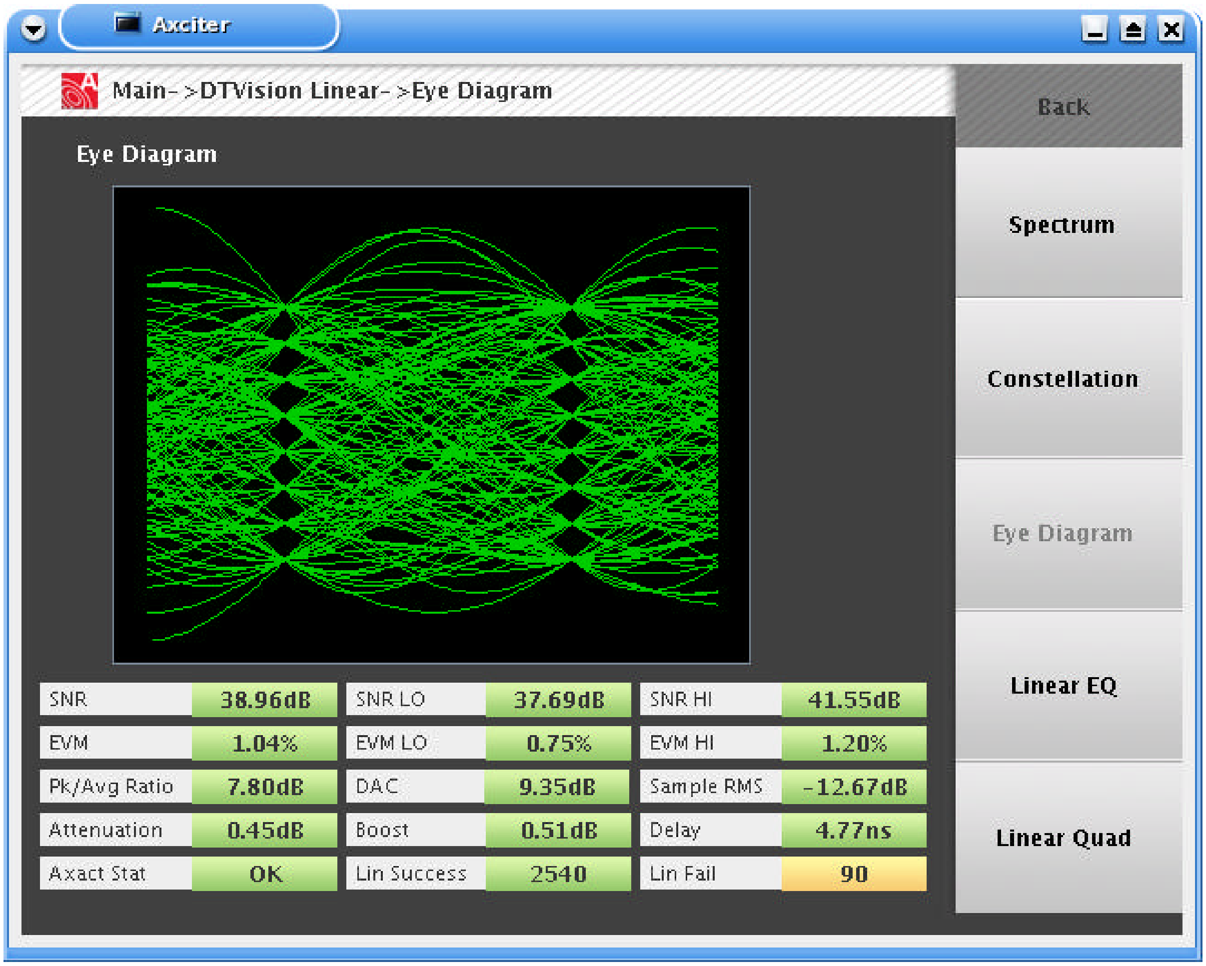
DTVision Eye Screen



I-Signal Eye Display

Graphic display of the eight data amplitude levels. This can be used to monitor the demodulated 8VSB signal. When signal is precise, the seven vertical "eyes" will appear (this display shows two sets). Linear or non-linear distortion in the modulator process will cause incorrect I-signal amplitude at center of "eye" pattern. Transmitter distortion such as group delay, frequency tilt, or ripple will cause the "eye" to close and result in receiver data errors.

.

Linear Equalizer Graph

Linear Equalizer Display:

This display shows the characteristics of the linear adaptive equalizer.

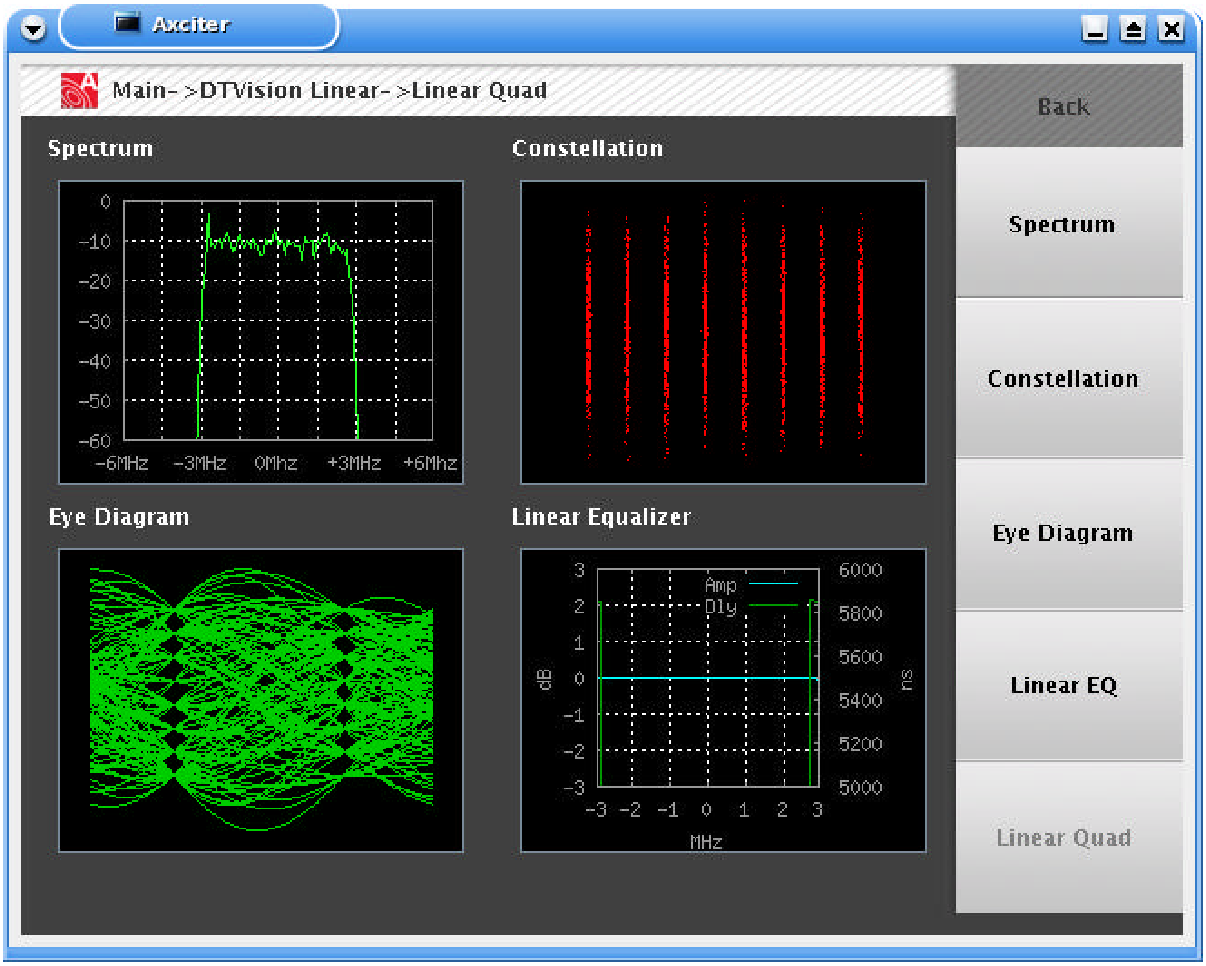
The horizontal axis is frequency (0 to 5.38 MHz).

There are two traces on this display. One shows the amplitude of the equalizer's response in decibels, and the other shows the group delay of the equalizer in nanoseconds. The vertical scale for the amplitude display is along the left side of the display. The range is always –3 to +3 decibels. The group delay scale automatically scales itself to the equalizer data, and the minimum and maximum values appear along the right side of the scale.

Since this display shows the equalizer characteristics, the channel (transmitter) characteristics, which are being corrected, will be the inverse of the equalizer. For example, if the equalizer shows a rising amplitude response with increasing frequency, then the transmitter has a falling amplitude response with increasing frequency. The same inverse relationship also holds with respect to group delay.

In normal operation, the amplitude response will be generally flat, and the group delay curve will drop off at the frequency extremes (near 0 and 5.38 MHz) because of the channel filter's group delay.

Linear Quad Display Screen



DTVision Non-Linear - Optional

This section contains information regarding the DTVision Screens. These screens are optional diagnostic screens. They are not necessary for the operation of the Axciter. However, they greatly enhance the experience. These graphs provide the same type of views as an EFA.

All of the Nonlinear screens have the following reference values displayed

EVM

The error vector magnitude (EVM) value indicates quality of the digital modulation. EVM is defined as the RMS error at the sampling instants divided by the RMS of the ideal symbols. The error is expressed as a percentage. As signal quality increases, this value decreases.

S/N

The transmitted signal quality is also expressed as an in-band signal to noise ratio, expressed in dB. As signal quality increases, this value will increase (logarithmically).

DAC Headroom

ever negative, then there is clipping in the IF modulator, nonlinear equalizer, and/or the DAC. If this happens, lower the unity gain reference point for the nonlinear equalizer.

EVM

The error vector magnitude (EVM) value indicates quality of the digital modulation. EVM is defined as the RMS error at the sampling instants divided by the RMS of the ideal symbols. The error is expressed as a percentage. As signal quality increases, this value decreases.

S/N

The transmitted signal quality is also expressed as an in-band signal to noise ratio, expressed in dB. As signal quality increases, this value will increase (logarithmically).

Digital to Analog Converter (DAC) Headroom

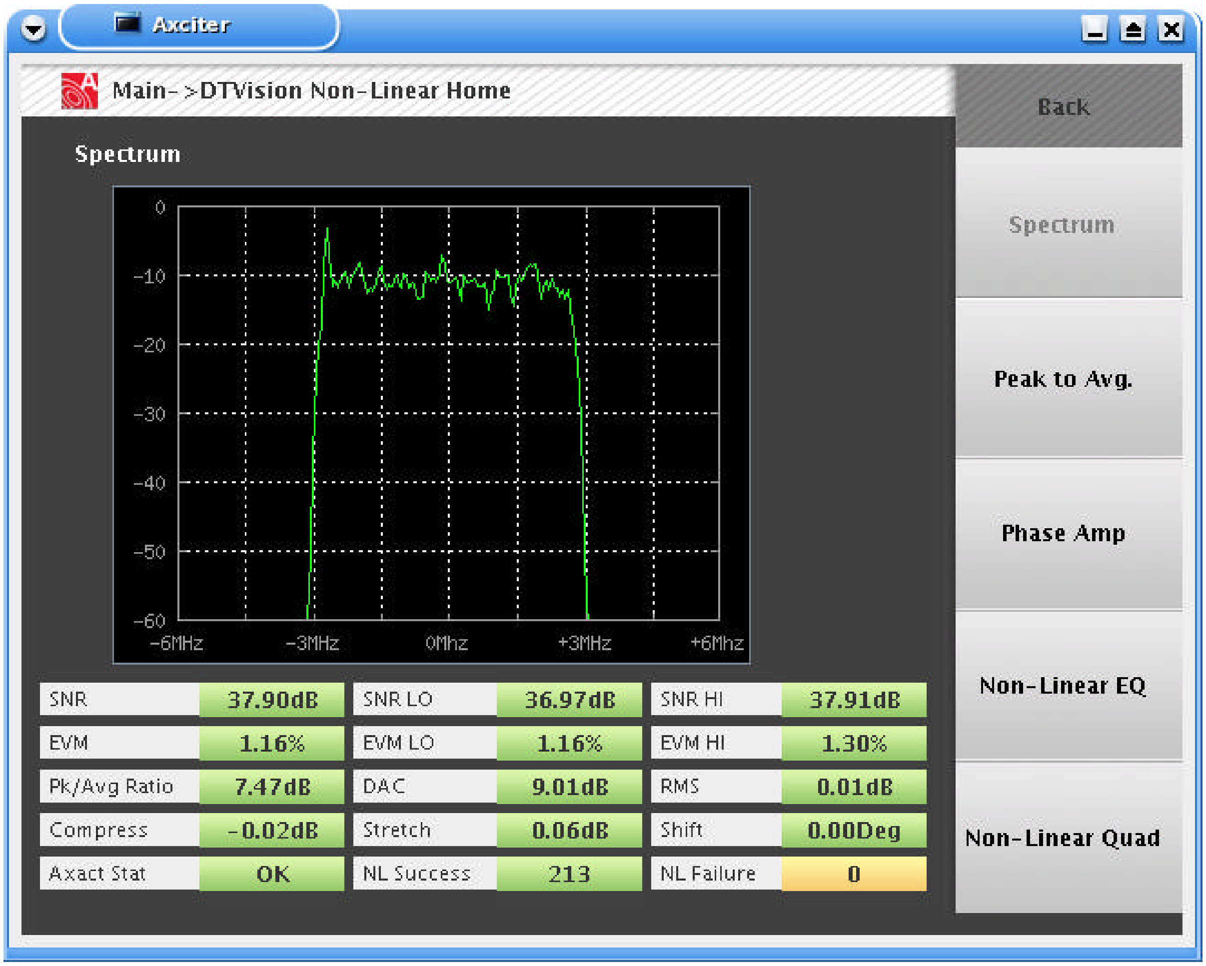
This parameter shows the amplitude (in dB) of the equalized IF signal with respect to the maximum output from the digital to analog converter (DAC). A positive value indicates normal operation and no clipping. If this value is ever negative, then there is clipping occurring in the IF modulator, nonlinear equalizer, and/or the DAC. If this happens, lower the unity gain reference point for the nonlinear equalizer.

Peak to Average Ratio

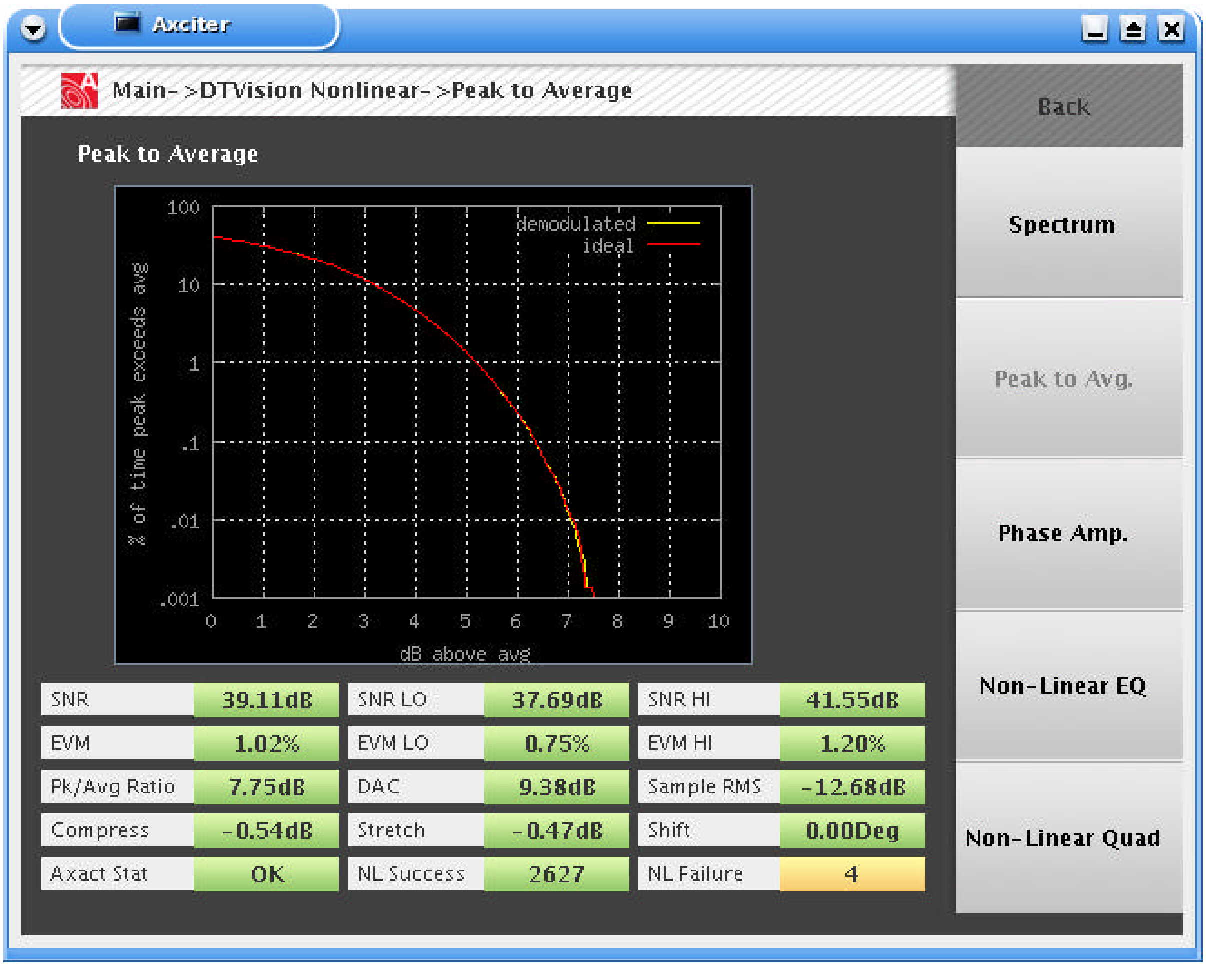
This value shows the peak to average ratio of the transmitted signal. This value is typically 6 to 8 dB for a perfect signal. A value significantly lower will indicate peak compression. A small amount of peak compression is normal.

This parameter shows the amplitude (in dB) of the equalized IF signal with respect to the maximum output from the digital to analog converter (DAC). A positive value indicates normal operation and no clipping.

DTVision Non-Linear Home/Spectrum Screen



DTVision Peak to Average Screen



Peak to Average Ratio Display:

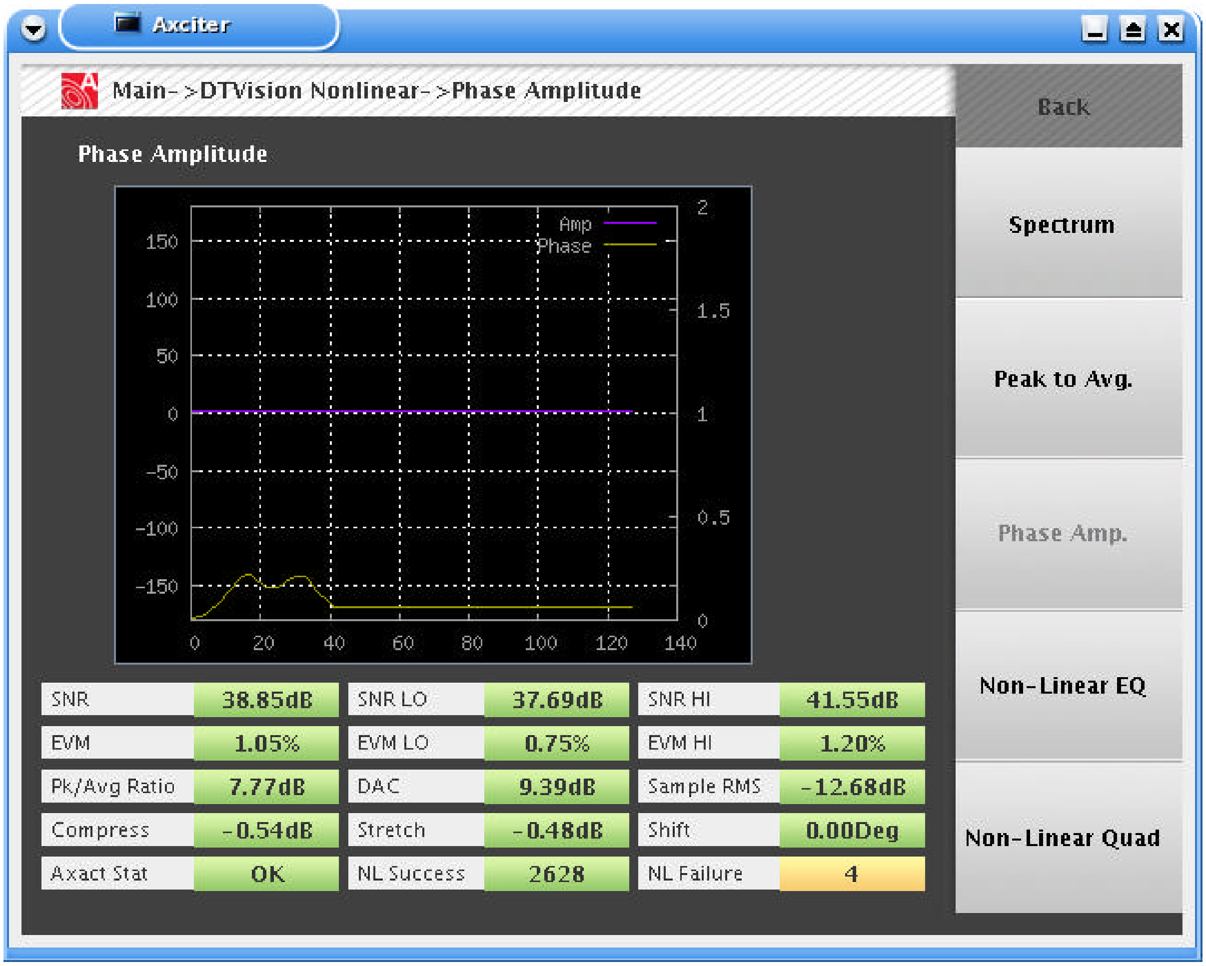
This screen shows the peak to average ratio in a statistical fashion. The red trace shows the ideal signal's peak to average ratio statistics, and the yellow trace shows the statistics of the transmitter's output.

The curves show the cumulative distribution function of the peak to average ratio's probability density.

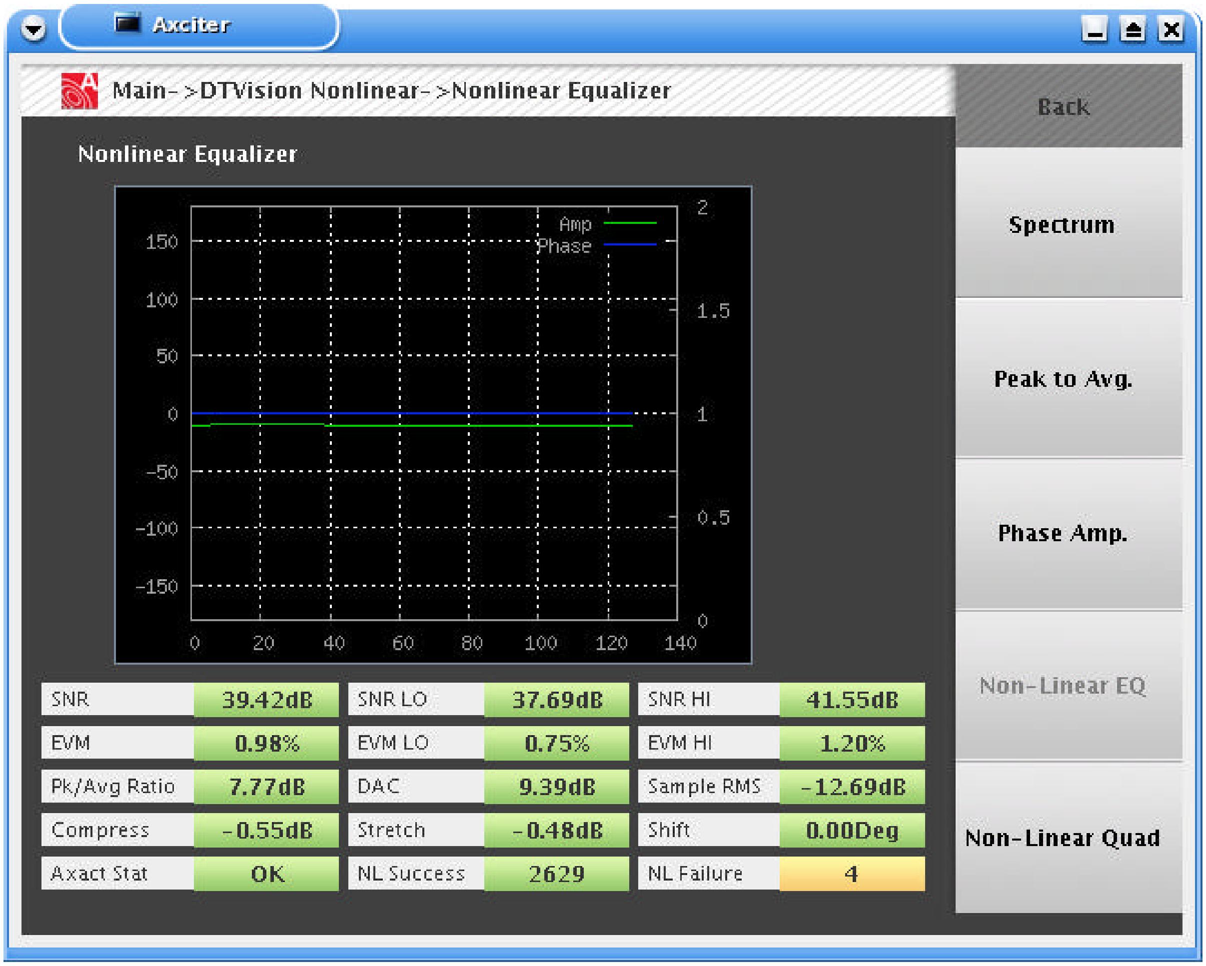
The horizontal scale shows the peak to average ratio measured in decibels. The vertical scale shows the percentage of the time that the peak to average ratio exceeds the value on the horizontal scale. The vertical scale is logarithmic.

When the transmitter is clipping signal peaks, the low probability, high peak to average portion of the (yellow) curve for the transmitter's output will appear to the right of the (red) curve indicating the ideal signal.

Nonlinear Phase Amplitude Display



Nonlinear Equalizer Display

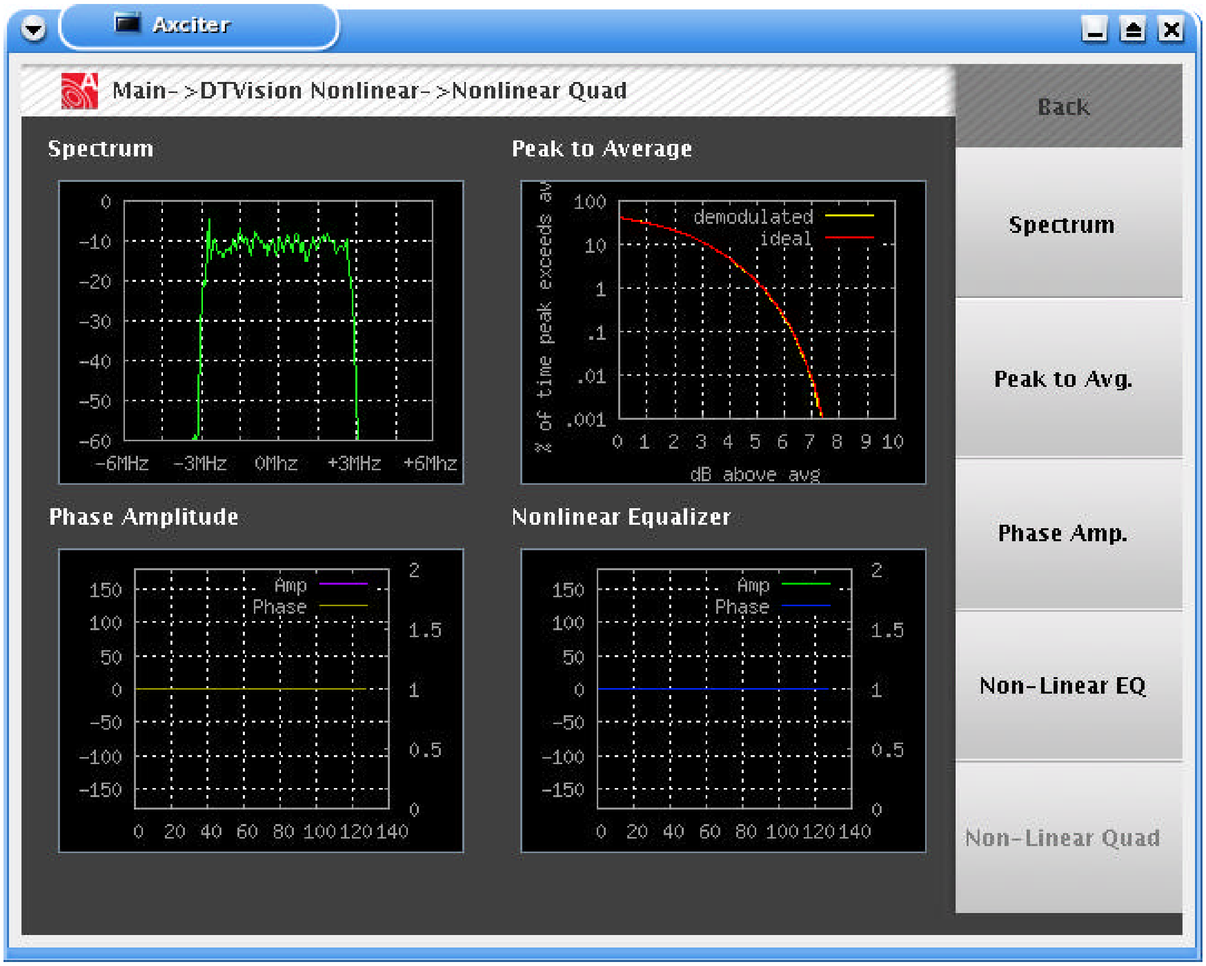


Nonlinear Equalizer Display:

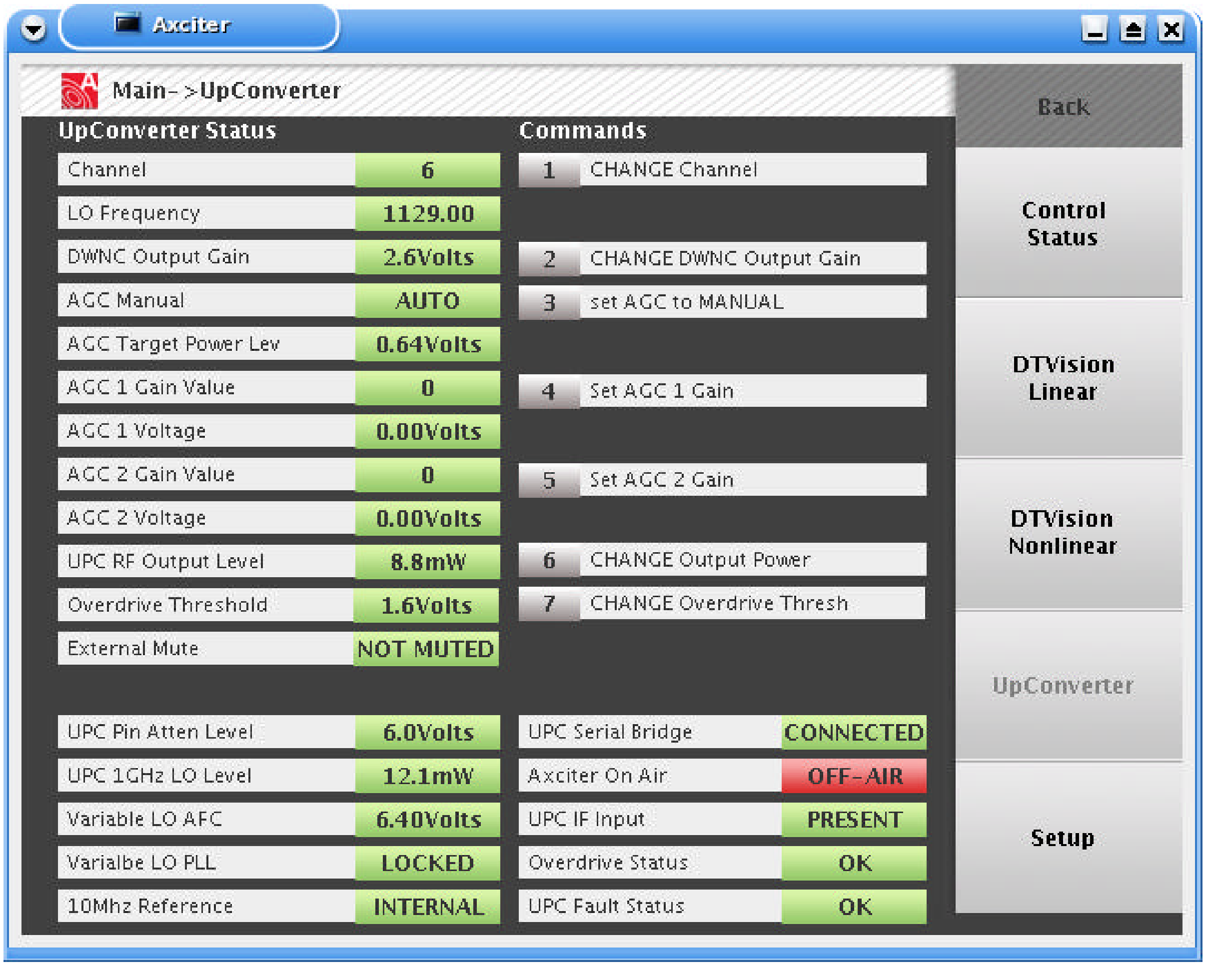
This display shows the nonlinear corrections being applied to the signal to correct for the RF power amplifier's envelope compression and incidental phase modulation. The horizontal axis is the ideal RF envelope magnitude. The yellow magnitude trace shows the instantaneous gain correction being applied to the signal as a function of the desired envelope amplitude, to correct for amplitude compression in the power amplifier. The red phase trace shows the amount of phase correction being applied to correct for the power amplifier's incidental phase modulation.

As the ideal amplitude becomes large (corresponding to the right part of the display), the probability density function of the ideal envelope magnitude becomes very small or zero. So, data in the right hand portion of the display will generally be extrapolated. Also, the magnitude equalization characteristic may also drop off, to accomplish clipping and to prevent overflow of the data feeding the DAC.

Nonlinear Quad Display Screen



Upconverter Screen



This screen shows controls and status values related to the upconverter.

Channel Select:

Entering a number in this box selects the channel. Channels 2-6 are VHF low band, 7-13 are VHF high band, and channels 14-69 are UHF. (If the channel number is ever changed, the channel filter in the upconverter will need to be replaced or retuned to the new channel.)

LO Frequency

DWNC Output Gain

AGC Manual

AGC Target Power Level

AGC 1 Gain Value

AGC 1 Voltage

AGC 2 Gain Value

AGC 2 Voltage

UPC RF Output Level

Overdrive Threshold

External Mute

UPC Pin Attenuation Level

UPC 1GHz LO Level

Variable LO AFC

Variable LO PLL

10MHz Reference

UPC Serial Bridge

This value indicates whether or not the Serial Bridge between the Netburner and the Micro ATX computer is up and operational.

Axciter On Air

This value indicates if this Axciter is On Air. This value is received from the UP/DWN converter.

UPC IF Input

Overdrive Status

UPC Fault Status

Setup Screen

Debug Level

This value shows the Current Debug level of the Fox Control Software. During normal operation this value will be set to zero (0). However, if problems are encountered this number can be adjusted to add information to the log file. To change the level use command one (1). Valid debug levels range from zero (0) to three(3).

Adaptive SNR Threshold

This value shows the Current Signal to Noise Ratio Threshold. When Adaptive SNR reaches this level it no longer changes the equalizers. To change the Threshold use command number two (2) and enter a value between 25 and 50.

Axact Good Files

This shows the number of “good” files that AXACT produces. These are debug log files. The good files have AXACT information in them. To change this value select command three (3) and enter a value between 0 and 99.

Axact Bad Files

This shows the number of "bad" files that AXACT produces. These files are for debug purposes and currently only point to a good file. To change this value select command four (4) and enter a value between 0 and 99.

External 10MHz Expected

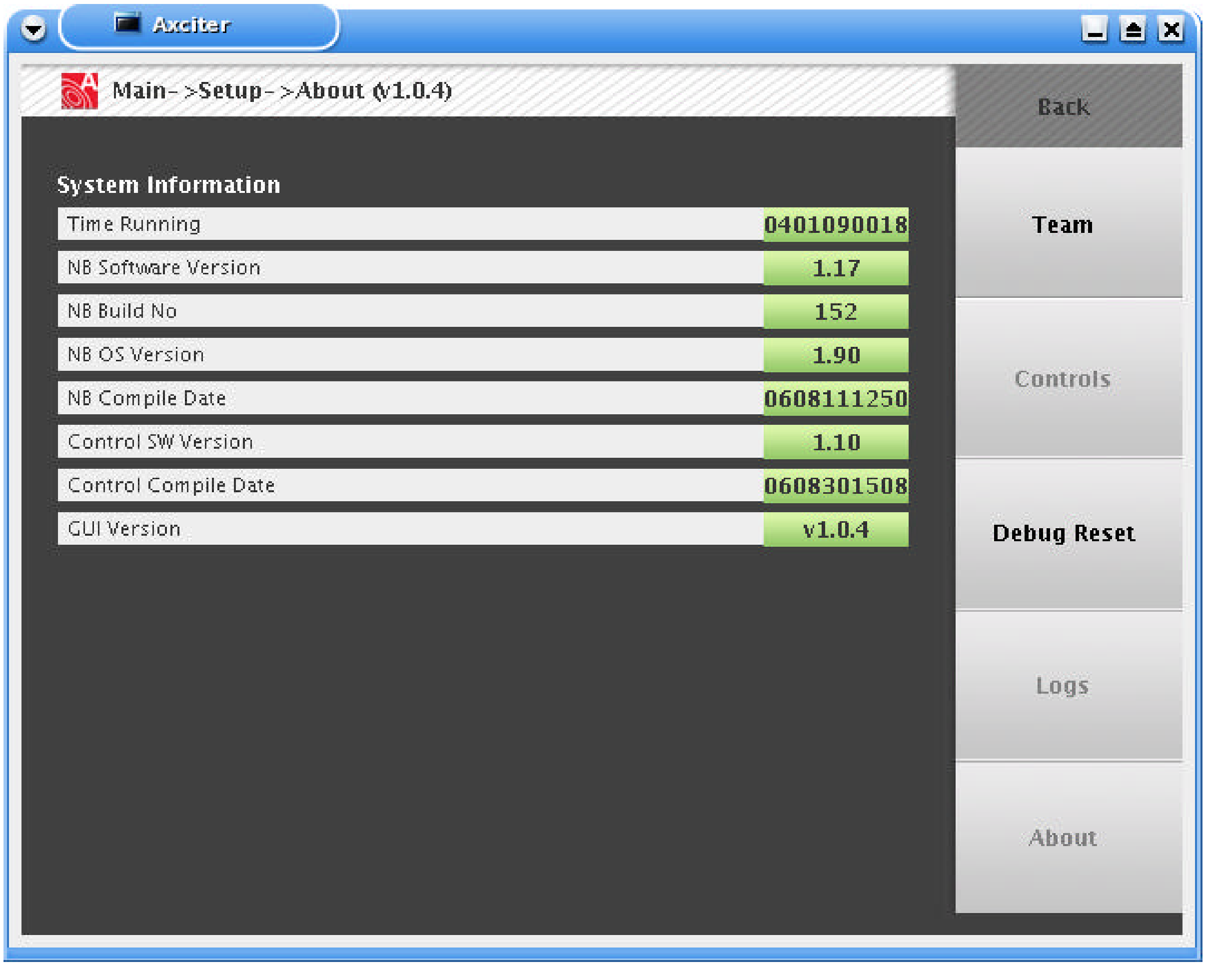
This value reflects

Ignore External Reference

Operate/Standby Status

Adaptive in Standby

Debug Reset



Time Running

NB Software Version

NB OS Version

NB Compile Date

Control SW Version

Control Compile Date

GUI Version

Chapter 3: Upconverter/Downconverter Tray or Module Assemblies

Upconverter/Downconverter Tray and Modules Overview

(**NOTE:** The boards contained in the stand alone Upconverter/ Downconverter tray and the boards contained in the Upconverter and Downconverter sled assemblies are the same.)

The Upconverter/Downconverter Tray, used with Visionary IOT Transmitters, contains (A7) a Final Conversion Board, Axciter (1307263), (A5) a First Conversion Board (1306759), (A4) a L-Band PLL Board, Axciter (1307206), (A3) an AGC Control Board, Axciter (1307366), (A2) an Interface Board (1307383) and (A6) a Downconverter Board (1306807).

The Upconverter Sled and Downconverter Sled Assemblies are used with Innovator Solid State Transmitters. The Upconverter Module Assembly (1306850) contains (A2) a Final Conversion Board, Axciter (1307263), (A3) a First Conversion Board (1306759), (A4) a L-Band PLL Board, Axciter (1307206) and (A1) an AGC Control Board, Axciter (1307366). The Downconverter Module Assembly (1306852) contains (A1) a Downconverter Board (1306807). These two modules operate identically to the Upconverter/Downconverter tray.

The 44 MHz IF input, -6 dBm in level, to the upconverter module assembly is applied through the backplane board from the modulated IF input jack located on the rear of the HX or LX exciter/driver chassis assembly. The 44 MHz IF input to the upconverter/downconverter tray connects through J5, the IF input jack located on the rear panel. The signal connects to the First Conversion board and is converted to a second IF of 1044 MHz by an image rejection mixer located on the First Conversion board. A filter selects the appropriate conversion product, which is then amplified to a level of approximately –8 dBm. The 1 GHz LO frequency is generated externally by the Axciter modulator and is applied to a high pass and low pass filter designed to eliminate any other interfering signals that might be coupled into the 1 GHz LO. The LO is applied to an ALC circuit that maintains the LO level to each mixer of +13 dBm over a wide range of 1 GHz LO input levels. The LO sample is also sent to the Downconverter board inside the tray or to the external Downconverter module for its use.

This second IF signal is then applied to a second mixer mounted on the Final Conversion board that converts it back to a broadcast channel (2-69) by an LO that operates in 1.0 MHz steps between 1.1-1.9 GHz depending on the channel selected. The LO frequency equals the Channel center frequency plus 1044 MHz. (As an example CH: 14: Center Frequency is 473.00 MHz therefore LO2 is 473 + 1044, which equals 1517.00 MHz.)

The output of the mixer is applied to a 900 MHz Low pass filter to remove unwanted conversion products. The resulting signal is amplified and wired to a Pin diode attenuator and then connected to the output of the Upconverter/Downconverter Tray or the output of the Upconverter Module. This pin diode attenuator adjusts the gain of the tray or module and is controlled by an Automatic Gain Control circuit, which maintains a constant power out of the upconverter, and also the transmitter, that connects to the power amplifier module.

The Axciter upconverter/downconverter tray or modules have no need for periodic alignment. This section describes the boards that make up the upconverter and downconverter in each system. The Axciter and its associated upconverter require some signals to be interchanged between them such as IF in and IF out. Please refer to the interconnect drawing of the particular transmitter to determine how these connections are made.

Upconverter / Downconverter Board Descriptions

Final Conversion Board, Axciter (1307263)

This board converts a signal at an input frequency of 1044 MHz to a broadcast VHF or UHF TV channel.

The IF at 1044MHz is applied to the board at J7, and is converted down to VHF or UHF by the mixer IC U6. The LO frequency is applied to the board at a level of +20 dBm at J8. The output of the mixer is applied to a 6 dB attenuator and then to a 900 MHz Low Pass filter. The filter is intended to remove any unwanted conversion products. The signal is next connected to the amplifier U2, and then a pin diode attenuator consisting of DS4, DS5 and their associated components. The attenuator sets the output level of the board and is controlled by an external AGC circuit.

The output of the pin attenuator is applied to another amplifier U3 and another low pass filter, before reaching the final amplifier U1. The output of the board is at J5 with a sample of the output available at J6, which is 20 dB in level below the signal at J5. A sample of the output is also applied to an average power detector for remote metering.

L-Band PLL Board, Axciter (1307206)

This board generates an LO at a frequency of 1.1-1.9 GHz. The board contains a PLL IC U6, which controls the output frequency of a VCO. The PLL IC divides the output of the VCO down to 1.0 MHz, and compares it to a 1.0 MHz reference created by dividing down an external 10 MHz reference that is applied to the board at J1 pin 4. The IC generates an error current that is applied to U3 and its associated components to generate a bias voltage for the VCO's AFC input.

There are two VCOs on the board, U4, which operates at 1.1-1.3 GHz for VHF channels, and U5, which operates at 1.5-1.9 GHz for UHF channels. The VCO in use is selected by a signal applied to J1 pin 20. This input enables the power supply either U1 or U2 for the appropriate VCO for the desired channel. U7 is a power supply IC that generates +5V for the PLL IC U6.

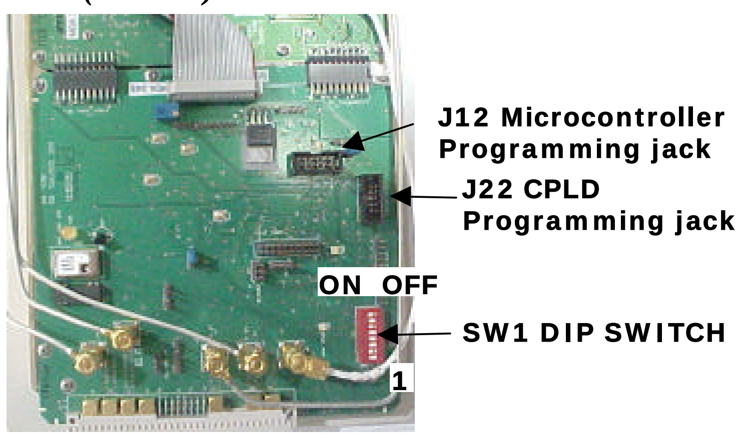
The output of each VCO is filtered by a low pass filter to remove any harmonic content and applied to a pin diode switch consisting of CR1, CR2, and their associated components. The selected signal is amplified by U9 and U10, then applied to a high pass filter and finally amplified to a level of approximately +21 dBm by U11. The output is connected to a low pass filter to remove any unwanted harmonic content and leaves the board at J3 at a level of +20 dBm.

First Conversion Board, Axciter (1306759)

This board takes an external 1 GHz LO and filters and adjust its level to +10 dBm into each of the two mixers used in the image rejection mixer.

The LO is applied to a low pass filter before being connected to an image rejection mixer consisting of U1, U2, U3 and U7. The 44 MHz IF input is connected to the board at J5, is applied to a frequency response network consisting of R87-R89, L20-22, C60-62 and associated components. It then is applied to the image rejection mixer. This mixer converts the 44 MHz input to an output frequency of 1044 MHz. The output of the mixer is amplified by U4 and applied to ceramic band pass filter U5. This filter rejects any LO leakage at 1 GHz and also any unwanted out of band products. The output of the filter is amplified by U6 and then filtered before exiting the board at J1.

AGC Control Board, Axciter (1307366)



AGC Control Board, Axciter

This board performs a variety of functions, which include an interface between the other boards in the upconverter and the rest of the transmitter. It also has a microcontroller U8, which controls and monitors the functions of the other boards in the assembly.

The microcontroller communicates via an RS-485 interface with the transmitter's system control module. It reports any faults and metering information and receives channel information, which it passes along to the PLLs on the L-Band PLL Board and the First Conversion Board.

The board also generates various voltages used by the rest of the boards in the upconverter. U9 converts the +12V input to the board to +20V. U15 converts +12V to +5V for the on board 10 MHz crystal oscillator.

U12 converts +12V to +9V for the L-Band PLL board and the First Conversion board. U13 and U14 generate +5V for the microcontroller.

The board also selects whether the internal or external 10 MHz reference source will be used. There is an onboard 10 MHz oscillator, U3, which is used when no external 10 MHz source is present. The Relay K1 is automatically switched to the external 10 MHz reference whenever it is present. The LED DS1 illuminates whenever the internal 10 MHz reference is used. The diode detector CR1 detects the presence of the 10 MHz external reference, that connects to U2, which compares the detected level to a reference level and switches the relay whenever the reference is present. It also disables the internal oscillator whenever the external 10 MHz reference is being used. The output of the relay is split to drive multiple outputs, some internal and some external. The external outputs leave the board at J1-22C and J1-31B and are used by the external receiver and modulator modules.

The board also contains AGC circuitry, which controls a pin diode attenuator on the Downconverter Board. There are three references used by the AGC circuit. The first is the AGC reference #1, which comes from the transmitter's driver module. The second is the AGC reference #2, which is a diode-ORed sample of the output stages of the transmitter. The IC U5 normalizes the level of the AGC reference # 1 and sets it at a level that is 0.2V less than the level of AGC reference #2. The AGC reference #1 and #2 are diode-ORed with only the highest reference used by the AGC circuit.

The highest reference is compared to the ALC reference, which originated on the IF processor module, and the error voltage generated by U4D and applied to the external pin attenuator. The AGC will try to maintain a constant ratio between the ALC voltages and the higher of the two AGC voltages. If something in the output amplifier of the transmitter fails, the AGC reference #1 voltage will take over and the power will be regulated at the output of the driver.

Located on the board is the DIP switch SW1. See the picture above. The function of each position is stated in the following text. We have added the use of position 5 to allow or disable the changing RF output power while the Upconverter is in Auto AGC Mode.

Upconverter DIP Switch SW1	**Function**
Position 1	Master/Slave, **ON** turns control board into RS-485 master. This is used when there is **ONLY** a tray based upconverter and Axciter in the system.
Position 2	Mute Orientation - Reverses the polarity of the MUTE input from the remote connector on the rear panel of the Upconverter. In the **OFF** position, the Upconverter requires a pull down to come out of mute.
Position 3-4	Not Used
Position 5	Disable Auto AGC Power Changes. **OFF** allows power adjustments to be made while the Upconverter is in Auto AGC mode. **ON** does not allow power adjustment when the Upconverter is in Auto AGC mode.

Upconverter DIP Switch SW1	Function
Position 6	AGC 1 and 2 Gain Modify Enable. **ON** enables the user to modify AGC1 gain and AGC 2 gain through the Axciter
Position 7	Upconverter Lockout- **ON** locks out all commands from the Axciter
Position 8	Frequency Modify Enable. **ON** enables the user to modify the Frequency through the Axciter

The upconverter provides the frequency translation necessary to convert the IF output signal of the Axciter to the assigned channel frequency. The upconverter is 100% synthesized using PLL techniques so no crystal changes are required to operate on any standard U.S. TV channel.

A 10 MHz signal is required as a reference for the two PLL systems on the IF and RF board. The IF board contains a 10 MHz oven controlled crystal oscillator (OCXO) for this purpose. If synchronous or precise frequency control is required, an external 10 MHz reference can be applied through an external connector that is connected to the IF board. The 10 MHz reference (internal or external) is also provided as a buffered output for use by the Axciter Upconverter/Downconverter.

Downconverter Board, Axciter (1306807)

A sample of the transmitter's RF output is applied to the downconverter board, mounted in the tray or the downconverter module, at a nominal input level of –6 dBm. The signal is attenuated by a 10 dB pad, and then converted to an IF of 1044 MHz by mixer U1. A sample of the upconversion LO from the L-Band PLL Board mounted in the upconverter module assembly is sent through the exciter's backplane board, or directly to the board in the stand alone tray. On the downconverter board, the LO is amplified and then filtered to remove any spurious energy before being applied to U1.

A filter selects the appropriate conversion product, with the resulting signal being applied to the mixer U9, which converts the signal to a second IF of 44 MHz. A 1 GHz LO frequency that is generated externally, and either sent through the exciter's backplane board to the downconverter module or connected from the 1st conversion board in the stand alone tray. The 1 GHz LO is applied to a high pass and low pass filter designed to eliminate any other interfering signals that might be coupled into the 1 GHz LO. This 44 MHz second IF signal is then applied to a low pass filter to remove any out of band energy, amplified and connected to a frequency response correction circuit intended to compensate for any linear distortions in the downconversion path. Adjustments R50-R52 and C78-C80 are used to control the frequency response of the downconverter. The resulting signal is sent to a pin diode attenuator, which allows the operator to adjust the gain of the downconversion path. The signal is then amplified again to a level of +4 dBm average and applied to a cascaded high pass low pass filter, which removes any out of band energy that would be aliased in the demodulation process.

Chapter 4: Axciter Modulator and Transmitter Set Up Procedures

Axciter Alignment Overview

It is one of the features of the Axciter that it has no internal adjustments that are made on it's circuitry. There is not even an adjustable pot, capacitor, or coil anywhere on the boards. This is made possible through the use of almost entirely digital electronics that are under software control. Even component aging should not put the unit out of normal operation.

Several system parameters are adjusted through the user interface screens, such as power output, AGC levels, etc. Mostly this is through commands sent from the Axciter to the upconverter. Proper setting of these parameters is system dependent, and other systems manuals should be referenced for information on their setting.

Transmitter Set Up Procedures

System Preparation

This Exciter Digital transmitter was aligned at the factory and should not require additional adjustments to achieve normal operation.

The Sled-Based System is made up of an Axciter Modulator Tray and a LX or HX Driver/Amplifier Assembly that contains an Axciter Downconverter Sled and an Axciter Upconverter Sled.

Each Module, in the Driver/Amplifier Chassis Assembly, has an assigned slot and will not fit properly or operate in the incorrect slot. Do not try to place a Module in the wrong slot as this may damage the slot or the connectors on the backplane board. Each module has the name of the module on the front, bottom for identification and correct placement. The Modules are placed in the HX or LX Amplifier/Driver Chassis Assembly from left to right; (1) Axciter Downconverter, (2) Blank panel, (3) Blank Panel, (4) Axciter Upconverter, (5) Controller/Power Supply and (6) Driver Power Amplifier.

Initial Test Set Up

This section describes the set up of the Axciter Modulator Sled-Based system. The Axciter Modulator takes the SMPTE 310 digital stream input and converts it to the desired On Channel RF Output that is amplified to produce the systems output power level.

Check that the RF output at the DTV Mask Filter is terminated into a dummy load of at least the rated output of the system or connected to the antenna for your system. While performing the alignment, refer to the Test Data Sheet for the transmitter and compare the final readings from the factory with the readings on each of the modules. The readings should be very similar. If a reading is way off, the problem is likely to be in that module.

Switch On the main AC for the system and the individual circuit breakers on the cabinets and assemblies. Check that AC is present to all systems.

This transmitter operates using a SMPTE 310M input that connects to J27, the SMTE Input Jack, located on the rear of the Axciter Modulator Tray. Check that the SMTE input is present. If the (Optional) external 10 MHz input from the GPS is used, check that it is connected to J9 on the Axciter Modulator.

The LCD screen, located at the front of the Control/Power Supply Module in the Exciter Driver/Amplifier Assembly, controls the functional operation of the transmitter and in turn the exciter.

The check of and the setup of the drive levels are completed using the LCD Display and the front panel adjustments located on the Axciter Modulator Tray. The level of the RF output which includes adjustment of the drive level of the Intermediate Power Amplifier and the adjustment of the linearity and phase pre-distortion to compensate for any nonlinear response of the Power Amplifiers are controlled within the Axciter Modulator Tray.

Setting Up the Output Power of the Transmitter in Sled-Based System

The following adjustments are completed using the LCD screen located on the front panel of the Axciter Modulator Tray. On the Axciter Main Screen, push the button next to the Upconverter tab on the right side of the screen. This will open the Upconverter Main Screen. Set the AGC to Manual by selecting 3 on the keyboard entry. The screen will now indicate AGC Manual. Set the transmitter to full power using the Driver/Amplifier LCD display while viewing the Power Control Screen in the Set Up Menu.

Setting up of AGC 1

To set up the AGC, first the AGC must be activated. Locate the 8 position DIP switch SW1 mounted on the Control Board in the Axciter Upconverter Sled, mounted in the Driver/Amplifier Chassis Assembly. The Upconverter DIP Switch Positions 6 and 8 must be switched ON which allows the user to modify the AGC 1 and AGC 2 gain through the Axciter Modulator.

On the Axciter Upconverter Screen, set AGC 1 to 1.5 Volts, by selecting 4 on the key board entry. This will cause a detail screen to appear prompting you to enter a number value. Monitor the AGC 1 Gain Value on the screen and increase or decrease the value of the number entered until the monitored reading is 1.5 Volts.

Setting up of AGC 2

On the Axciter Upconverter Screen, set AGC 2 to 1.7 Volts, by selecting 5 on the keyboard entry. This will cause a detail screen to appear prompting you to enter a number value. Monitor the AGC 2 Gain Value on the screen and increase or decrease the value of the number entered until the monitored reading is 1.7 Volts.

After the setting up of the AGC, the AGC must be de-activated to prevent accidental changes. The Upconverter DIP Switch SW1 Positions 6 and 8 must be switched OFF which locks the AGC 1 and AGC 2 gain.

Setting up of Overdrive Threshold

On the Axciter Upconverter Screen set the Overdrive Threshold to 1.6 Volts, by selecting 7 on the keyboard entry. This will cause a detail screen to appear. Increase or decrease the voltage as needed until the monitored reading is 1.6 Volts.

Place the Transmitter into AGC by pushing the 3 of the keyboard entry on the Axciter Upconverter Screen. This will place the Transmitter AGC into Auto.

(K2) Axciter Pre and Post Filter Sample Values

RF samples, to the external Axciter Relay, in a sled-based system, or to the rear of the Upconverter/Downconverter tray, in a tray-based system:
These levels should be measured with a power meter before connecting them. Your installation may require RF attenuators to be placed in line with the samples to get them within the desired range.

J1 on the Relay or J17 on the Upconverter Tray is the connection to the Forward power sample of the coupler before the mask filter, Pre-Filter Sample.
Level into the Relay at J1 or the Upconverter Tray at J17 should be 0 dBm to –10 dBm.
–5 dBm typical

J2 on the Relay or J16 on the Upconverter Tray is the connection to the Forward power sample after the mask filter, Post-Filter Sample.
Level into the Relay at J2 or the Upconverter Tray at J16 should be 0 dBm to –10 dBm.
–5 dBm typical, but within .5 dB of the Pre-Filter sample.

Upconverter Down Converter Adjustment

On the Axciter Modulator, activate the Upconverter Main screen by selecting Upconverter using the button next to it on the right side of the Axciter Main Screen. Activate the Downconverter Output Gain by pushing 2 on the key board entry. Monitor the DTVision Linear Display by pushing the button next to the DTVision Linear display on the right side of the Axciter Main Screen. At the bottom of the DTVision linear screen, locate the reading next to RMS. If this reading is between –10 dBm & 0 dBm no adjustment is needed. If it is not, adjust the "Downconverter Gain", then view the RMS value until it is within the –10 dBm to 0 dBm range.

System Calibration of Forward and Reflected Powers Using the HX or LX Driver/Amplifier, in Sled-Based Systems

NOTE: Perform the following procedures only if power calibration is suspect.

Forward Power Calibration

Check that transmitter is at 100% output power, as shown on the LCD display, on the Control/Power Supply Sled in the Driver/Amplifier, with the display in the Set Up menus.

Measure with a VOM, TP31-14, Red, and TP31-12, Black, at the terminal block TP31 located on the rear chassis of the Driver/Amplifier Chassis Assembly. Adjust R9, Forward Calibration Adjustment, on the Dual Peak Detector Board (1159965) for a reading of .8VDC on the VOM. Locate the Forward Power Adjust screen, in the Set Up menus of the LCD display on the Control/Power Supply Sled in the Driver/Amplifier, and adjust the up or down arrow as needed to achieve 100 % output power.

This completes the forward power set up.

Reflected Power Calibration

Switch the transmitter to Standby. Remove the connector that is on Jack J2, on the Dual Peak Detector Board (1159965), and replace with the connector now on J1, also inserting a 10 dB pad in series. Switch the transmitter to operate. Monitor the LCD display in the Set Up menus, reflected power screen, located on the Control/Power Supply Sled mounted in the Driver/Amplifier. Adjust R10, Reflected Calibration Adjustment, on the Dual Peak Detector Board (1159965) for a reading of 10% on the display. Switch the transmitter to Standby. Move the connector back to J1 while removing the 10 dB pad. Replace the original connector onto J2. Switch the transmitter to Operate.

This completes the set up and adjustment of the transmitter using the Axciter Modulator in a Sled-Based System.

If a problem occurred during set up, contact Axcera field service at 1-(724) 873-8100.

Chapter 5: Maintenance

Maintenance

The Axciter is designed with components that require little or no periodic maintenance except for the routine cleaning of the fan and the front panels of the trays.

The amount of time between cleanings depends on the conditions within the transmitter room. While the electronics have been designed to function even if covered with dust, a heavy buildup of dust, dirt, or insects will affect the cooling of the components. This could lead to a thermal shutdown or premature failure of the affected trays.

When the front panels of the trays become dust-covered, the top covers should be removed and any accumulated foreign material should be removed. A vacuum cleaner, utilizing a small wand-type attachment, is an excellent way to suction out the dirt. Alcohol and other cleaning agents should not be used unless you are certain that the solvents will not damage the components or the silk-screened markings on the trays and the boards. Water-based cleaners can be used, but do not saturate the components. The fans and heatsinks should be cleaned of all dust or dirt to permit the free flow of air for cooling purposes.

It is recommended that the operating parameters of the system be recorded from the LCD display screen at least once a month. It is suggested that this data be retained in a rugged folder or envelope. Photocopies of the log sheet should be made for future data entries.

Appendix A: System & Modulator Drawings

Axciter System, Stand-Alone (Used with Visionary Series IOT Transmitters)
(The system contains an Axciter Modulator Tray 1305842 and an Upconverter/ Downconverter Tray 1307394)

OR

Axciter System, Sled-Based (Used with LX & HX Series Transmitters)
(The system contains an Axciter Modulator Tray 1305842, an Upconverter Module Assembly 1306850 and a Downconverter Module Assembly 1306852)

Axciter Modulator Tray

VSB Modulator Board, Axciter

Appendix B: Upconverter/Downconverter Tray Drawings (Used with Visionary IOT Transmitters

Appendix C: Upconverter and Downconverter Module Assembly Drawings (Used with Innovator LX & HX Series Transmitters)

Appendix D: Glossary of Terms

Acronyms	Definitions
1x clock	10.762238 MHz symbol clock
8x clock	86.097902 MHz clock
AEQ	Adaptive Equalizer
AES	Audio Engineering Society (standard for digital audio)
AES/EBU	Audio Engineering Society/European Broadcasting Union (standard for digital audio)
AFC	Automatic Frequency Control
ALC	Automatic Level Control
Alias	A false signal from beats between signal frequency and sampling frequency
API	Application Program Interface
ATSC	Advanced Television Systems Committee / Digital TV / DTV
Aural	Analog television sound signal
AVGNL	Averaging of nonlinear equalizers
BEQ	Baseband equalizer
Channel Coder	PC board that accepts SMPTE data and produces clock signals and ATSC-compliant symbols
Combiner	Notch diplexer for combining separately amplified NTSC visual and aural signals
dB	Decibel measurement of a power. 10 * log (base 10) of the power ratio.
dBm	Decibel measurement with respect to 1milliWatt. Measurement of power.
DDS	Int 32 bit – Direct Digital Synthesizer – generates a frequency
DSB	Double Side Band
DTV	Digital Television
DTVAEQ	Digital Television Adaptive [linear] Equalizer
EDH	Error Detection and Handling
EVM	Error Vector Magnitude – measured in percentage
FCC	Federal Communications Commission
FPGA	Field Programmable Gate Array
Ideali	Ideal I (in-phase) channel signal
Idealq	Ideal Q (quadrature) channel signal
IEQ	Integer Equalizer
IF	Intermediate Frequency

IVFAIL	Filter Inversion Failure
Lattice	Manufacturer of FPGAs
LAVG	Enables LMS adaptive filter coefficient averaging
LED	Light Emitting Diode
LEVM	Enables calculation of EVM and signal to noise values
LEVMEQ	Enables calculation of linearly equalized EVM and signal to noise values
LMS	Least Means Square
Lunity	Scaling factor for nonlinear equalizer for unity gain value
Lwindo	Controls windowing of linear adaptive equalizer coefficients
NLEQIO	Nonlinear Equalizer I Channel – Old
NLEQI	Nonlinear Equalizer I channel - New
NLEQQO	Nonlinear Equalizer Q Channel – Old
NLEQQ	Nonlinear Equalizer Q channel - New
NTSC	National Television Systems Committee (Analog TV)
NTSCRR	Analog TV RRC filtering control
P	Power
OCXO	Oven Controlled Crystal Oscillator
RC	Raised Cosine
RMS	Root Mean Square
RRC	Root Raised Cosine
SMB	Connector type
SMPTE	Society of Motion Picture and Television Engineers
SNR	Signal to Noise Ratio – usually measured in decibels
SSB	Single Side Band
TXEQ	Transmitter equalizer – linear equalizer coefficients – AEQ
Visual	Analog television video signal
VSAEQ	Vector Signal Analyzer Equalizer
VSB	Vestigial Side Band
Weaver Modulator	A method for generating SSB and VSB signals – also known as the "third method" of SSB modulation
WEQ	Weaver Equalizer
Xleak	Controls LMS algorithm coefficient leakiness

Appendix A

System & Modulator

Subassembly & Schematic Drawings

Appendix B

Upconverter Assembly
(1306850)

Subassembly & Schematic Drawings

Appendix C

Downconverter Assembly
(1306852)

Subassembly & Schematic Drawings