



Hallux-PCI

User Manual

Software Version 1.2x

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Chapter 1 Introduction

1.1 Overview of Hallux-PCI

The Hallux-PCI Digital Modulator/Calibrator, a companion product to the Ulyssix Syrinx-PCI Digital Baseband Demodulator, is a DSP (Digital Signal Processing) based multi-function card designed around the PCI form factor. Modulation modes are software selectable to support FM, FSK, PM, and BPSK modulation techniques. DSP algorithms are implemented in state-of-the-art FPGAs (Field Programmable Gate Arrays) allowing for rapid enhancements or customization.

Up to eight digital VCOs can be individually configured as either modulator or calibrator channels with any combination of channel types and modulation schemes. All configured channels are digitally summed creating a single multiplex output. Input data channels are modulated with user supplied data connected to the card through BNC cables. Hallux channels are configured for modulation type, frequency, deviation, and autostep profile. Select FM, FSK, PM, or BPSK modulation mode for each channel. Fully programmable, all IRIG 106-93 CBW and PBW FM subcarriers are supported as well as non-standard frequencies with a carrier frequency range of 250 Hz to 5 MHz.

Using DSP based algorithms, including Modulated Numerically Controlled Oscillators (MNCO) with 32 bit phase accumulators; the Hallux-PCI is extremely accurate and stable. User-friendly Windows based Graphic User Interface (GUI) software is supplied for easy product installation into a Windows based host computer system.

One additional feature of the Hallux-PCI allows any single channel to be used as a Waveform Generator. This feature provides Sine, Triangle, Saw Tooth and Square wave patterns with programmable frequencies.

The Hallux-PCI Digital Modulator/Calibrator is a natural addition to any Telemetry or Satellite Communications ground station. It can function as an FM Demultiplex System Calibrator, FM Multiplexer, Data Insertion Converter, satellite command and control tone generator, etc.

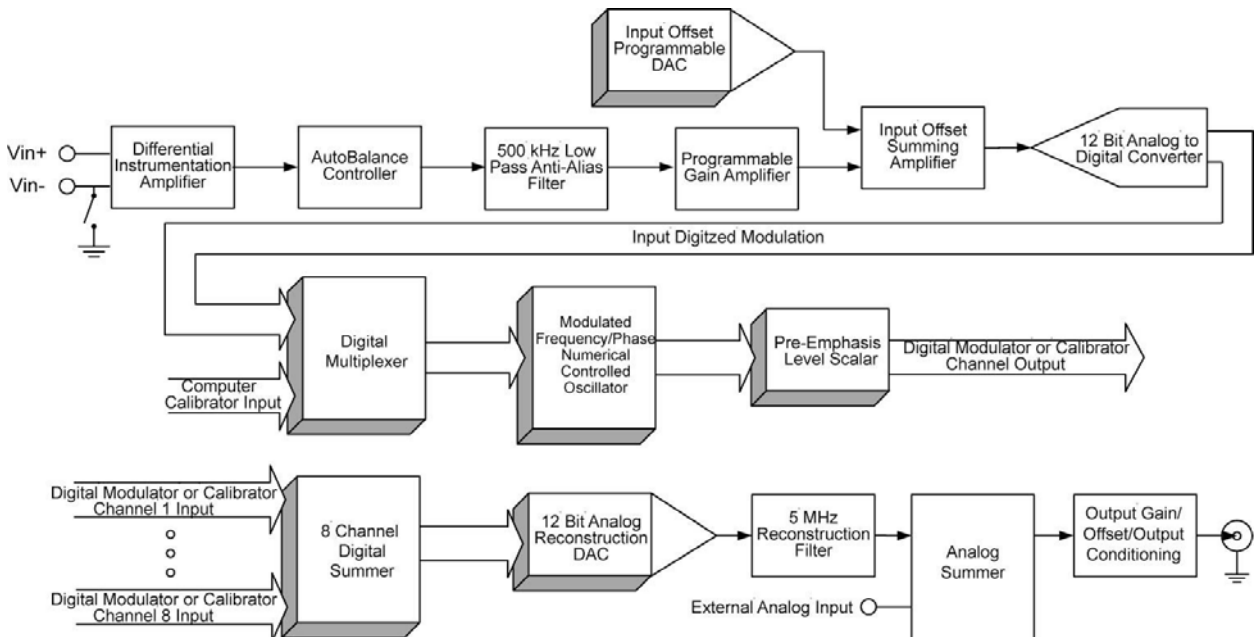


Figure 1 - Hallux-PCI Block Diagram

1.2 Specifications

Physical Specifications

PCI Form Factor	32 bit PCI form factor, +5 Volt System
Interface Connectors	DB25 connector with breakout cable to individual BNC connectors for Output, VCO Input, and Summing Input
Manufacturing	The design utilizes Surface Mount Technology (SMT), manufactured with robotic assembly techniques to IPC-610B Class 2 manufacturing standards
Temperature Range	Operating: 0°C to 50°C Storage: -20°C to 60°C
Power Consumption:	+5V 1.0 Amp +12 V 0.9 Amp -12V 0.0 Amp

Overall Card Specifications

VCOs / Calibrators per card	Eight (8)
Independent Digitizers per card	Eight (8)
Waveform Generators per card	One (1)
Summing Input Level	5.0 VPP for max resolution for a single sub-carrier (Summing Input sums external Analog input for higher channel multiplex capacities)
Multiplex Output Level	Programmable from 1.0 to 10.0 VPP into a 1kOhm load
Frequency Range	250 Hz to 5 MHz
Analog Output Noise	Less than 10mVRMS

Calibrator Specifications

Calibration Modes	Manual or Automatic (Auto-step)
Calibration Steps	3 to 21 steps from -100% to +100% deviation
Auto-step Dwell Time	0.5 to 10 seconds per step Programmable in 0.1-second increments

Waveform Generator Specifications

Waveform Modes	Sine, Triangle, Saw Tooth, Square
Frequency Range	Sine Wave 250 Hz to 5 MHz all other modes 250 Hz to 1 MHz (Limited due to harmonic filtering)

Input Modulation Specifications

Modulation Modes	FM, FSK, PM, BPSK
Input Frequency Response	DC to 500KHz
Input Configuration	Single ended or differential using BNC connectors, Jumper selectable
Input Voltage Range	0.5 VPP to 5.0 VPP, selectable
Maximum Safe Input	± 40 VDC
Input Offset	Programmable from center to either band edge
Range to Range Gain Error	0.03 % at 25°C

Individual Subcarrier VCO/Calibrator Specifications

Subcarrier Frequency Range	250 Hz to 5.0 MHz
Center Frequency Resolution	0.0002 PPM (1 part in 232)
FM Deviation Range	0.5% to 50.0% of center frequency
PM Deviation Range	0.3 to 2.3 radians, programmable
Subcarrier Input Dev Resolution	0.0244% (12 bit digitizer)
Subcarrier Harmonic Distortion	All harmonic terms are below -56 dB
Input Data Harmonic Distortion	All harmonic terms are below -60 dB
Input Modulation Linearity	Less than 0.05%

Pre-emphasis Scheduling
Deviation Accuracy
Linear Deviation Range
Frequency Stability

Programmable from 0 to -20 dB per subcarrier
0.0244% of the programmed center frequency
 $\pm 125\%$ of the programmed deviation
25 PPM over the full operation range

Ordering Information

Hallux-PCI-01

Standard 8 Channel Calibrator/Multiplexer Unit

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 defect in material or workmanship, Ulyssix standard repair service charge will apply. This warranty does not extend to any products that have been subject to misuse, negligence, modifications or 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 manufacturers warranty. Ulyssix makes no express or implied warranties beyond those described herein, and in no event will Ulyssix be responsible for consequential damages of any nature arising out of or connected with the use of its products.

1.4 Repair Service Charges

The minimum service charge for non-warranty repair of individual units, accomplished at our factory is \$250 per unit plus return shipping charges. Equipment must be shipped to the factory with transportation prepaid. Please call the Ulyssix Customer Service Department at 301-846-4800 for a return authorization number and shipping information. All units repaired will be warranted for 90 days from the date of the said repair.

Chapter 2 Installation

2.1 System Requirements

The following table contains the preferred and minimum computer configuration requirements for installing and operating the Hallux-PCI Digital Modulator/Calibrator. For optimum performance of the Hallux-PCI product, please install into a computer that meets or exceeds the Preferred Configuration Specifications.

Parameter	Preferred Configuration	Minimum Configuration
Processor Speed	500 MHz or Higher	300 MHz Minimum
RAM	128 MB or Higher	64 MB Minimum
Available Hard Drive Space	15 MB	10 MB Minimum
Operating System	Windows 2000	Windows '95, '98, 2000, NT
Power Supply	25 Watts available power per PCI card installed	25 Watts Available Power per PCI Card Installed
Chassis	1 Full Length PCI Slot is required for each PCI card installed	1 Full Length PCI Slot is required for each PCI Card Installed
Drives	CD ROM	CD ROM or 3.5 Inch Floppy

Figure 2 - Minimum System Requirements Table

2.2 Software/Hardware Installation

The Windows Based Hallux-PCI software can operate on computers with Windows 95, Windows 98, Windows NT, or Windows 2000 operating systems. Ulyssix strongly recommends that you install the software before installing the Ulyssix cards into your PCI chassis. The required drivers and .INF files are installed with the software. Follow the appropriate instructions.

2.2.1 Windows 95/98/NT Installation

1. Boot the machine.
2. **NOTE: If running Windows NT you must log in with administrator privileges.**
3. Install the Hallux-PCI software onto your computer by inserting the Hallux-PCI software CD into your CD drive then running the setup.exe Install Shield script. The software, the required driver and the required .INF file will be installed. You will be prompted to reboot. Select Yes. The machine will reboot.
4. After reboot, shutdown the computer and install the card.
5. Turn on the computer.
6. At Windows start up, your computer will detect a new card installed on the PCI bus and then start "Add New Hardware Wizard" prompting the user to install a driver for a PCI Bridge card. The window should display "Ulyssix PLX_9080 Driver" as the new driver. Click Next.
7. The next window will be displayed prompting how Windows searches for the new hardware driver. Select "Search for the best driver for your device". Click Next.
8. The next window allows the user to choose the location of the driver. Select "Specify a Location" and browse to c:\WINDOWS\INF and hit next. The installation will find the Ulyssix PLX_9080 Driver file in your Windows\INF directory and assign it to your card. Hit Next.
9. The next window shows the Ulyssix PLX_9080 Driver. Click Finish.
10. Windows will continue booting as normal. The next time you start your computer, it will bypass the detected new hardware dialog.

2.2.2 Windows 2000 Installation

1. Boot the machine.
2. **NOTE: You must log in with administrator privileges.**
3. Install the Hallux-PCI software onto your computer by inserting the Hallux-PCI software CD into your CD drive then running the setup.exe Install Shield script. The software, the required driver and the required .INF file will be installed. You will be prompted to reboot. Select Yes. The machine will reboot. After reboot, shutdown the computer and install the card.
4. Turn on the computer.
5. At Windows start up, your computer will detect a new card installed on the PCI bus. A "Found New Hardware" message will appear while the "Found New Hardware" Wizard is coming up. Click Next.
6. The Install Hardware Device Drivers screen will come up and say "This wizard will complete the installation for this device: Ulyssix Technologies, Inc. PLX9080 PCI Card Generic Bus Interface". On this screen select "Search for the Suitable Driver for my Device". Click Next.
7. The next window allows you to direct the wizard to search for a suitable driver in a specific location. Select "Specify a Location". Click Next.
8. The Found New Hardware Wizard will ask you to insert the manufacturer's installation disk into the drive selected. This is not necessary.
9. Type c:\WINNT\inf into the browse location and hit Enter.
10. The wizard will display the Driver Files Search Results screen. The wizard will display "The wizard found a driver for the following device: Ulyssix Technologies, Inc. PLX9080 PCI Card Generic Bus Interface." Click Next.
11. The wizard will display the Insert Disk screen asking you to "Insert the Compact Disc labeled 'WinDriver Installation Disk' into your CD-ROM drive." You do not have to install the CD. Click OK.
12. The wizard will display the Files Needed screen.
13. Browse to c:\WINNT\System32\drivers and click OK.
14. Select windrvr.sys.
15. The selected path will display. Click OK.
16. Completing the Found New Hardware Wizard screen will display. Click Finish.
17. Windows may ask you to restart your computer prior to using the new card. Hit ok. Restart your computer even if Windows does not prompt you to do so.
18. Windows will continue booting as normal. The next time you start your computer, it will bypass the "Found New Hardware" dialog.

Note: Steps 11-15 of the install process will be skipped if you install additional Hallux-PCI cards in the future.

2.2.3 Installing Cards in a Previously Used PCI Slot

When a PCI card is installed into a Windows 95/98/2000 computer (install new hardware wizard), the driver for that card is assigned to that specific slot of the computer. The computer will look for only that type of card and if another type of card is later installed in that slot, the computer will not recognize it nor will it launch the "install new hardware" wizard. This will prevent proper installation of the Ulyssix card. If you have problems getting the PCI computer to recognize that you are installing new hardware you may have to clear out the registry for the previously installed card. Follow the steps below to uninstall the unwanted card. This is not necessary if you are running Windows NT.

2.2.3.1 Uninstalling Hardware – Windows 95/98

It is very important that you do not uninstall required hardware drivers. Do not perform the following process unless you have a thorough understanding of computer hardware.

1. Click the Start Button and go to Settings / Control Panel / System.
2. Click the Device Manager tab.
3. Click the radio button to select "View device by connection".
4. Select the group "Advanced Configuration and Power Interface (ACPI) BIOS".
5. Double Click "PCI Bus". This will list the installed PCI device drivers.

6. Highlight the device that you want to Uninstall and click the Remove button. Make sure you know which device to uninstall!

2.2.3.2 Uninstalling Hardware – Windows 2000

It is very important that you do not uninstall required hardware drivers. Do not perform the following process unless you have a thorough understanding of computer hardware.

1. Click the Start Button and go to Settings / Control Panel / Add/Remove Hardware.
2. The Add/Remove Hardware Wizard will launch. Click Next.
3. The “Choose a Hardware Task” screen will come up.
4. Click the radio button to select “Uninstall/Unplug a Device”.
5. The “Choose a Removal Task” screen will come up.
6. Click the radio button to select “Uninstall a Device”.
7. The “Installed Devices on Your Computer” screen will come up. Click the “Show Hidden Devices” box to show all installed devices.
8. Double click the device that you want to Uninstall. Make sure you know which device to uninstall!
9. The “Uninstall a Device” screen will come up. This screen identifies the device you have chosen to uninstall.
10. Click the radio button to select “Yes, I want to uninstall this device.”
11. Click “Next” and follow the instructions on the screen to complete the removal.

2.2.4 Un-Install Software

You can un-install the Hallux-PCI Software from your desktop. Click the Start Button. Go to Settings / Control Panel and double click the Add / Remove Programs icon. Highlight Hallux-PCI and click the Add/Remove Programs button. Uninstalling the software does not remove the Ulyssix hardware from the Windows registry.

2.2.5 Power Cycling Guidelines

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

2.3 Product Identification

Every Hallux-PCI Digital Modulator/Calibrator card is assigned a unique serial number before shipment from the factory. This number, as well as the unit’s model and revision are clearly marked on the reverse side of the PC board. Refer to the following figure.

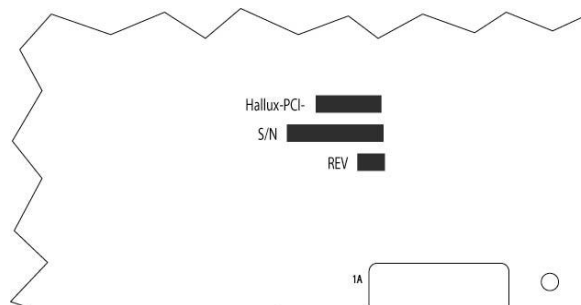


Figure 3 - Product Identification

2.3.1 Model Number

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

Model	Description
Hallux-PCI-01	Standard 8 Channel Digital Modulator/Calibrator

2.3.2 Serial Number

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

2.3.3 Revision Numbers

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

2.4 Hardware Setup

2.4.1 General

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

2.4.2 Jumpers

Once the Hallux-PCI is unpackaged and no damage is apparent, check the unit to confirm that all required jumpers are present. Refer to the figure below for jumper locations. The seventeen jumpers required are factory set and require no alteration by the user. The exception to this statement is when you want to change the Input Mode to differential. See section 2.4.2.1 for details.

2.4.2.1 Input Mode

Each Modulator channel's input mode can be set for single ended or differential. Single ended mode is set by placement of the mode jumper on the board. Set to differential mode by removing the appropriate jumper. Jumpers JP12, 13, 15, 16, 18, 19, 21 and 22 correspond to input mode select for channels 1 – 8 respectively. The Hallux-PCI is shipped with jumpers set for single ended mode.

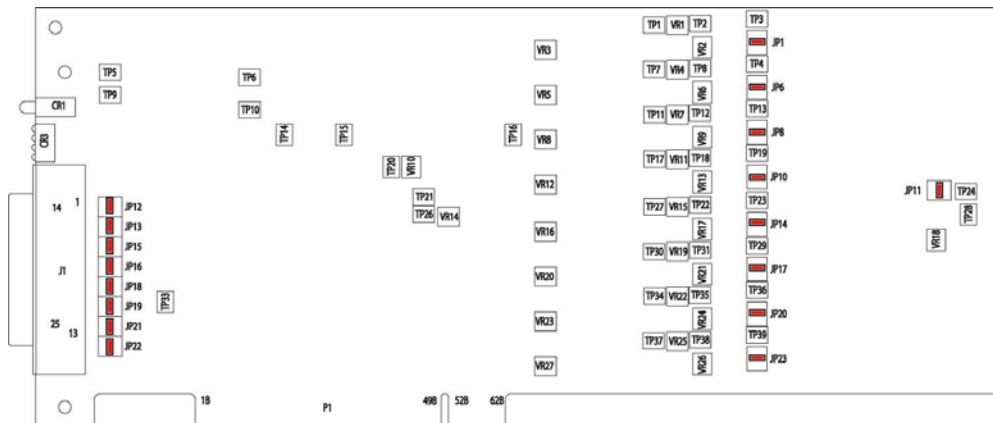


Figure 4 - Jumper Locations

2.5 Hardware Installation

The Hallux-PCI is easily installed into any PC chassis with an available full length PCI slot. The Hallux-PCI software must be installed before installing the Hallux-PCI card. Follow the steps below to install the Hallux-PCI card. Up to 4 Hallux-PCI cards can be installed into a single chassis.

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

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

2.5.1 Adding Cards to an Existing System

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

Additional Hallux-PCI cards can be installed into any available full length PCI slot in your computer at any time. Up to 4 Hallux-PCI cards can be installed into a single chassis. Follow the installation instructions above. When you install additional cards into a computer, the PCI bus may assign new Card ID numbers for existing and/or new cards depending upon the slot you install the card into, and the configuration of the PCI bus for your specific computer. If this happens, the configuration files will be corrupted and will not program the hardware properly.

Ulyssix recommends that when you add or remove Hallux-PCI cards from your system that you delete the HalluxCfg.Cfg file from the Program Files/Ulyssix/HalluxPCI directory. When you re-enter the Hallux-PCI Software, all cards will be loaded with default values.

2.5.2 Power Cycling Guidelines

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

Chapter 3 Operation

3.1 General

Before using your Hallux-PCI card you must first - 1) install the Hallux-PCI software onto your computer and 2) install the Hallux-PCI card into an available PCI slot. Upon power up you should verify proper LED indication and connect the input and output cables to the card. LED indicators and Interconnections are explained in the following sections.

3.2 LED Indicators

LED Indicators on the rear panel of the Hallux-PCI card provide identification and status for each card. The following sections describe the function of each LED.

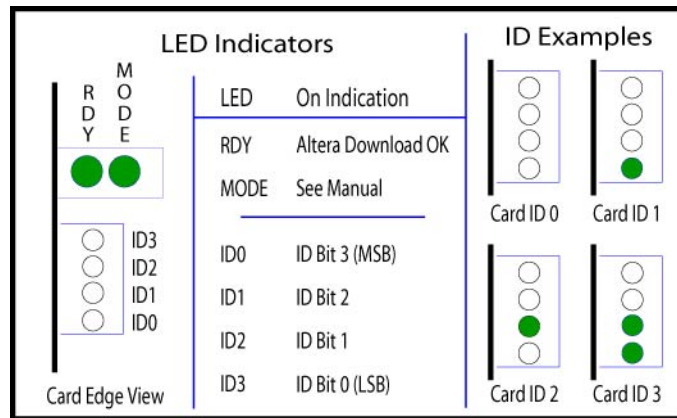


Figure 5 - LED Indicators

3.2.1 RDY - Altera Download OK

DSP algorithms are downloaded from on-board flash into Altera FPGAs upon power up of the Hallux-PCI. RDY, the Altera Download OK light, will illuminate after power up once the Altera FPGAs have successfully received the download. This LED will be illuminated during normal operation. If the Altera Download OK light is not illuminated after power up, contact the factory for assistance.

Note

If the RDY light is not on after power up, it may be because of improper power cycling. Unfortunately, all computers do not behave identically in regard to the amount of time for the PCI bus and the ATX power supply to settle after power down. The electronics on the Ulyssix boards require that the bus and power supply are fully settled before re-applying power to the system. We recommend that you wait a minimum of 30 seconds after you power down before you restart your computer. This will ensure that the system has had time to settle and the Ulyssix cards should start up properly.

3.2.2 Mode

Ulyssix produces several products that utilize the Hallux-PCI printed circuit card. These products are similar in appearance, especially when installed in a chassis. The Mode LED will be off if the card is configured as a standard Hallux-PCI. The MODE LED will be on if the card is configured as a HalluxPCM-PCI card.

3.2.3 Card ID

The Hallux-PCI software assigns a Card ID number to each Hallux-PCI card detected in the chassis. Note that the Cards are numbered 0 through 3. The ID number appears on all screens of the software to identify setup, status, and data to a specific Hallux-PCI card. The Card ID LEDs on the back panel give a binary representation of the Card ID number for each card. Refer to the LED Indicator figure above and the table below to determine the Card ID number.

Note: 0 indicates LED off, 1 indicates LED on.

ID3	0	0	0	0
ID2	0	0	0	0
ID1	0	0	1	1
ID0	0	1	0	1
Card ID	0	1	2	3

Figure 6 - Card ID Table

3.3 Interconnections

Input and output connections are made to the Hallux-PCI through a breakout cable from the 25 Pin PC board mounted DIN connector to 10 individual BNC connectors (See Figure 7 below.). Each BNC connector is labeled to identify its function. Refer to the following sections for connector identification.

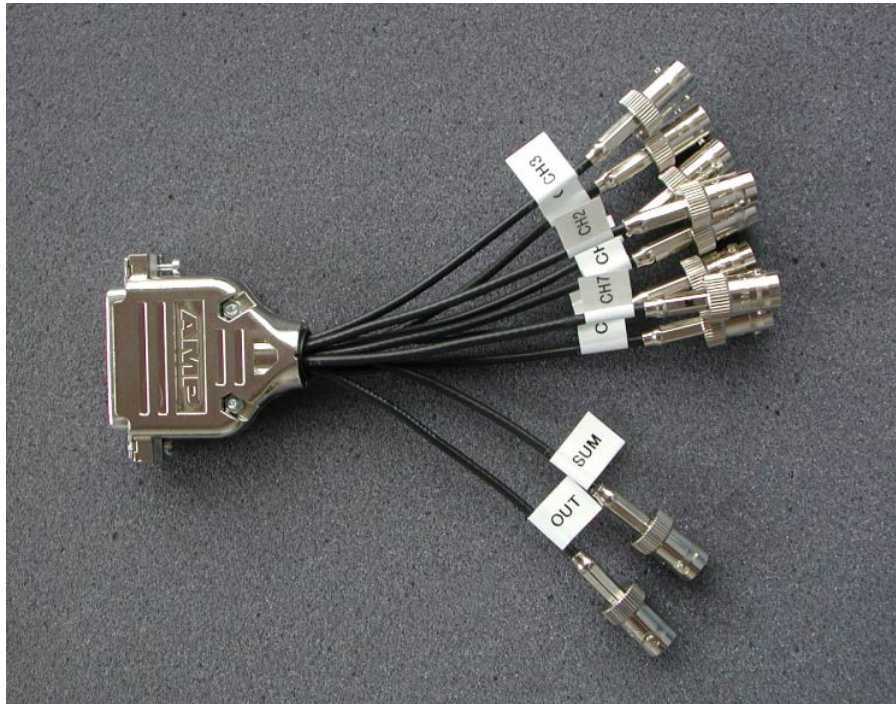


Figure 7 - Hallux-PCI Breakout Cable

3.3.1 Modulator Input

Connect the analog input signal to be used to modulate each Modulator channel to the appropriate modulator input BNC connector. Each input is labeled CH1, CH2, etc. Modulator inputs can be configured for either single ended or differential input. See Section 2.4.2.1 for details.

3.3.2 Summing Input

The summing input is designed to allow the user to sum several Hallux card outputs resulting in higher channel count calibration or modulation signals. Connect the output of one Hallux card to the SUM input of a second. The output of the second card will be a composite of both multiplexes. The amplitude of the SUM input should be set to 5.0 VPP for maximum resolution for a single sub-carrier. Adjustment of the SUM input level may be required depending on the number of channels contained in each multiplex.

3.3.3 Modulator/Calibrator Output

The composite multiplex output of modulator and calibrator channels is made available on the Modulator/Calibrator Output connector.

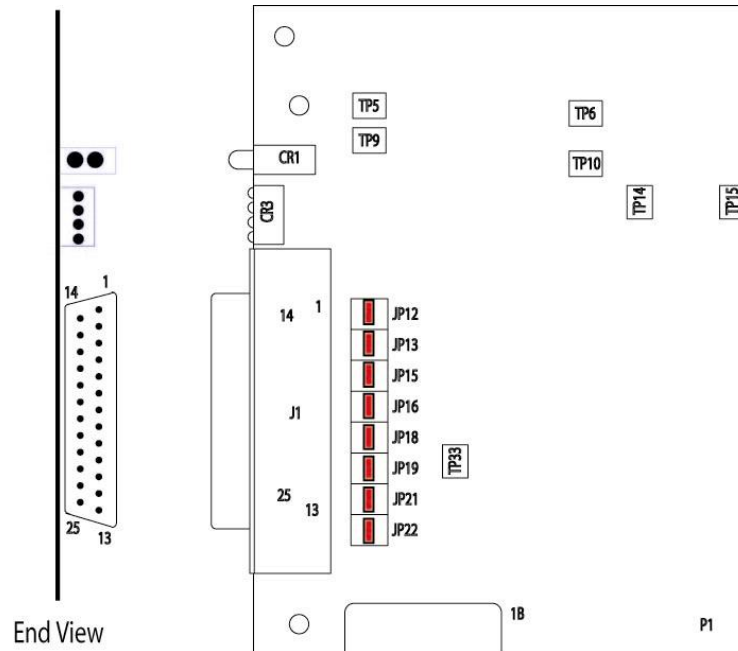


Figure 8 - Connections

JP1 Pin	Description	Label
1	Summing Input +	SUM
2	No Connection	
3	Modulator Channel 1 Input +	CH1+
4	Modulator Channel 2 Input +	CH2+
5	Modulator Channel 3 Input +	CH3+
6	Modulator Channel 4 Input +	CH4+
7	Modulator Channel 5 Input +	CH5+
8	Modulator Channel 6 Input +	CH6+
9	Modulator Channel 7 Input +	CH7+
10	Modulator Channel 8 Input +	CH8+
11	No Connection	
12	Output +	OUT+
13	No Connection	
14	Summing Input -	SUM-
15	No Connection	
16	Modulator Channel 1 Input -	CH1-
17	Modulator Channel 2 Input -	CH2-
18	Modulator Channel 3 Input -	CH3-
19	Modulator Channel 4 Input -	CH4-
20	Modulator Channel 5 Input -	CH5-
21	Modulator Channel 6 Input -	CH6-
22	Modulator Channel 7 Input -	CH7-
23	Modulator Channel 8 Input -	CH8-
24	No Connection	
25	Output -	OUT-

Figure 9 - J1 Connector Pin-out

3.4 Modulator/Calibrator Setup and Operation

The following sections describe the various screens of the Windows based Hallux-PCI software. Please note that you must click the Apply button on any setup screen to download any modified settings to the Hallux card. No changes will be made to the card until Apply has been clicked.

3.4.1 Hallux-PCI Status Screen

The Hallux-PCI Status Screen is the first screen you see when the Hallux-PCI software is launched. A Channel Status Block will be displayed for each of the eight channels for the selected Hallux-PCI card. Up to four Hallux-PCI cards can be installed into a single PCI chassis. The software will open in simulation mode if the PCI bus detects no Hallux-PCI cards. In this mode, the words "Simulation Mode" will appear in each Channel Status Block, directly under the Channel Number. Software and DLL version numbers are displayed to the right of the screen. Several drop down menu options are available and are discussed later in the manual.

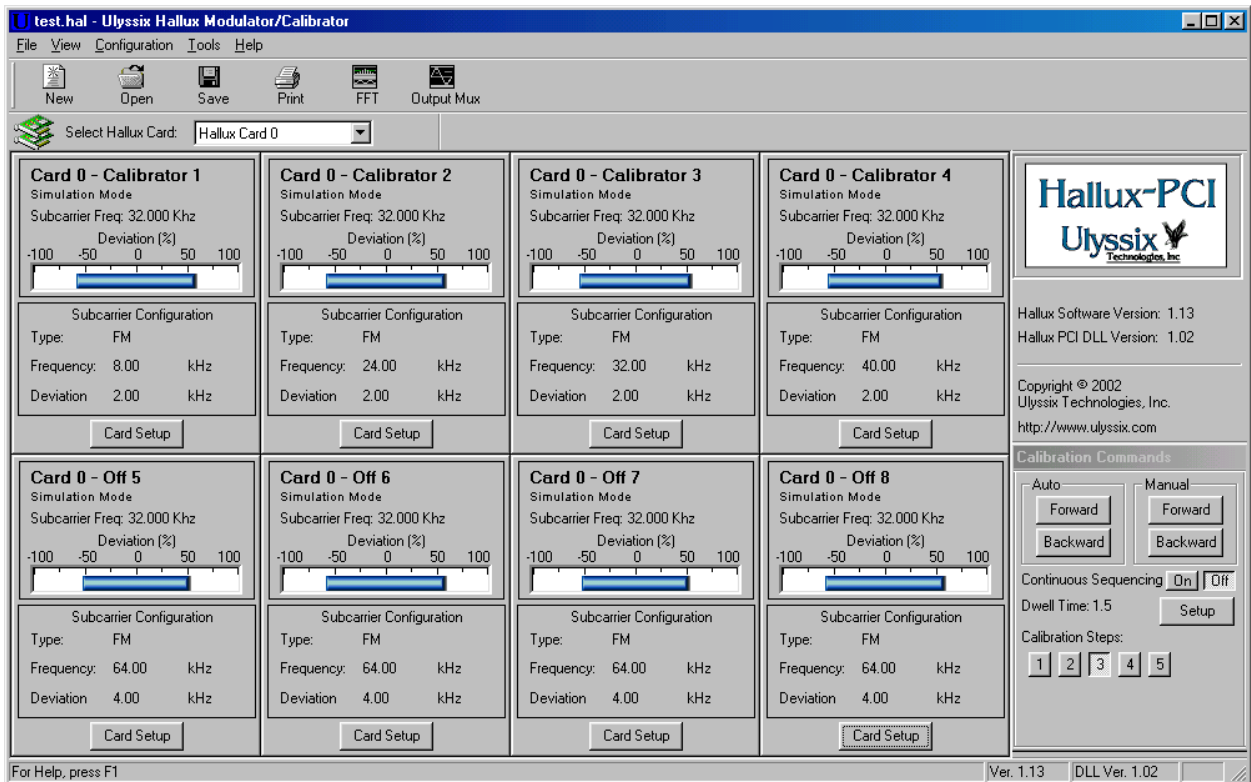


Figure 10 - Hallux-PCI Status Screen in Simulation Mode

3.4.2 Select Hallux Card

Up to four Hallux-PCI cards can be installed into a single computer chassis. The individual cards will be given a “Card ID” number by the software (Card 0, Card 1, Card 2, and Card 3.) Four LEDs on the back panel identify the card for connection purposes (See Figure 5.) The Hallux Software displays the status and programming screens for one card at a time to avoid confusion. Select the desired card from the drop down menu located at the top left corner of the main screen, just under the toolbar. All setup and status screens identify the related Card and Channel numbers.

3.4.3 Calibration Commands

The Calibration Commands (Calibrator Toolbar) are displayed at the bottom right portion of the main screen if one or more Hallux Channels have been configured as Calibrator channels. The Calibrator Toolbar allows you to control the calibrator function of the Hallux card. From this toolbar you select Auto, Manual, or Continuous Sequencing calibration, the number of calibration steps, and dwell time. The Calibrator Toolbar is thoroughly explained in Section 3.4.5.3.

3.4.4 Channel Status Block

A Channel Status Block (Figure 11) for each Hallux-PCI Channel appears on the Hallux Status Screen displaying programming and status information. The Hallux-PCI software assigns a Card number to each Hallux-PCI card detected in the chassis. Up to 4 Hallux Cards can be installed in a single PCI Chassis. Note that the cards are numbered 0 through 3. The card and channel number appear on all screens of the software to identify setup, status, and data to a specific Hallux-PCI card and channel. The Card ID LEDs (See Figure 5) give a binary representation of the card number. The fields displayed on the Channel Status Block are explained below.

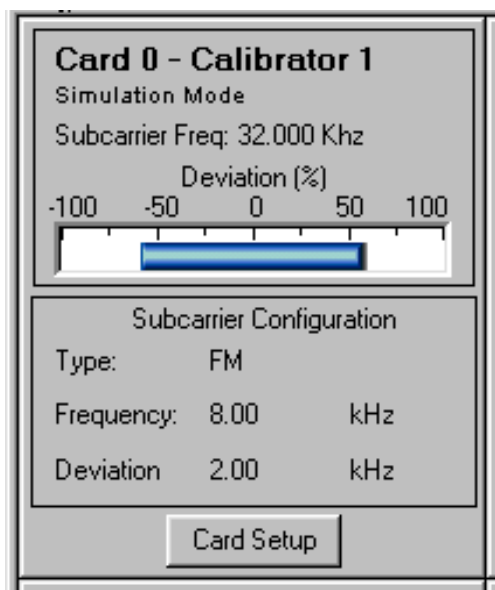


Figure 11 - Channel Status Block

3.4.4.1 Modulator/Calibrator Model

The Modulator/Calibrator Model appears in the top left corner of the Status Block directly under the Card Number and reflects the hardware version of that card. If no Hallux-PCI cards are detected, the words “Simulation Mode” will appear instead of the Model. The standard model number of the Hallux-PCI card is the Hallux-PCI-01. Other model numbers have slightly different capability and operational limitations. The Hallux-PCI software will automatically recognize the hardware model.

3.4.4.2 Channel Number

Each Hallux channel is identified by the Card number and the Channel number. The Hallux-PCI software assigns a Card number to each Hallux-PCI card detected in the chassis. You select which card to view or modify from the main status screen. Up to 4 Hallux Cards can be installed in a single PCI Chassis. Note that the cards are numbered 0 through 3. The Card number corresponds to the ID LEDs on the back of the card (refer to section on LED Indicators). The Channel number corresponds to channels 1 – 8 of the Hallux card.

3.4.4.3 Deviation Meter

The Deviation Meter provides a graphical representation of the modulation data for the programmed channel. The blue indicator shows the percent deviation for the channel. The Deviation Meter is updated based on a “boxcar” average of multiple data points. The number of data points averaged for the display is selectable to allow the user to adjust the response.

3.4.4.4 Frequency Counter

The Frequency Counter displays the actual frequency of the carrier. This portion of the display can be turned on or off to suit your preference. To change the status of this display, select Configuration from the main screen menu bar and select Freq Subcarrier Counter.

3.4.4.5 Channel Type

The Type field displays the selected modulation mode for each channel. Available modes include FM, FSK, PM, and BPSK.

3.4.4.6 Frequency and Deviation

The Frequency and Deviation for each Hallux-PCI are programmed from the Setup Screen.

3.4.4.7 Setup

See Section 3.4.7 for Setup information.

3.4.5 Tool Bar Features

The toolbar is a group of icons at the top of the screen that provides short-cut access to configuration and status screens, as well as control of standard Windows functions such as file management and printing. The specific use of these functions is explained below.



... creates a new file format file. Default settings are loaded.
See Section 3.4.6.1.1.



... loads an existing format file.
See Section 3.4.6.1.2.



... saves a new or modified format file.
See Section 3.4.6.1.3.



... prints the configuration file that summarizes all card setup parameters.
See Section 3.4.6.1.5



... displays the FFT screen showing frequency and time domain of generated channels.
See Section 3.4.5.5.2.



... short-cut to Output Multiplex setup screen.
See Section 3.4.6.6.2.

3.4.6 Menu Bar Features

The menu bar provides access to configuration, status, and help screens, as well as control of standard Windows functions such as file management and printing. The specific use of these functions is explained below.

3.4.6.1 File Management

Each time the Hallux-PCI software is executed, the most recently downloaded set up parameters are loaded into the Hallux-PCI cards in your chassis. The active file format name (with a .hal extension) will be displayed at the top of the Hallux-PCI Status Screen. You are able to create and save setup configurations for common applications. This is done from the file drop down menu or from the toolbar.

Available from the Hallux-PCI Status Screen is the file management menu. Click File at the top left corner of the Hallux-PCI Status Screen to save, save as, or recall saved program formats (Figure 12). This feature of the software eliminates the need to re-enter set up information for frequently used channels. The software will ask you if you want to save setup information each time you exit. You

are also able to exit the Hallux-PCI software from this drop down menu. The following paragraphs describe the functions available from the File dropdown list.

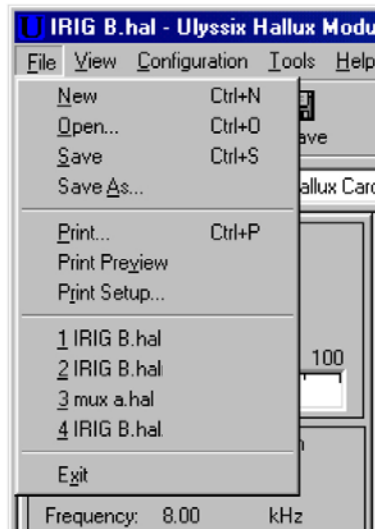


Figure 12 - File Format Screen

3.4.6.1.1 New

Click New to create a new configuration file. The default setup parameters will be loaded. You will be asked if you want to save the existing format file if it has been modified and not saved. Go to the setup screen and configure the Hallux card or cards as desired. Go to File/Save to name and save the new format file. Identify file formats with a name that will be easily recognized for future loading.

3.4.6.1.2 Open

Click Open to load an existing format file. Valid format files for the Hallux-PCI software will have a .hal file extension. Select the file name to load and hit Open. The setup parameters will be automatically downloaded to the Hallux-PCI cards in your chassis.

3.4.6.1.3 Save

After entering and applying setup parameters to the Hallux-PCI cards in your chassis, you can save this information for later use. Click on File at the top left corner of the Hallux-PCI Status Screen and choose Save. The default directory for saved formats is the same directory where the Hallux-PCI program resides but you can store them in any location on your hard drive. Identify the file format with a name that will be easily recognized for future loading.

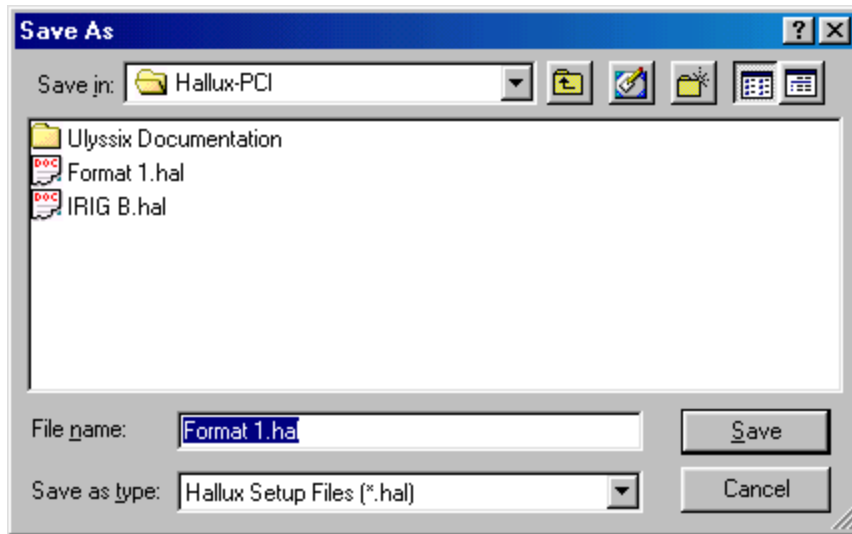


Figure 13 - Saving a Format File

3.4.6.1.4 Save As

Use the “Save As” option to copy the format to another name for modification. You can also use the Save As option if you have made changes to an existing format but want to retain the original format for future use.

3.4.6.1.5 Print

A Hallux Configuration Report can be printed either by selecting print from the File dropdown menu or by clicking the Print icon from the toolbar. The printed document will contain all setup information for all detected Hallux-PCI cards in your system.

3.4.6.1.6 Print Preview

Print Preview allows you to view the Hallux Configuration Report on your computer screen. The Hallux Configuration document will contain all setup information for all detected Hallux-PCI cards in your system.

3.4.6.1.7 Print Setup

Print Setup is a standard Windows print setup screen.

3.4.6.1.8 Exit

Exit allows you to close the Hallux-PCI software.

3.4.6.2 View

The View drop-down menu (See Figure 14) allows you to display or hide the main Toolbar, the Status Bar, or the Card Selection Toolbar on the Hallux-PCI Status Screen. It also allows you to display or hide the Calibrator toolbar. The main Toolbar is the group of icons including New, Open, Save, Print, FFT, and Output Mux. The status bar is the bar of information displayed at the bottom of the screen that displays the software and dll version information. The Calibrator toolbar is explained in the next section of the manual. The Card Selection Toolbar is explained in Section 3.4.5.4.

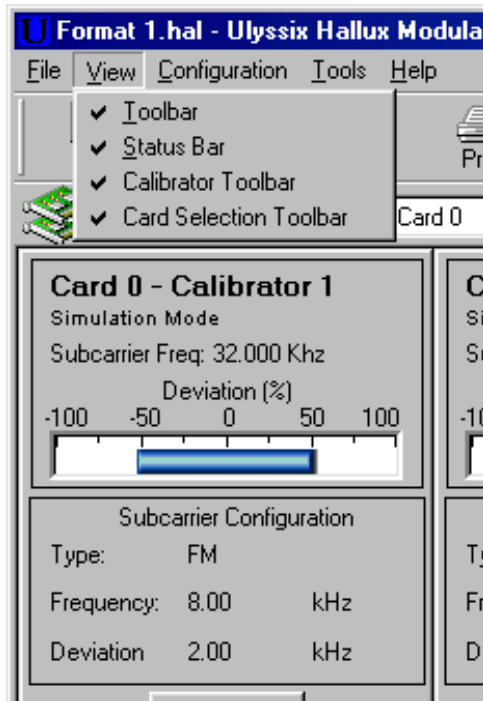


Figure 14 - View

3.4.6.3 Calibrator Toolbar

The Calibrator Toolbar allows you to control the calibrator function of the Hallux card. From this toolbar you select auto, manual, or continuous sequencing calibration, the number of calibration steps, and dwell time. The Calibrator Toolbar will only be automatically displayed if one or more Hallux channels are configured as calibrators.

3.4.6.3.1 Auto mode

For Automatic calibration, click either the Forward or Backward button located below the word Auto. If you select Forward, the calibrator will start at the programmed lower band edge and cycle upward to the programmed upper band edge, then return to the programmed center frequency. If you click the Backward button the direction of the calibration will be reversed.

3.4.6.3.2 Manual mode

For Manual calibration, click either the Forward or Backward button located below the word Manual. If you select Forward, the calibrator will step from the current position one step per click from lower band edge to upper band edge. If you click the Backward button the direction of the calibration will be reversed.

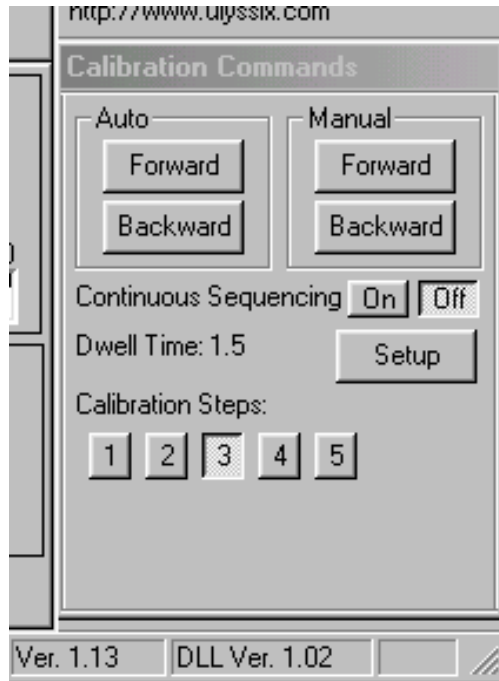


Figure 15 - Calibration Toolbar

3.4.6.3.3 Continuous Sequencing

Continuous Sequencing allows you to repeat the calibration sequence through the programmed number of calibration steps indefinitely in the forward direction. All channels configured as calibrator channels will begin at lower band edge and sequence forward to upper band edge. The calibrator will then return to lower band edge and continue to sequence. When Continuous Sequencing is selected, the Auto and Manual calibration control buttons will be disabled. Click the Continuous Sequencing - Off button to stop the cycle.

3.4.6.3.4 Calibrate Setup

Click the Setup button to set the number of steps and the dwell time. Enter the desired number of calibration steps from 3 to 21. The dwell time can be from 0.1 to 10 seconds. To set the dwell time, click and drag the slide button until the desired number of seconds is displayed. You can also click to the left or right of the button to change the setting in half-second steps.

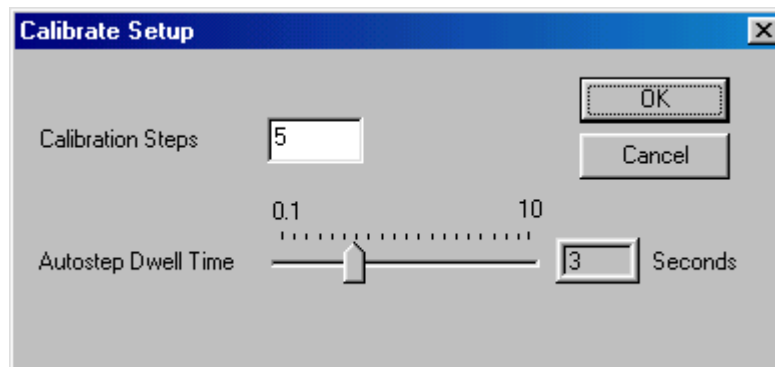


Figure 16 - Calibrate Setup Screen

3.4.6.4 Card Selection Toolbar

Up to four Hallux-PCI cards can be installed into a single computer chassis. The individual cards will be given a "Card ID" number by the software (Card 0, Card 1, Card 2, and Card 3.) Four LEDs on the back panel identify the card for connection purposes (See Figure 5.) The Hallux Software displays the status and programming screens for one card at a time to avoid confusion. Select the desired card from the Card Selection Toolbar located at the top left corner of the main screen, just under the toolbar. All setup and status screens identify the related Card and Channel numbers.

3.4.6.5 Configuration

The Configuration drop-down menu (See Figure Below) allows you to alter several attributes of the main screen. It also allows you to set the multiplex output configuration.

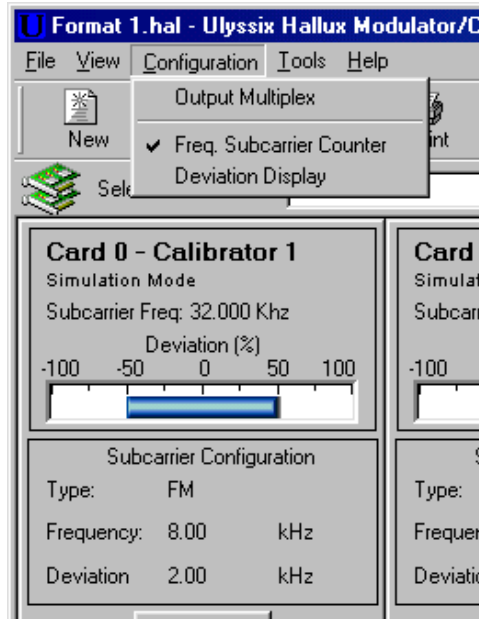


Figure 17 - Configuration Drop Down Menu

3.4.6.5.1 Output Multiplex

Select Output Multiplex from the Configuration menu to set the voltage level and offset for the output of the card. Click and drag the slide button to set the desired value. You can also click to the left or right of the button to change the value in 1V steps for Output Level and 0.5V steps for Output Offset. The programmed peak-to-peak output voltage is measured at the output connector if one channel is configured. As you add channels the voltage level may reduce. If multiple Hallux cards are installed, select which card you want to configure. Click the Apply button to download your settings.

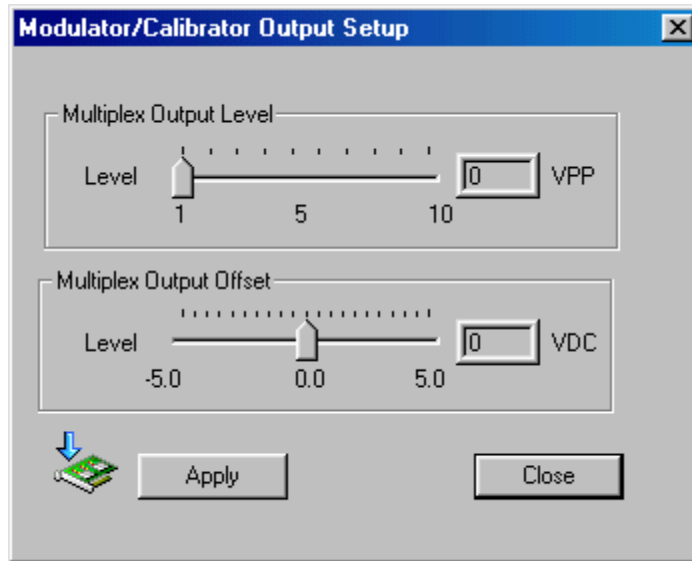


Figure 18 - Output Multiplex Screen

3.4.6.5.2 Freq Subcarrier Counter

The Channel Status Block for each channel provides a graphical representation of the channel data both in % deviation and Carrier Frequency in kHz. The frequency counter can be turned on or off by selecting or deselecting “Freq Subcarrier Counter” from the configuration drop down menu.

3.4.6.5.3 Deviation Display

The data displayed on the Deviation (%) display is derived from a “boxcar” average of several data values from the digital modulator. The Hallux software averages from 1 to 32 data values then updates the display. The oldest value is then discarded and replaced by the newest available data in a first in first out process. The number of values to be averaged is selectable by clicking on “Deviation Display” from the Configure drop down menu (See Figure Below). Enter a number between 1 and 32. The higher the number, the more data points averaged and the DC offset level of the modulator data is displayed. The lower the number, the fewer data points averaged, and deviation display represents the AC frequency response of the modulator input data. The setup on the deviation display does not in any way effect operation. It is merely there to allow the user to change the update rate of the deviation display to quick view either the AC or DC response of the modulator.

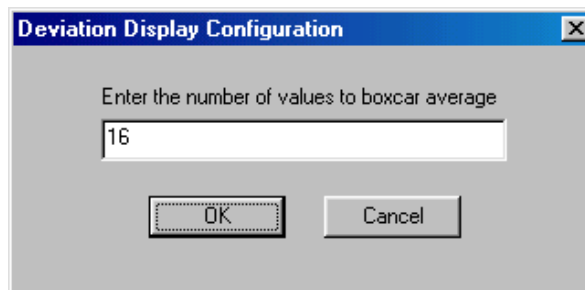


Figure 19 - Deviation Display

3.4.6.6 Tools

The Tools dropdown menu allows you to open the Hallux-PCI software debug screen and access the Multiplex FFT screen.

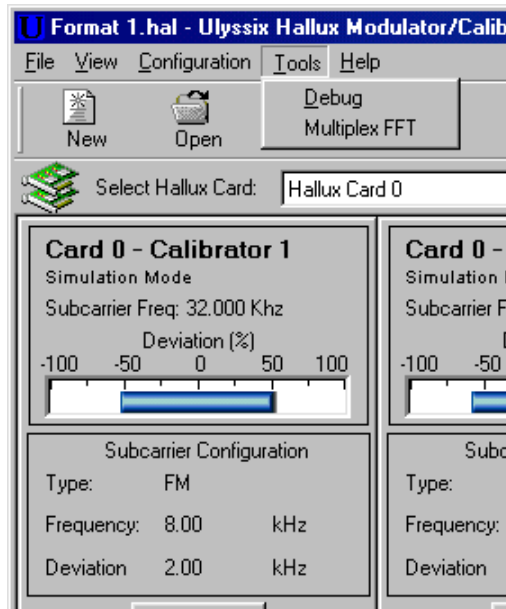


Figure 20 - Tools

3.4.6.6.1 Debug Screen

The debug screen is used at the factory to access the registers of the Hallux-PCI board. Typically a user will not access the debug screen. In some instances, however, there may be a need to open the debug screen for troubleshooting purposes. Ulyssix recommends that you not attempt to use the debug screen without consulting the factory.

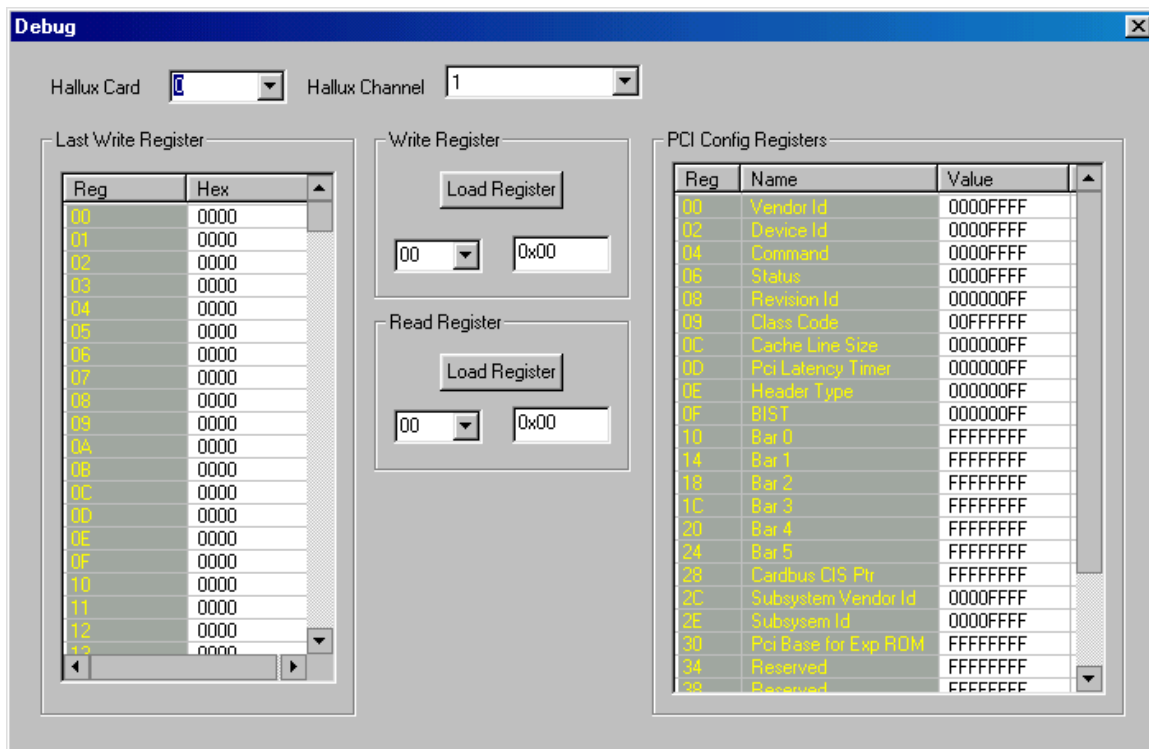


Figure 21 - Debug Screen

3.4.6.6.2 Multiplex FFT Screen

The Multiplex FFT Screen gives a graphical representation in the frequency and time domain of the programmed output multiplex. The X-axis of the FFT screen is scaled to 5 MHz, the max output frequency of the card. The resolution of the X-Axis for the Frequency Domain display is the total display range (5MHz) divided by 512 (512 point FFT) or 9.765 kHz. The screen allows you to view the frequency content and any pre-emphasis schedule that you may have applied. Several fields allow you to change the display.

3.4.6.6.2.1 Hallux-PCI Card

If several Hallux-PCI cards are installed, select which card you want to view.

3.4.6.6.2.2 FFT Window

Select from Hammng, Hanning, Blackman, or Rectangular FFT windowing of the Frequency Domain window.

3.4.6.6.2.3 Frequency Domain Controls

Set the Min and Max dB point for the Frequency Domain display. This feature allows you to “zoom in” on a very specific dB range of the output multiplex. This allows you to confirm that the programmed sub-carriers are present and that the proper pre-emphasis has been applied. The X-axis of the FFT screen is scaled to 5 MHz, the max output frequency of the card. The resolution of the X-Axis of the Frequency Domain display is the total display range (5MHz) divided by 512 (512 point FFT) or 9.765 kHz.

3.4.6.6.2.4 Time Domain Controls

Set the Min and Max levels for the Time Domain display. This is the “amplitude” setting for the Time Domain display. The units of measure for the time domain is percent of programmed output level.

3.4.6.6.2.5 FIFO Controls

The FIFO controls allow you to pause and single step the display data.

3.4.6.6.2.6 Grid Controls

Select Grid at the bottom right corner of each display section to display the grid. Deselect Grid to turn the grid off.

3.4.6.6.2.7 Y Min Top Control

Select Y Min Top at the bottom right corner of each display if you want to make the top of the screen the min point.

3.4.6.6.2.8 Print

Select the print button to generate a report and send it to an installed printer.

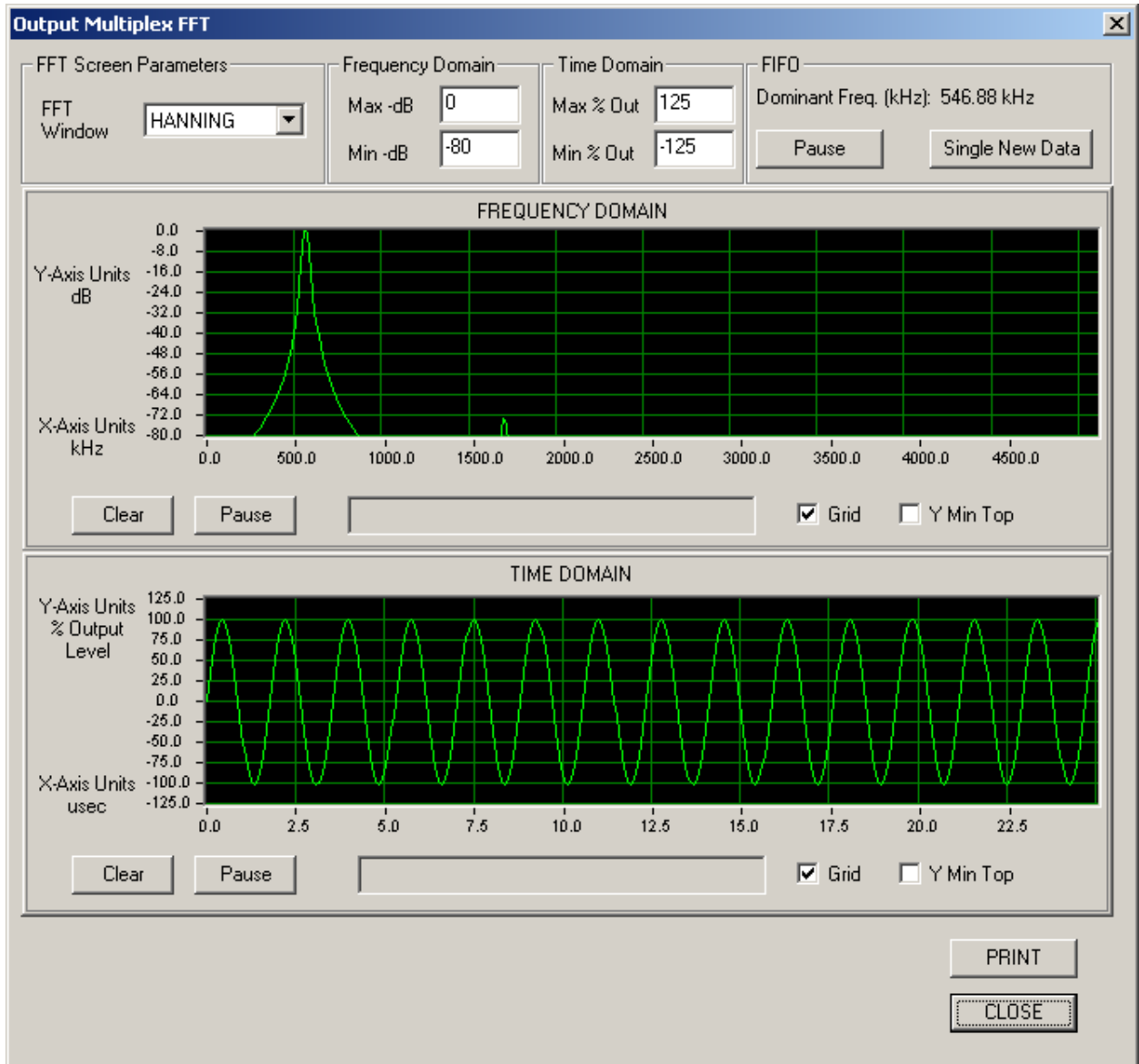


Figure 22 - FFT Screen

3.4.6.6.2.9 FFT Marker

To use the FFT Marker, move your mouse to a point of interest and click the left mouse button. A yellow marker appears. The Frequency and amplitude for that point of interest will be displayed at the bottom of the screen. For the Frequency Domain display, the X data is the Frequency in kHz. The Y data is the amplitude in dB. The resolution of the X-Axis of the Frequency Domain display is the total display range (5MHz) divided by 512 (512 point FFT) or 9.765 kHz. For the Time Domain display, the X data is time in microseconds. The Y data is the amplitude in percent of the programmed output level.

3.4.6.7 Help

Select "Manual" from the Help drop down menu to view the User Manual. Adobe Acrobat Reader version 4.0 or above is required to view the manual. Select "About" from this drop down menu to view the Software version and release date.

3.4.7 Channel Setup

The Channel Setup Screen allows the user to program specific channel information for each of the eight channels of the Hallux-PCI card. The various setup parameters are discussed below. Please note that you must click the Apply button to download any modified settings to the Hallux card. No changes will be made to the card until Apply has been clicked. Please note that the Card ID and Channel ID are displayed at the top of the channel setup screen.

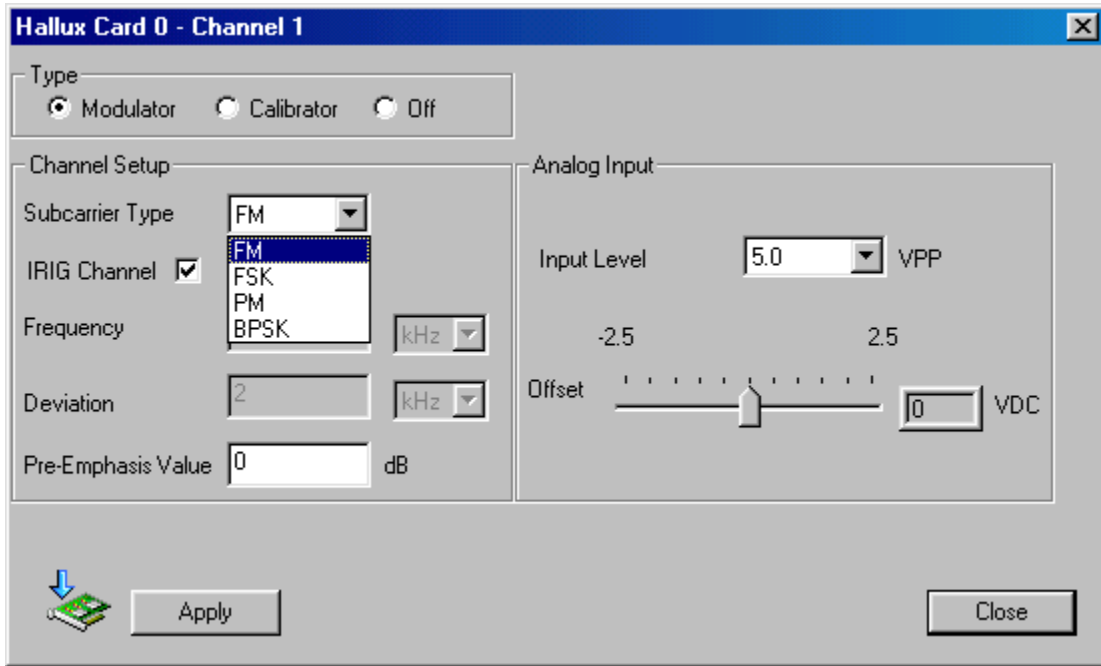


Figure 23 - Channel Setup Screen

3.4.7.1 Channel Type

Select the desired mode for the channel. Select Modulator, Calibrator, Waveform Generator or OFF. Ulyssix recommends that you turn off any unnecessary channels.

3.4.7.1.1 Modulator

Modulator channels allow you to input external data to modulate the digital VCO. The maximum input data frequency is 500 kHz. Channel frequency and deviation settings must take into consideration the frequency of the modulating data. Ulyssix recommends that the input data frequency not exceed the deviation setting for the channel. Connect the input data to the appropriately labeled BNC connector on the breakout cable that is connected to the back panel connector of the card.

3.4.7.1.1.1 Analog Input Level

The modulator channels must be configured for a specific peak-to-peak input level. This setting determines what input voltage coincides with plus and minus 100% deviation of the channel. Select the desired input level from the drop down menu. Choose from 0.5, 1.0, 2.5, and 5.0 VPP. If 5.0 VPP is selected, a -2.5 VDC input will move the sub-carrier to lower band edge and a $+2.5$ VDC input will move the subcarrier to upper band edge providing that 0.0 VDC input offset is selected.

3.4.7.1.1.2 Analog Input Offset

The Hallux-PCI card has an offset adjustment for input data that is not balanced around 0 VDC. The programmed offset voltage is applied to the input signal to create a bipolar input symmetrical around 0 VDC. Click and drag the slide button to program a value from $+2.5$ VDC to -2.5 VDC in 0.1 V increments. You can also click to the left or right of the button to change the value in 0.5V steps.

Example: If the input signal is 0.0 VDC to 5 VDC, set your input level to 5.0 VPP and set the input offset to -2.5 VDC. The programmed -2.5 VDC value will compensate for the +2.5 VDC offset on the input.

3.4.7.1.2 Calibrator

Calibrator channels will automatically or manually step through a predefined profile for specific number of steps and dwell time. Access the calibrator toolbar from the View dropdown menu. See section 3.4.6.3.4 for calibrator setup information.

3.4.7.1.3 Waveform Generator

Waveform generator mode can be used on a single channel to generate a programmable waveform patterns. The waveform type can be selected from Sine, Triangle, Saw Tooth and Square waves. The frequency is programmable from 250 Hz to 5 MHz for the Sine wave and 250 Hz to 1 MHz for all other patterns.

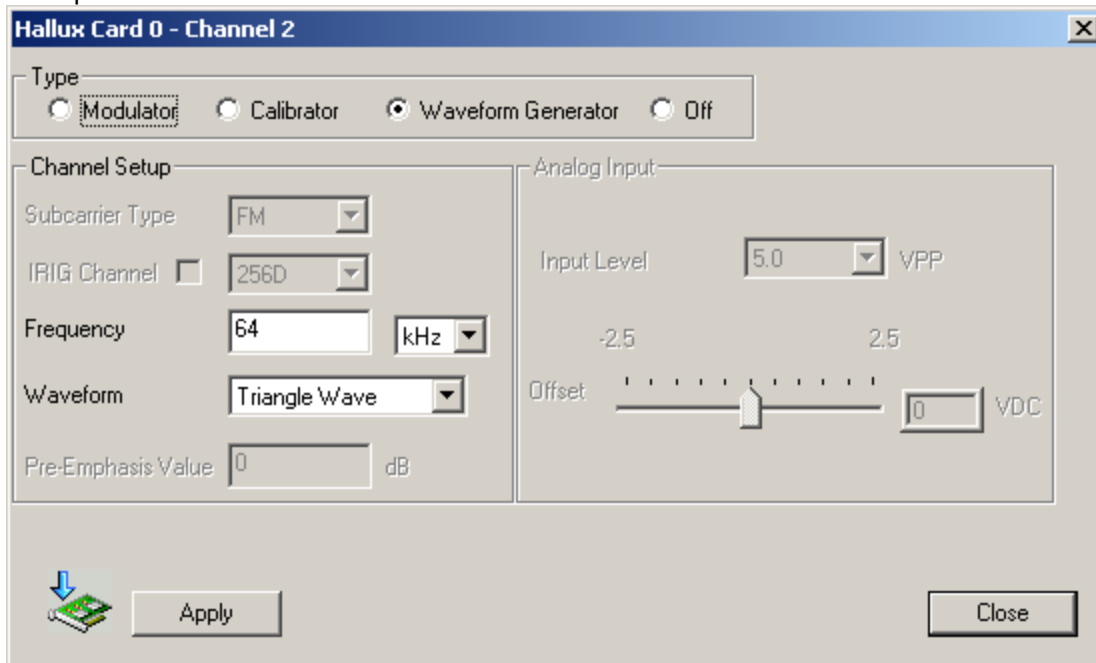


Figure 24 - Waveform Generator Setup

3.4.7.1.4 OFF

All unused channels should be turned off.

3.4.7.2 Subcarrier Type

Select the appropriate modulation mode for the selected channel from the drop down menu. Choose from FM, FSK, PM, and BPSK. See Figure above.

3.4.7.3 IRIG Channel

When a standard IRIG channel is desired, click the IRIG Channel box and select the appropriate IRIG channel from the drop down menu. The Frequency and Deviation will be automatically entered.

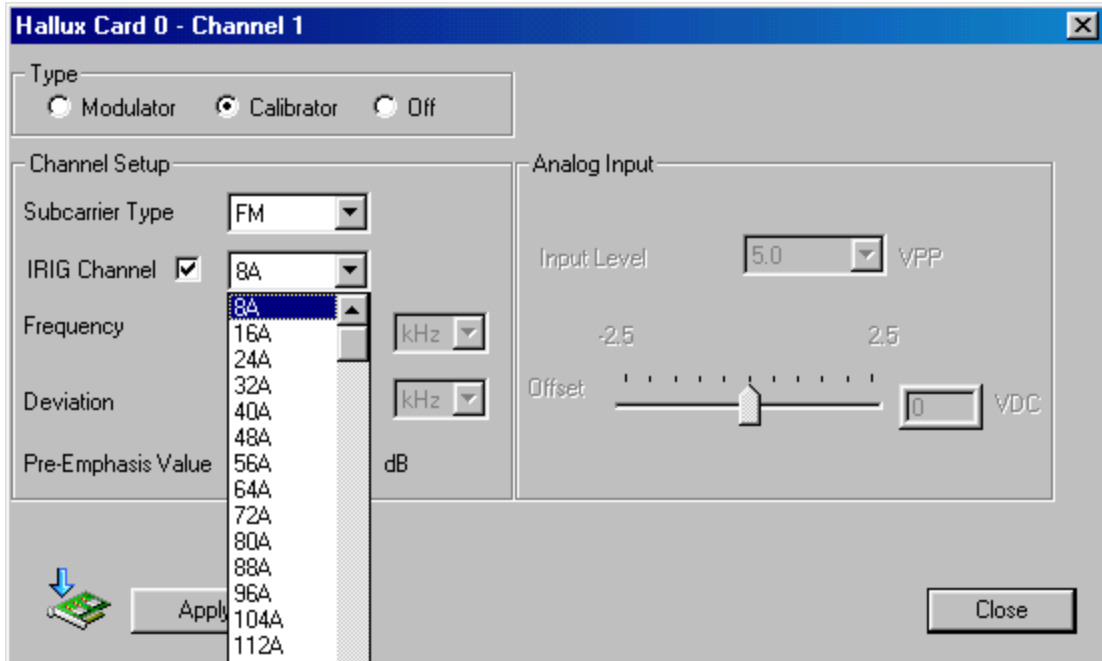


Figure 25 - IRIG Channel

3.4.7.4 Frequency

Enter the subcarrier frequency of the desired channel. The Hallux-PCI Digital Modulator/Calibrator supports IRIG and non-IRIG sub-carriers from 250 Hz to 5 MHz. Select the unit of measure from the drop down menu to the right of the Frequency. Select Hz, kHz, or MHz. The Frequency field is not accessible if you have selected an IRIG channel. It will, however, display the Frequency that corresponds to the selected IRIG channel.

3.4.7.5 Deviation

Enter the Deviation of the channel. The Hallux-PCI card supports FM deviations from 0.5 to 50% of the entered center frequency. Select the unit of measure from the drop down menu to the right of the Frequency. Select Hz, kHz, or MHz. The Deviation field is not accessible if you have selected an IRIG channel. It will, however, display the Deviation that corresponds to the selected IRIG channel.

3.4.7.6 Pre-Emphasis

A Pre-Emphasis schedule can be applied to the output multiplex. This is done by entering a value from 0 dB to -20 dB for each channel. The amplitude of the channel will be reduced by the entered value. This value is a relative value between active sub-carriers.