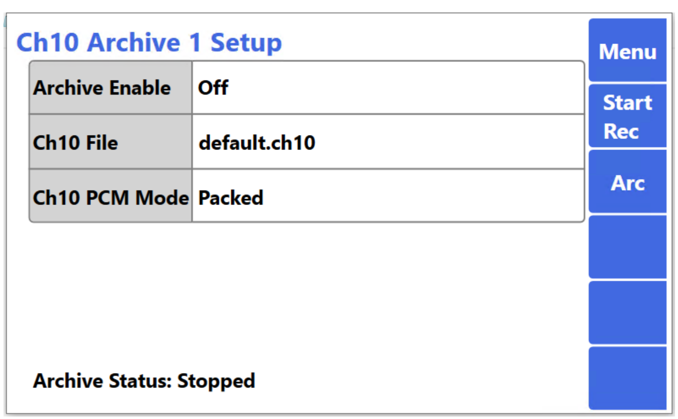

Figure 77 – Chapter 10 Archive Setup

1. **Archive Enable** – Set the value to **On** to record the data for this Frame Sync to the Chapter 10 file.
2. **Archive File** – Sets the file name for the archive file.
3. **Ch10 PCM Mode** – Sets the PCM Mode for the recording.
   a. **None** – Disables Chapter 10 recording for this channel.
   b. **Packed** – Chapter 10 Packed Mode records frame synchronized data that is zero padded to ensure that each Frame Sync Pattern begins in the first bit of a new byte. Each Chapter 10 PCM packet will begin with a frame sync pattern and contain only complete minor frames.
   c. **Throughput** – Chapter 10 Throughput Mode records raw binary data before the data is frame synchronized. The frame sync pattern can begin in any bit in a byte. The packet contains a fixed number of bits that is not based on the minor frame size. **NOTE:** When using Throughput Mode, the system turns off the Frame Sync in the Tarsus card and enables Data in Search Mode. The system will **NEVER** have Frame Lock when recording in Throughput Mode.
   d. **Throughput Align** – This is PCM Mode in not included in the IRIG106 Chapter 10 standard. Throughput Align has the packet format of Throughput Mode but has the Tarus3 Frame Sync enabled. Each Chapter 10 PCM packet will begin with a frame sync pattern and contain only complete minor frames if the signal stays in Frame Lock. The Frame Sync is set to Data In Search Mode, so even if the Frame Sync unlocks, every bit is recorded.
   e. **Unpacked** – Chapter 10 Unpacked mode divides a minor frame by Decom Words and zero pads them to either 8-bits or 16-bits. For example, a10-bit word uses 16-bits (with 6-bits of zero added to the front of the word).
4. Press **Start Rec** to begin archiving all enabled streams.
5. Press **Stop Rec** to end archiving all enabled streams.

7.12 Configuring CRC (Optional Licensed Feature)

The system has an optional Cyclic Redundancy Check (CRC) algorithm incorporated into each channel. The CRC option is a 16-bit CCITT algorithm used to detect data bit errors within a minor frame boundary. The system calculations the CRC on all bits within the minor frame excluding the CRC words. The CRC Setup display includes settings for both Channel 1 and Channel 2. The CRC Setup is available on both channels. Below are descriptions of various variables, calculations, and feedback of the CRC algorithm.

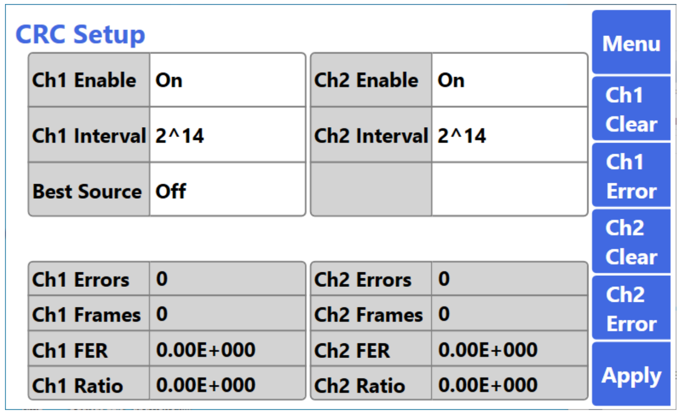

Figure 78 – CRC Setup and Status

7.12.1 CRC Setup

1. **Enable** – The Enable field turns On or Off the CRC of the selected channel. Each channel is independent. The user can enable one channel and disable the other channel. However, if the Best Source is set to CRC, then both CRC channels must be enabled.
2. **Interval** – The sample interval is the number of minor frames that the system uses in the Frame Error Rate (FER) calculation. Each time the selected number of frames passes, the system repeats the FER calculation and displays the result on the screen. To prevent updating to the display too often, the system does not allow a Samp Int that results an update rate faster than 0.5 seconds.
3. **Best Source** – The Best Source selector determines the output of the Bit Sync 1 and Bit Sync Clock BNCs. The options are: Off, Frame Sync, and CRC. Off disables the Best Source Selector. Frame Sync uses the Frame Lock Status for determining the best source. CRC uses the CRC status for determining the best source.

7.12.2 CRC Status

1. **Errors** – The Errors field displays the current error count of the specified CRC channel. Each error represents a minor frame which failed CRC validation. The error counter has a maximum value of 2^64, at which point the user must reset channel.
2. **Frames** – The Frames field displays the count of minor frames that the CRC algorithm has evaluated. This field has a maximum value of 2^64, at which point the user must reset the channel.
3. **FER** – The Frame Error Rate (FER) field displays the calculation of the rate at which minor frame errors are occurring. This calculation uses the Sample Interval to determine when to perform the calculation. For example, if the Samp Int is set to 2^10, then the system performs the FER calculation every 1024 minor frames. Since this calculation does not use overall errors or minor frames, it provides a more instantaneous calculation of the received errors.
4. **Ratio** – The Ratio field displays the calculation of Errors per Minor Frame. This calculation uses the overall Error count divided by the overall Minor Frame count.

7.12.3 Frame Sync Statistics

The Frame Sync Statistics Measurement also displays theCRC Error Count and Ratio. To match the other values in the Frame Sync Statistics display, the Ratio is displayed as percentage.

7.13 Importing and Exporting Configuration Files

The system can import and export configuration files. The configuration files for the system are exchangeable with the Ulyssix ALTAIR software. Both software packages use the same XML file structure.

Please see section **8.3 External Drive Folder Names** for more details about the external drive files and folders.

1. Insert a USB drive containing a folder titled "GryphonConfigurationFiles" in the root directory. The USB drive must be inserted before navigating to the File Import Export Menu.
2. From the Main Menu, touch File Menu.
3. From the System Menu, touch Import Export to navigate to the File Import Export Menu.

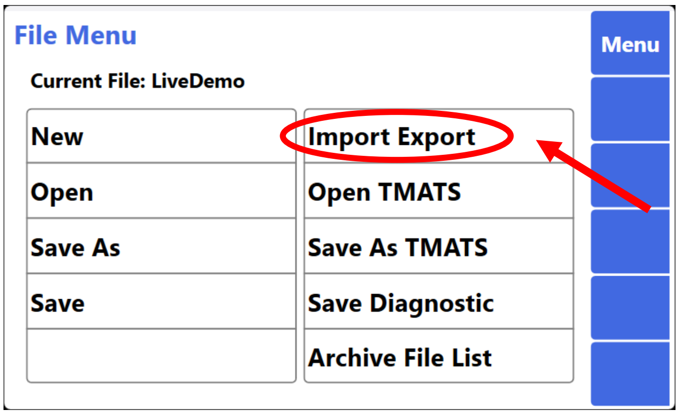

Figure 79 – Select Import Export from File Menu

4. The File Import Export Menu has options to Import Configs and Export Configs.
   a. Import Configs will copy of the configuration files from the USB "GryphonConfigurationFiles" folder to the system.
   b. Export Configs will copy of the configuration files from the system to the USB "GryphonConfigurationFiles" folder.

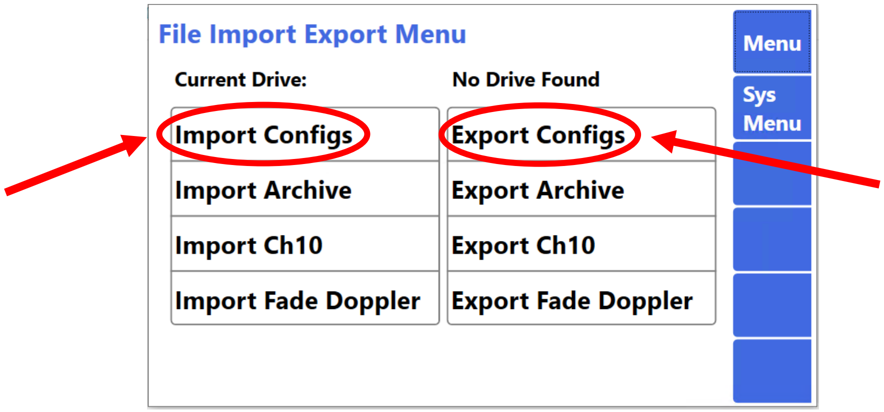

Figure 80 – Import/Export Menu

Any files of the same name will be overwritten in the destination folder (USB or system).

5. If no errors occur, a message will indicate the process completed. If any errors occur a message will indicate what happened and you can immediately try again.

7.14 Importing and Exporting Archive and Chapter 10 Files

The system imports and exports Ulyssix Tarsus Archive Data (TAD) files and Chapter 10 files.

Please see section **8.3 External Drive Folder Names** for more details about the external drive files and folders.

1. Insert a USB drive containing a folder named "GryphonArchive" in the root directory for TAD files and a folder named "GryphonCh10Files" in the root directory for Chapter 10 files. The USB drive must be inserted before navigating to the File Import Export Menu.
2. From the Main Menu, touch **File Menu**.
3. From the System Menu, touch **Import Export** to navigate to the File Import Export Menu.

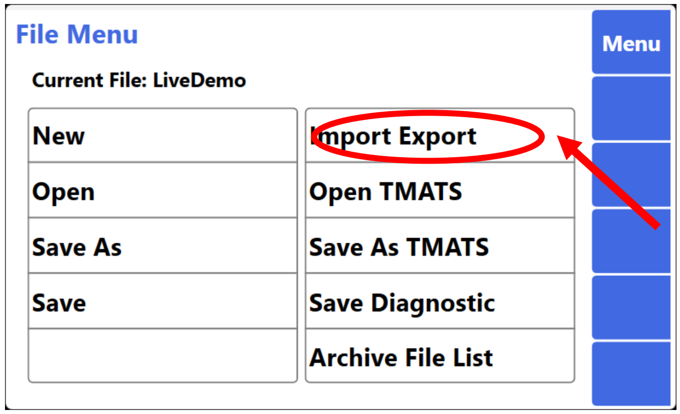

Figure 81 – System Menu

4. The File Import Export Menu has options to Import Archive, Export Archive, Import Ch10, and Export Ch10.
    a. Import Archive will copy the TAD files from the USB “GryphonArchive” folder to the system.
    b. Export Archive will copy the TAD files from the system to the USB “GryphonArchive” folder.
    c. Import Ch10 will copy the Chapter 10 files from the USB “GryphonCh10Files” folder to the system.
    d. Export Archive will copy the Chapter 10 files from the system to the USB “GryphonCh10Files” folder.

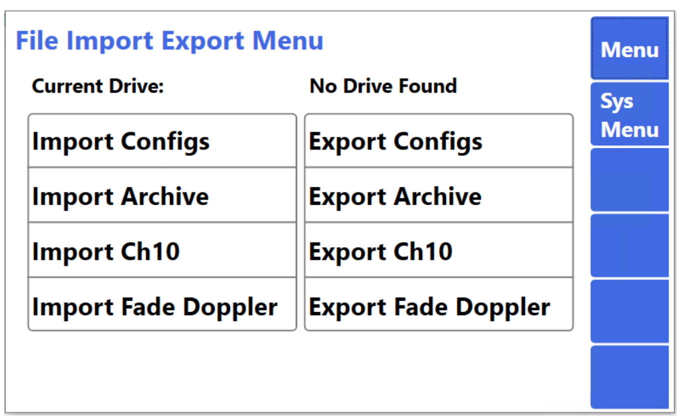

Figure 82 – Import/Export Configurations Screen

Any files of the same name will be overwritten in the destination folder (USB or system).

5. If no errors occur, a message will indicate the process completed. If any errors occur a message will indicate what happened and you can immediately try again.

The Import and Export Archive files will copy all files with the following file extensions: .Tad, .Rad, .Pad, and .Pac.

The Import and Export Chapter 10 files will copy all files with the following file extensions: .Ch10, .C10, .Tmats, .Tmt, and .Tma.

Chapter 8 Firmware and Software Update

Ulyssix products are based on the Altera FPGA technology with the latest data acquisition integrated circuits. The internal hardware performs different data acquisition and telemetry processing functions including dual full digitally implemented Bit Syncs, PCM Decoms, multi-channel clock data recovery (CDR) modules, SGLS modulator/demodulator, and other data acquisition applications. The basis for the card is three 14-bit analog to digital paths into over three million gates of user configurable space.

The System Menu includes options to Update Firmware and Update Software. Each requires the update files to be in specific folders on an external connected drive via a USB connection. The required file names are listed in section **8.3 External Drive Folder Names**.

8.1 Updating Software

Touch the System Menu option and then in the System Menu touch the Update Software option.

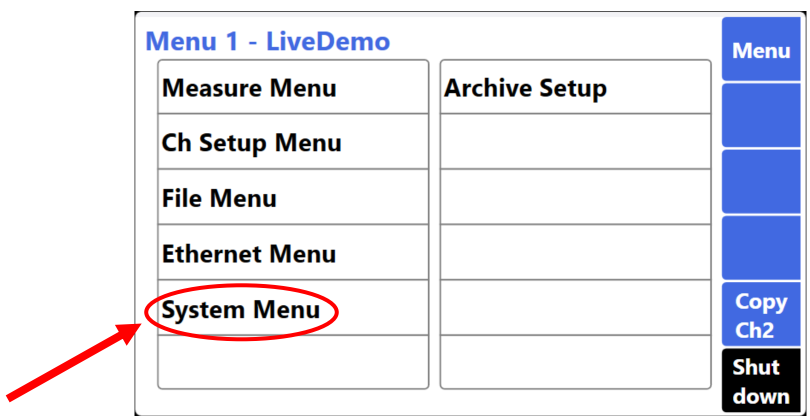

Figure 83 – Select System Menu from Main Menu

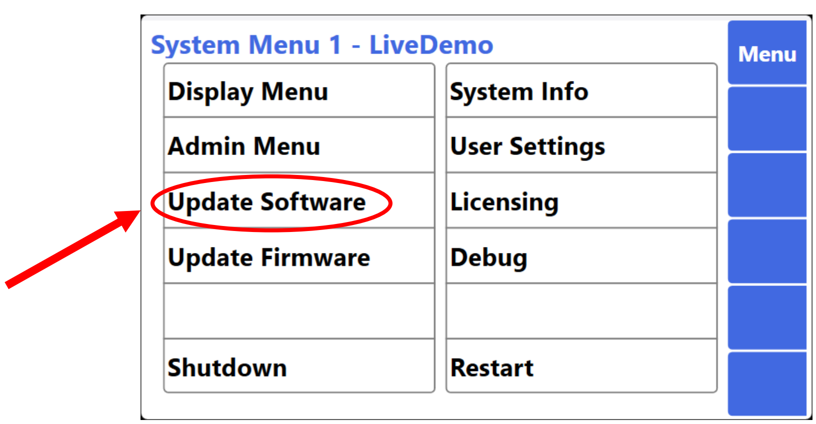

Figure 84 – Select Update Software from System Menu

In the Update Software screen, there is a table on the left and row of white buttons on the right. The table lists the two types of updates, UpgradeApp and SW Upgrade, in the first column and the user selectable paths to required files in the second column. The user selectable paths to the required files are updated when the Update Software screen loads. To refresh the list of the user selectable paths, navigate to the System Menu and then back to the Update Software screen.

Touching the "UApp Update" button updates the UpgradeApp, which is an external application that aides in the updating the software. Touching the "SW Update" button updates the software.

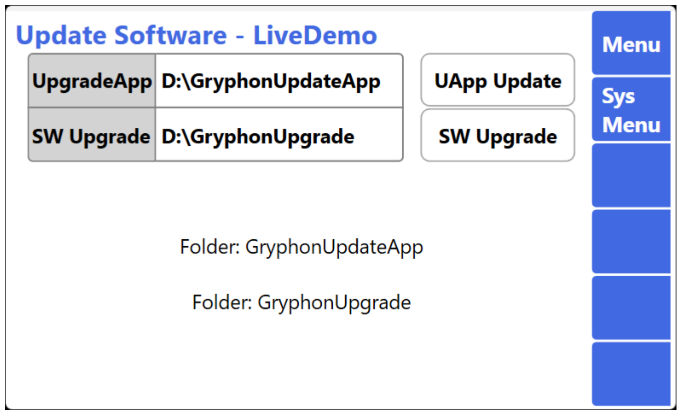

Figure 85 – Update Software

8.1.1 Upgrade App

The Upgrade App is responsible for upgrading the software. The software cannot update files that it is currently using, so it starts the Upgrade App to execute the upgrade and then restart the software.

1. Attach the external drive with the correct files located in the "GryphonUpdateApp" folder.
2. From the Main Menu, touch the System Menu entry.
3. In the System Menu, touch the Update entry.
4. In the Update display, select the desired path to the "GryphonUpdateApp" folder on an external drive by touching the path name to activate the drop-down menu list of path options. Select the desired path from the list.
5. Touch the **UApp Update** button to start the update process.
6. When the process is complete, a pop-up window displays the success message with the old version number and new versions number.

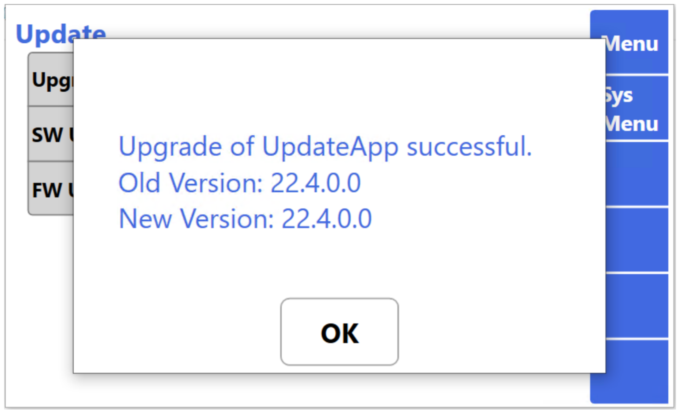

Figure 86 – Upgrade UpdateApp Success Message

8.1.2 Software Update

The Software Update function uses the Upgrade App to upgrade the software from the user selected path in the second row of the table. To upgrade the software, select the desired path from the table and then touch the **SW Update** button.

1. Attach the external drive with the correct files located in the "GryphonUpgrade" folder.
2. From the Main Menu, touch the System Menu entry.
3. In the System Menu, touch the Update entry.
4. In the Update display, select the desired path to the "GryphonUpgrade" folder on an external drive by touching the path name to activate the drop-down menu list of path options. Select the desired path from the list.
5. Touch the **SW Update** button to start the update process.
6. The software will shut down. The Upgrade App will upgrade the software in the background.
7. When the Upgrade App completes the update, it will re-launch the software. The software will return to the default start up display.

8.2 Updating Firmware

Touch the System Menu option and then in the System Menu touch the Update Software option.

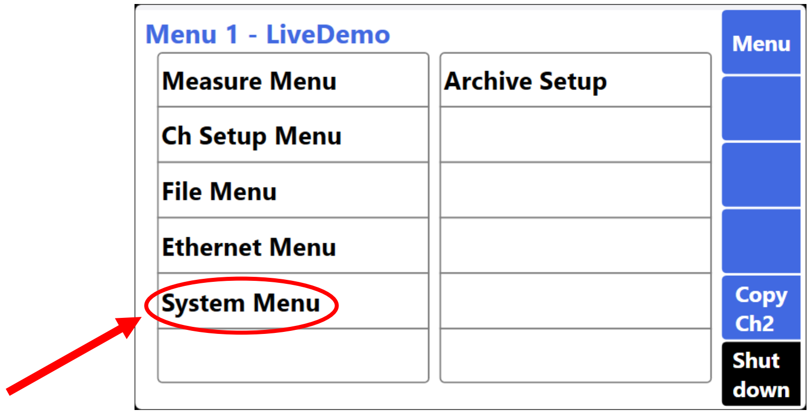

Figure 87 – Select System Menu from Main Menu

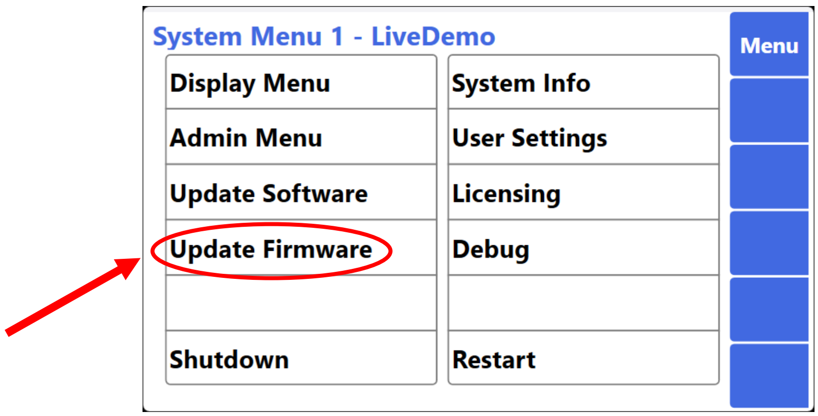

Figure 88 – Select Update Firmware from System Menu

In the Update Screen, there is a table on the left and row of white buttons on the right. The table has an option to select the FPGA, FW Update, and FW Verify in the first column and the user selectable paths to required files in the second column. The user selectable paths to the required files are updated when the Update screen loads. To refresh the list of the user selectable paths, navigate to the System Menu and then back to the Update Firmware screen.

Touching the text next to “Select FPGA” activates a drop-down menu to select which FPGA to update. A Tarsus3 card has FPGA1. A Tarsus4 card has FPGA1, FPGA2, and FPGA3. Touching the “FW Update” button updates the firmware for the selected FPGA. Touching the “FW Verify” button reads the firmware from the Tarsus card and compares it to the file listed n

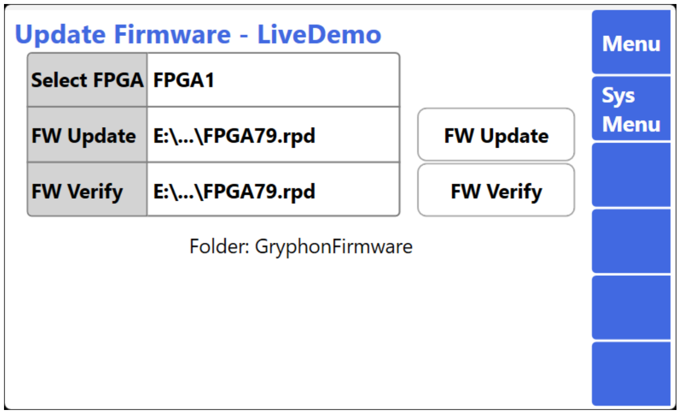

Figure 89 – Update Firmware

8.2.1 Firmware Update

The Firmware Update function programs the FPGA on the Tarsus card. To update the Tarsus FPGA, select the desired path from the table and then touch the **FW Update** button.

1. Attach the external drive with the correct files located in the "GryphonFirmware" folder.
2. From the Main Menu, touch the System Menu entry.
3. In the System Menu, touch the Update entry.
4. In the Update display, select the desired path to the **RPD** file on an external drive by touching the path name to activate the drop-down menu list of path options. Select the desired path from the list.
5. Touch the **FW Update** button to start the update process.
    a. The first step is erasing the current firmware in the FPGA. The erase takes about 60 seconds. The software updates a progress bar indicating the remaining time in the erase process.
    b. The second step is Programming. This step takes about 30 seconds.
    c. When the update is complete, the software displays a success message along with the Checksum for the RPD file.

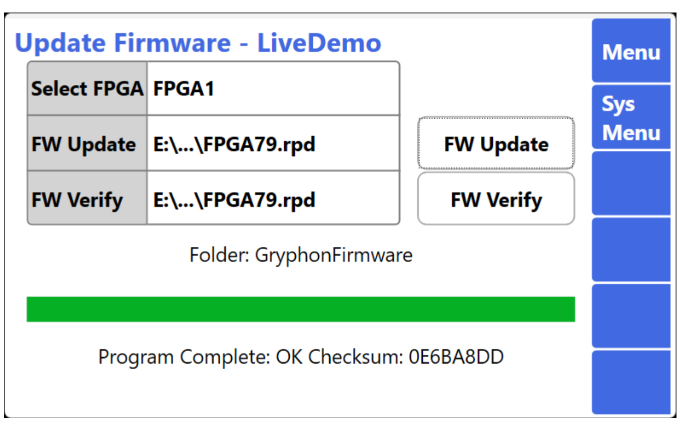

Figure 90 – Firmware Update Success Message

8.2.2 Firmware Verify

The Firmware Verify function compares the stored binary data in the Tarsus FPGA to the RPD file in the "GryphonFirmware" folder on the external drive.

1. Attach the external drive with the correct files located in the "GryphonFirmware" folder.
2. From the Main Menu, touch the System Menu entry.
3. In the System Menu, touch the Update entry.
4. In the Update display, select the desired path to the **RPD** file on an external drive by touching the path name to activate the drop-down menu list of path options. Select the desired path from the list.
5. Touch the **FW Verify** button to start the verify process.
   a. The Verify function takes about 30 seconds. The software shows the process in a progress bar.
   b. When the verify is complete, the success message is displayed along with the Checksum for the FPGA binary data.

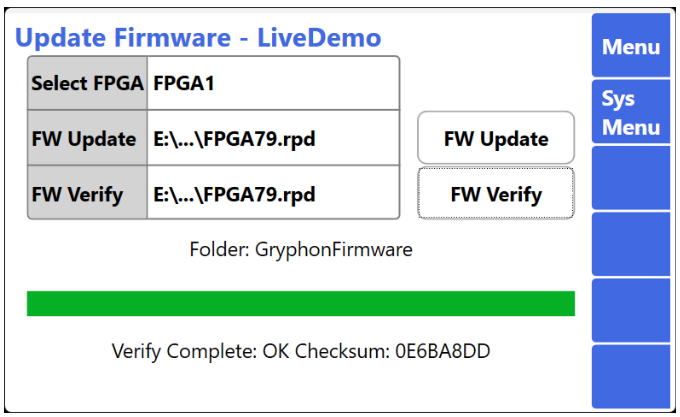

Figure 91 – Firmware Verify Success Message

8.3 External Drive Folder Names

The system allows for input and output of data, files, and configurations via the front USB ports. The unit needs to find specific folders in the root of the USB device for certain functions.

Please note that the folder names **DO NOT** contain the space character.

Folder Name	Function	Contents
GryphonUpgrade	**Input** – Used when updating the software.	All .Dlls and .Exe files for the software update.
GryphonFirmware	**Input** – Used when updating the firmware of the internal Tarsus card hardware.	One FPGA File: either FPGA79.rpd or FPGA89.rbf.

		Readme.txt may also be included.
GryphonUpdateApp	**Input** – Used when updating the app that runs in the background to update the software.	One .Exe file.
GryphonArchive	**Input** / **Output** – Used to import or export stored .Tad files.	Any Ulyssix frame synchronized archive files. The file extensions are .Tad, .Rad, .Pad, and .Pac.
GryphonConfigurationFiles	**Input** / **Output** – Used to import or export configuration files.	Configuration files (.Xml or .Ulx extension). These files are compatible with any Gryphon or ALTAIR unit.
GryphonCh10Files	**Input** / **Output** – Used to import or export Chapter 10 files.	Any Chapter 10 files. Includes both Ch10 data files (.Ch10, C10, etc.) and TMATS files (.Tmats, .Tmt, .Tma, etc.).
GryphonFadeDopplerFiles	**Input** / **Output** – Used to import or export Fade Doppler files for the Transmitter (licensed option).	Fade Doppler files with file extension .Csv or .Rad.
GryphonDxsFiles	**Input** / **Output** – Used to import or export DeweSoft DXS configuration files.	DeweSoft files with extension .Dxs or .Xml.
GryphonScriptFiles	**Input** / **Output** – Used to import or export script files.	Script files with extensions .Us1 or Zs1.

Figure 92 – USB Folder Descriptions

Chapter 9 Troubleshooting

1. **No Bit Lock** – Diagnosing bit lock can be difficult. First ensure that the hardware is receiving data by viewing the Eye Pattern on the Measure screen. If there is a flat line, you will need to double check that the rear input selection and the cabling are correct. If data is making it to the board and still no Bit Lock, re-verify the bit rate and code type selections. Lastly, check an alternative Bit Sync using the same data source before calling the factory for assistance.

2. **No Frame Sync Lock** – After verifying good bit lock by viewing the Eye Pattern on the Measure screen, first attempt enabling Auto Polarity on the Frame Sync Setup screen to check for an inverted data stream. Next attempt adding bit slips up to half the size of a minor frame. This will open the window of tolerance for finding a Frame Sync pattern. Next attempt allowing for Sync Errors. Lastly verify with another Frame Sync using the same data stream before calling the factory for assistance.

3. **System Hangs During SW Update** – If the system freezes and becomes unresponsive during a software update using a USB drive, first remove the USB, then hold the front power rocker switch until the unit powers off. Verify the files in the software update. If this does not solve the problem, please contact Ulyssix for further instructions.

Chapter 10 Archive Data Files Explained

Archive files recorded by the system are binary files containing data from the Frame Sync circuitry of the Ulyssix PCM hardware. After Frame synchronizing the data is stuffed into a large dual port memory device. Along with the data, a header is generated and stuffed into the dual port memory at the beginning of every minor frame. The data is read from the dual port memory by the software and stored to an external memory source via the USB Ports on the front. Each file stored contains a file header and all minor frame and header data captured during an archive sequence. All archive data files end with the extension ".Tad" (Tarsus Archive Data). This section of the manual explains the format of the archive data.

10.1 Data Storage Format

The system stores the archive data in "Little Endian" format. "Little Endian" derived from the phrase "Little End In" means the little end of the data is stored in memory fist. For example, 0x12345678 would be stored in memory as (0x78 0x56 0x34 0x12).

10.2 File Header Definition

Each archived data file contains one file header structure. The file header is stored to indicate the date, time and configuration file used during the archive sequence. All file header data is in ASCII characters to allow viewing with a standard text editor. The header consists of 328 bytes:

10-bytes – Signature
12-bytes – Version
22-bytes – Date/Time
260-bytes – Configuration file and path
12-bytes – Input Data Source (Either "Frame Sync" or "Decom")
1 Unsigned Integer (32 bits) - Bits/Minor Frame
1 Unsigned Integer (32 bits) - Spare
1 Unsigned Integer (32 bits) – Spare

10.2.1 File Header Example

```
00000000  54 61 72 73 75 73 50 43  4D 00 31 2E 38 2E 32 2E  TarsusPCM.1.8.2.
00000010  32 00 00 00 00 00 32 2F  31 31 2F 32 30 30 35 20  2.....2/11/2005 
00000020  31 31 3A 34 39 3A 35 38  20 41 4D 00 43 3A 5C 50  11:49:58 AM.C:\P
00000030  72 6F 67 72 61 6D 20 46  69 6C 65 73 5C 55 6C 79  rogram Files\Uly
00000040  73 73 69 78 5C 54 61 72  73 75 73 50 43 4D 5C 43  ssix\TarsusPCM\C
00000050  6F 6E 66 69 67 75 72 61  74 69 6F 6E 46 69 6C 65  onfigurationFile
00000060  73 5C 64 65 6D 6F 2E 78  6D 6C 00 00 00 00 00 00  s\demo.xml......
00000070  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
00000080  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
00000090  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
000000a0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
000000b0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
000000c0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
000000d0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
000000e0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
000000f0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
00000100  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
00000110  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
00000120  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
00000130  46 72 61 6D 65 53 79 6E  63 00 00 00 00 02 00 00  FrameSync.......
00000140  00 00 00 00 00 00 00 00                           ........
```

File Header Information
Signature = TarsusPCM
Version = 1.7.11.9
Date/Time = 12/28/2004
2:12:25 PM
Configuration File =
C:\Program
Files\Ulyssix\TarsusPCM\Co
nfigurationsFiles\demo.xml
Source = Frame Sync

Figure 93 – Archive File Header Example

10.2.2 Minor Frame Header Definition

As stated above, header data precedes every minor frame in the archive file. The header contains time in Binary Coded Decimal (BCD) along with various status indicators. The header data is defined as three 32-bit data words with the following format.

32 Bit Words	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0000				100's days				10's days				1's days				10's hours				1's hours				10's minutes				1's minutes			
1	10's seconds				1's seconds				100's msec				10's msec				1's msec				100's usec				10's usec				1's usec			
2	Minor Frame Count																TC R Err	TC F Err	I/E	Slip	# Sync Errors				B Lock	SF Lock		MF Lock		FFI		

- Time Code Reader Error
- Time Code Flywheel Error
- Bit Sync Source (0 = Internal, 1=External)
- Bit Slip (1 = yes, 0 = no)
- Bit Sync Loop Lock
- Sub Frame Lock (2 = Lock, 1 = Check, 0 = Search)
- Minor Frame Lock (2 = Lock, 1 = Check, 0 = Search)
- Current Format # Indicator

Figure 94 – Archive Data Header Definition

Data Description

The Tarsus card continuously packs the frame data into a file in 32-bit chunks. If a minor frame size (bits) is not divisible by 32. Then the end of the minor frame will be zero filled.

10.2.3 Archive Data 32 Bit Sync 16 Bit Data

Sync Pattern Size: 32-bits
Sync Pattern: FE6B2840
Minor Frames: 1
Words per Frame: 16

```
02741012 30422590 000000D0 FE6B2840 11112222 33334444
55556666 77778888 CCCCCCCC CCCCCCCC CCCCCCCC 02741012
30423000 000000D0 FE6B2840 11112222 33334444 55556666
77778888 CCCCCCCC CCCCCCCC CCCCCCCC 02741012 30423409
000000D0 FE6B2840 11112222 33334444 55556666 77778888
CCCCCCCC CCCCCCCC CCCCCCCC 02741012 30423819 000000D0
FE6B2840 11112222 33334444 55556666 77778888 CCCCCCCC
```

Header Information
Time = 274:10:12:30.422.590
Minor Frame Count = 0
Internal Bit Sync
No Bit Slips
Bit Sync Loop Lock
Sub Frame = Lock
Minor Frame = Lock
Current Format = 0

Figure 95 – Archive Data Header Example

```
02741012 30422590 000000D0 FE6B2840 11112222 33334444
55556666 77778888 CCCCCCCC CCCCCCCC CCCCCCCC 02741012
30423000 000000D0 FE6B2840 11112222 33334444 55556666
77778888 CCCCCCCC CCCCCCCC CCCCCCCC 02741012 30423409
000000D0 FE6B2840 11112222 33334444 55556666 77778888
CCCCCCCC CCCCCCCC CCCCCCCC 02741012 30423819 000000D0
FE6B2840 11112222 33334444 55556666 77778888 CCCCCCCC
```

Data Information
Word 1 = 1111
Word 2 = 2222
Word 3 = 3333
Word 4 = 4444
Word 5 = 5555
Word 6 = 6666
Word 7 = 7777
Word 8 = 8888
Word 9 – 14 = CCCC

Figure 96 – Archive Data Example

10.2.4 Archive Data 24 Bit Sync 12 Bit Data

Sync Pattern Size: 24-bits
Sync Pattern: FAF320
Minor Frames: 1
Words per Frame: 8

Data Information
In (Hexadecimal)
Word 1 = 0111
Word 2 = 0222
Word 3 = 0333
Word 4 = 0444
Word 5 = 0555
Word 6 = 0666
Word 7 = 0777
Word 8 = 0888

```
02860949  31131514  000000D0  00FAF320  01110222  03330444  05550666  07770888
02860949  31131633  000000D0  00FAF320  01110222  03330444  05550666  07770888
02860949  31131752  000000D0  00FAF320  01110222  03330444  05550666  07770888
02860949  31131870  000000D0  00FAF320  01110222  03330444  05550666  07770888
02860949  31131989  000000D0  00FAF320  01110222  03330444  05550666  07770888
02860949  31132107  000000D0  00FAF320  01110222  03330444  05550666  07770888
02860949  31132226  000000D0  00FAF320  01110222  03330444  05550666  07770888
```

Figure 97 – 12-bit Archive Example

Chapter 11 FEC and Viterbi Theory

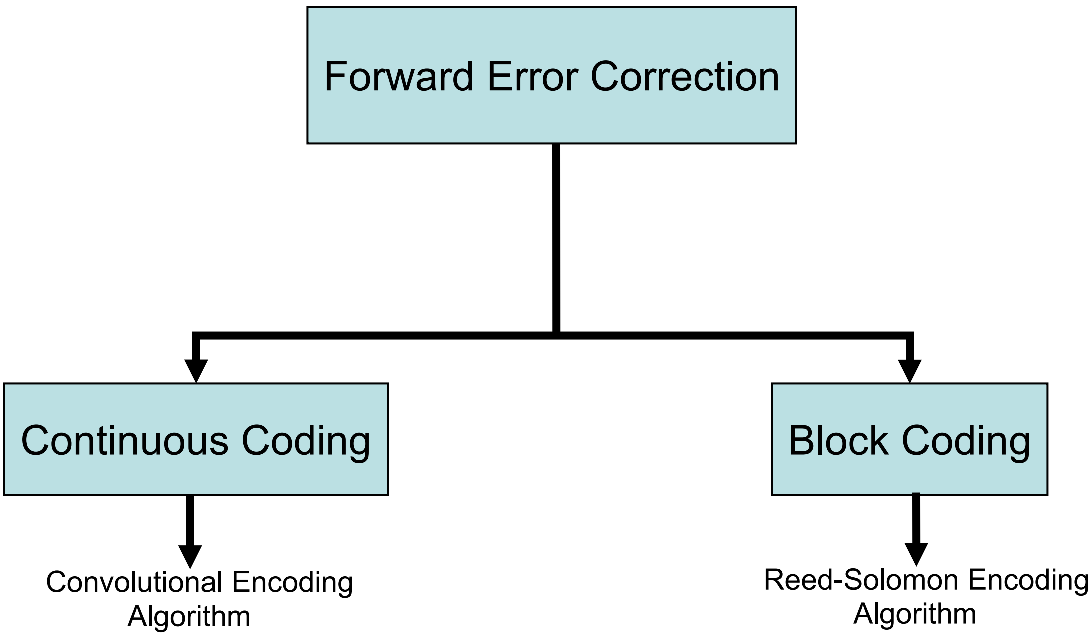

Figure 98 – Forward Error Correction Block Diagram

Figure 119 shows a diagram describing the algorithm choices to implement Forward Error Correction. Viterbi Decoding is the most common algorithm used in conjunction with a Convolutional Encoder and is the choice for the Ulyssix decoder.

- **<u>Forward Error Correction (FEC)</u>**
  - Forward error correction is a method that allows users to improve error control capabilities.
  - This is accomplished by transmitting redundant bits to the original data stream which can then be used to detect and correct errors.
  - Eliminates the need to resend data that usually results from transmission errors.

- The error correcting ability is determined by the design of the error correcting code.

- **<u>2 Most Common Categories of FEC</u>**

  1.) Continuous Codes
  - Performs operations on bit or symbol streams of arbitrary length.
  - Commonly referred to as **Convolutional Coding**
  - Most common decoding method **Viterbi Decoding**

  2.) Block Codes
  - Performs operations on fixed-size blocks or packets of symbols whose size is usually a function of a preset algorithm.
  - Most common type is **Reed-Solomon Coding**

- **<u>Convolutional versus Block Encoding</u>**
  - Soft-Decision Data permits Convolutionally Encoded System gain to degrade slowly as the error rate increases, whereas Block-Level codes only correct errors up to a point and the gain drops off rapidly afterwards.
  - Convolutional codes do not require block synchronization.
  - Convolutional codes are decoded after an arbitrary length of data whereas block-level codes require the reception of an entire data block before decoding begins.

- **<u>Convolutional Encoder Parameters</u>**
- Commonly specified by three parameters:
  - n: number of output bits
  - k: number of input bits
  - m: number of memory registers
- Code Rate: k/n:
  - Ratio describing the number of input bits to output bits.
  - An indicator of code efficiency.
  - Expressed as k/n:
    - k ranges from 1 to 8, m from 2 to 10 and k/n from 1/8 to 7/8
- Constraint Length: K
  - Represents the number of bits in encoder memory.
  - Directly affects the generation of output bits n.
- Generator Polynomials: G1, G2
  - Used to choose which register bits are selected from registers.
  - The number of polynomials is dependent on n.

References

[1] Telemetry Standards, IRIG STANDARD 106-04 Part I, Secretariat, Range Commanders Council, White Sands Missile Range, Mew Mexico. **http://jcs.mil/RCC**