RF Broadcast Appliance Family
User Manual

Applicable Models:

RFBA-1 – AM/FM/NOAA Weather Band Triple Receiver and FM MPX Translator

RFBA-1MA – AM/FM/NOAA Weather Band Triple Receiver, FM MPX Translator, and AM/FM/NOAA Weather Band Triple Modulation Analyzer

Document Revision History:

V0.9	27APR2012	CHT	Preliminary Release
V1.03	30APR2012	CHT	Release
V1.04	25JUN2012	CHT	Update for Public Service Band

Table of Contents

Table of Figures

Getting Started

The front panel of your RFBA family of Broadcast Appliances has a 40x2 character LCD display and a navigation style button that are shown in Figure 1. The user is able to adjust most of the settings of the RFBA unit by navigating through the display's menu with the front panel buttons. Some of the advanced features are only available via the Ethernet connection.

The rear of the RFBA is shown in Figure 2. The RFBA includes communication connections for Ethernet and USB, BNC connectors for each tuner input, and one BNC connector for an FM MPX output. The Phoenix-style connector provides analog audio output from each tuner and a relay output for configurable alerts. The power jack is used to power the RFBA unit via the included power supply at 12Volts, 1 Amp.

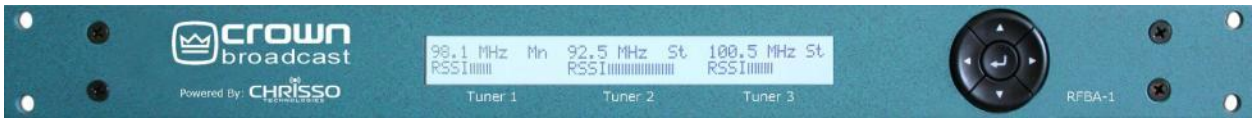

Figure 1 - Front View

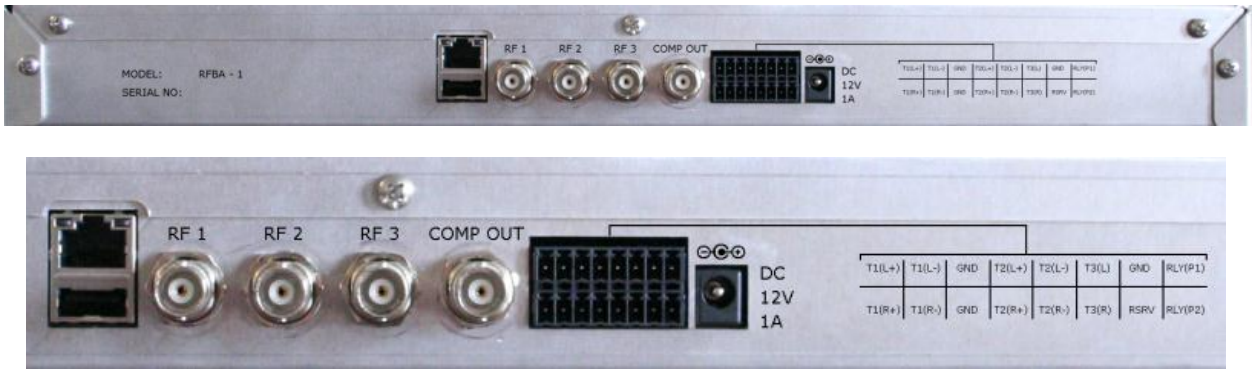

Figure 2 - Rear Views

The Phoenix connector mating part number is "FMCD 1.5/8-ST-3.5" and the order number is 1738869. The figure below shows the 20-pin version of the connector for the RFBA. One mating connector is provided with the purchase of each RFBA.

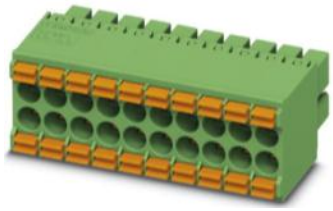

Figure 3 - Phoenix 20-Pin photo (The RFBA uses the 16-pin version of this connector)

The pin-out for the RFBA is shown in Figure 4 - Pin-out. The first pin is located closest to the power supply connector, and is numbered right to left when viewed from the rear of the product. A silkscreen is also provided on the rear of the unit for quick reference. Connections to the connector are made by

using a small screwdriver to push in on the orange portion of the connector while inserting your stripped cable into the corresponding hole.

Top Row	Description		Description	Bottom Row
Top #1	Tuner 3- Left - / Relay-P1		Tuner 3- Right - / Relay-P2	Bottom #1
Top #2	Ground		Reserved	Bottom #2
Top #3	Tuner 3- Left		Tuner 3- Right +	Bottom #3
Top #4	Tuner 2- Left -		Tuner 2- Right -	Bottom #4
Top #5	Tuner 2- Left +		Tuner 2- Right +	Bottom #5
Top #6	Ground		Ground	Bottom #6
Top #7	Tuner 1- Left -		Tuner 1- Right -	Bottom #7
Top #8	Tuner 1- Left +		Tuner 1- Right +	Bottom #8

Figure 4 - Pin-out

Model Numbers

Currently, there are two models in the RFBA family available: The RFBA-1 and the RFBA-1MA. Both units will be labeled as "RFBA-1" on the front panel

The RFBA-1MA contains every feature of the RFBA-1, but also adds the ability to operate as a highly accurate DSP-Based Triple Tuner Modulation Analyzer. Every RFBA-1 unit can be upgraded to be an RFBA-1MA via a user-installable software key. If you are interested in upgrading your RFBA-1 unit to the full capabilities of the RFBA-1MA, please contact Crown Broadcast for sales information.

Installation and Configurations

Your RFBA is versatile and designed to handle many user configurations. The typical configurations for the RFBA are: Triple Tuner for EAS/CAP, Triple Tuner Modulation Analyzer, Standalone FM Translator with RDS Encoding, or a Mixed Combination of Other Configurations.

Triple Tuner for EAS/CAP Reception

This all-in-one product allows the user to monitor three separate broadcasts while outputting the audio to a stand-alone EAS/CAP decoder unit. By separating the tuners from the EAS/CAP decoder, the user can be assured that the sensitivity of the tuners is not compromised by the harsh EMC noise that is typically seen in the PC-based EAS/CAP decoder units. In this configuration, the audio signals from the Phoenix connector may be connected directly to the EAS/CAP decoder unit. The audio level for each tuner may be digitally adjusted to meet the voltage requirements of your particular EAS/CAP decoder. The RFBA includes capability for Hi-Jack Avoidance and Squelch functions; in this configuration, users will typically disable these features. The Hi-Jack and Squelch functions can be adjusted via the front panel setup menus or via the Ethernet connection.

Triple Tuner Modulation Analyzer

The RFBA is capable of monitoring over 20 FM signal parameters as well as RDS data for each tuner simultaneously. The end user may wish to monitor several of their own stations to assure proper functionality or they may wish to monitor adjacent channels that sometimes over-modulate. The RFBA can also be controlled via the Ethernet connection, allowing a remote user to switch between stations that are being monitored. For operation in this configuration, the only connections required are the RF antennas and, if remote monitoring is desired, Ethernet. All of the parameters are available via the display menu or via the Ethernet connection. Note: the modulation analyzer feature is only available on the RFBA-1MA or as an upgrade to the RFBA-1. All units are capable of performing modulation analyzer functionality. If your RFBA does not include this function, please contact Crown Broadcast for sales information.

Standalone FM Translator with RDS Encoding

The RFBA uses a Digital Signal Processor, or DSP, to reconstruct an FM Stereo Composite Signal. In addition to the typical composite signal, the RFBA can also add RDS data to the composite signal. The audio source for this configuration is only available from the main tuner (Tuner #1). Tuner #2 and Tuner #3 do not include capability for composite signal regeneration, but can still be used for signal reception or analyzing.

The FM Stereo Composite Signal is always available from Tuner #1. In contrast to older translator designs, the RFBA does not simply pass through a down-converted FM multiplex. Instead, the audio and RDS data are recovered using world-class automotive-grade reception algorithms customized by Chrisso Technologies for translator purposes. A new FM multiplex with optional RDS data is then created digitally. The composite output signal is available on the BNC connector on the rear of the product, and can be fed to the composite input of your RF modulator/transmitter. The user can digitally adjust the MPX output level, pilot percentage, RDS modulation level, and many RDS parameters. Your RFBA will automatically adjust the audio portions of the FM Multiplex to account for user adjustments of the Pilot level and of the RDS level, ensuring strict adherence to the composite level specifications of the FCC.

The user can program many of the RDS parameters to be passed through from the received signal or to be user defined, allowing for certain data to be unique to your translator location. Program Identification (PID) is an example of an RDS parameter that the end user may wish to program differently, while leaving Program Service Name (PSName) and other fields unmodified.

Stand-alone Automatic Stereo Separation (SASS)

The FM translator also includes a new function to align the composite output with a specific RF modulator. Many RF modulators include a filter on the MPX input. This filter can cause a small shift in the L-R component of the composite signal and will degrade the maximum stereo separation. The RFBA includes an alignment routine where the RFBA can adjust the L-R for your specific RF modulator thus optimizing the maximum separation. Please see the alignment section of this manual for further details.

Mixed Combination of Other Configurations

The RFBA is capable of performing many of the above configurations concurrently. Tuner #1 is always able to receive a broadcast station and output audio. It is also always able to reconstruct an FM composite signal from the station received. If the modulation analyzer option is installed, it can also do a full analysis of the signal received on Tuner #1.

Broadcast Appliance System Overview

The RF Broadcast Appliance (RFBA) has been designed to perform multiple functions. The RFBA includes three independent automotive grade DSP based receivers. Each receiver is capable of receiving AM, FM, NOAA Weather band or Public Service frequencies. This makes the RFBA desirable for meeting the broadcasters EAS needs of monitoring of multiple stations. The RFBA also incorporates a DSP based FM composite generator that can be used for FM translators. The FM composite generator has additional functionality to add RDS capability to your translated signal, acting in a RDS pass thru mode or a user programmable mode. The RFBA can also be used as a triple tuner modulation analyzer and RDS decoder. Band and frequency selection is performed by front panel user control or remote Ethernet control.

Broadcast Appliance Functionality

The onboard AM/FM receiver utilizes a Digital Signal Processor (DSP) that incorporates advanced algorithms to provide world-class receiver performance. Tuner parameters have been optimized by experts in AM/FM reception to provide the best overall performance for this specific product, eliminating the need for broadcasters to make adjustments. The receiver is capable of tuning:

1) FM frequencies from 76.00 – 108.00 MHz in steps of 0.05 MHz (50 kHz)
2) AM frequencies from 520 – 1710 kHz in 10 kHz increments
3) AM frequencies from 531 – 1629 kHz in 9 kHz increments
4) All NOAA weather band channels from 162.400 – 162.550 MHz (Channels 1 – 7)
5) Public Service band from 144.000 – 175.000 MHz in 5 kHz increments

Broadcast Appliance Block Diagram

A high level block diagram of the RFBA is shown in Figure 5. As described previously, this product contains three independent tuners. Each tuner is capable of receiving AM, FM, NOAA Weather band or Public Service band. Each tuner has its own BNC RF connector. The right and left audio signals for each tuner are available as differential outputs on the supplied Phoenix connector. The audio outputs of tuner #1 are also used by the onboard DSP to generate a FM composite signal that can be used for translators. The onboard DSP also uses an RDS encoder so the user can add RDS information to the translator output. The FM composite output is available via a BNC connector on the rear of the product. Tuner #3 has an option to have a differential or single-ended audio output for the right and left channels. In the single-ended mode the negative outputs are used as connections to an internal relay. The relay can be programmed via the display or Ethernet to open or close based on certain events, such

as squelch or Hi-Jack. The default configuration for Tuner #3 is single ended audio with the internal relay.

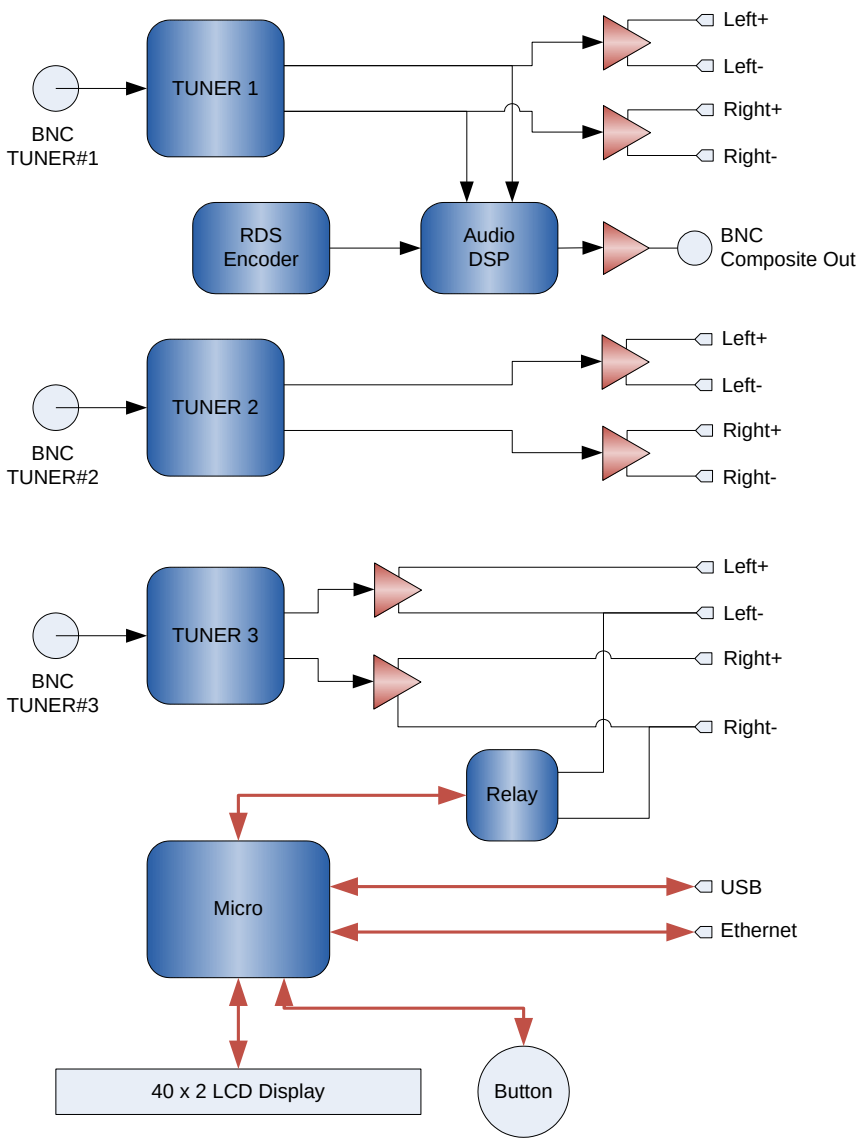

Figure 5 - Block Diagram

Broadcast Appliance Front Panel

User Interface

The RFBA includes a 2 x 40 character LCD and a navigation style button that allows the user to adjust all settings and monitor all available parameters. The navigation control has up, down, left, right, and enter buttons that allow the user to adjust most parameters. Some of the more advanced features are available via the Ethernet interface. The display incorporates arrows to assist the user during menu

navigation. Upon product initialization the RFBA will display the frequency and RSSI level of all three tuners, see Figure 6. The RFBA will also default to this main screen after one minute of user inactivity.

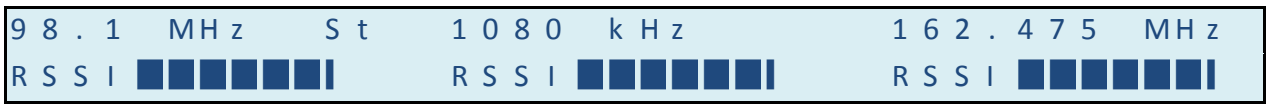

Figure 6 - Main Menu

The overall menu navigation map is shown below:

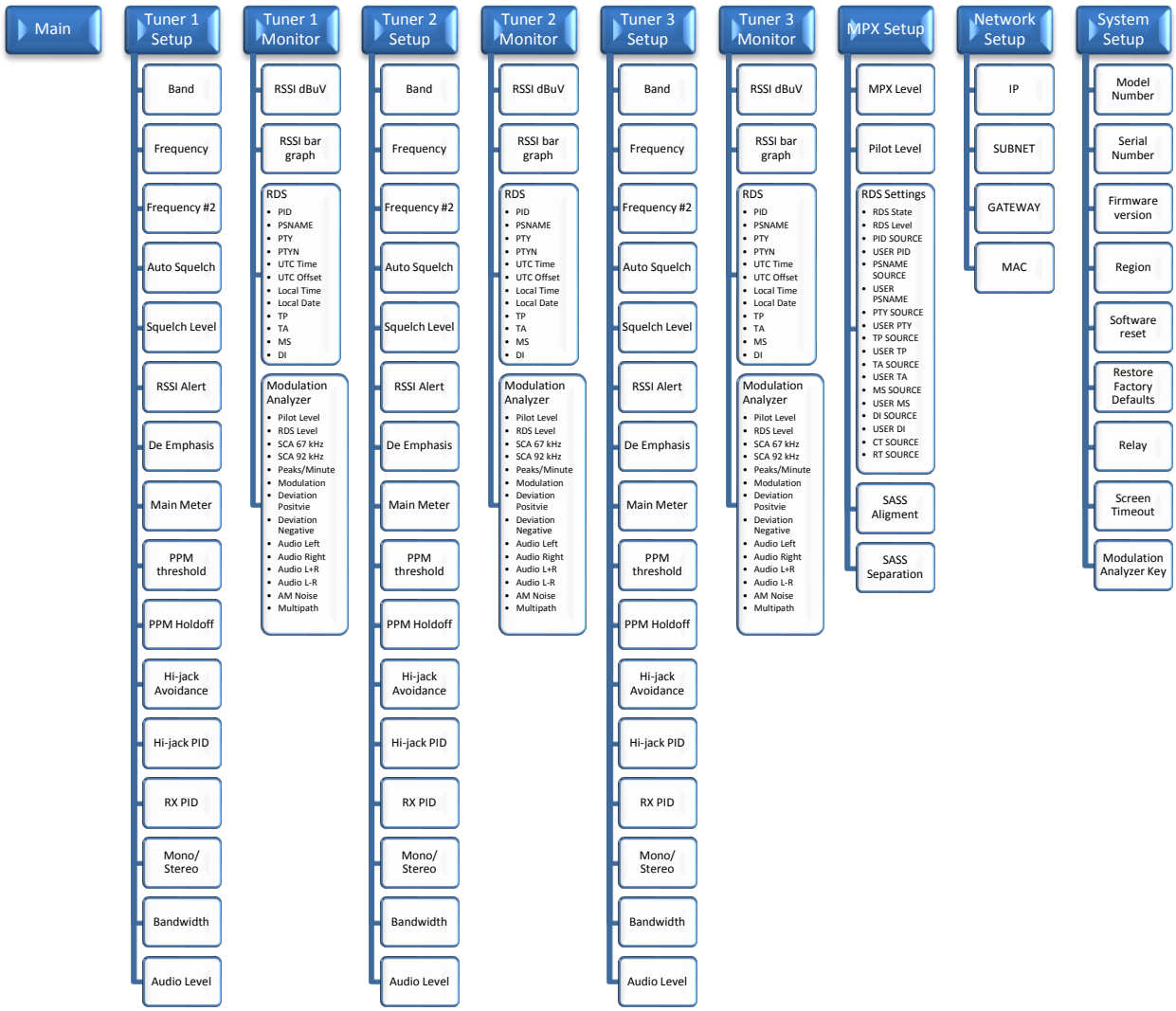

Figure 7 - Navigation Menu Overview

Tuner Setup Menu

Each tuner has a separate menu and can be controlled independently. The menu structure for all tuners are identical thus the following descriptions is relevant for all three tuners. A description of each of the setup features is detailed below:

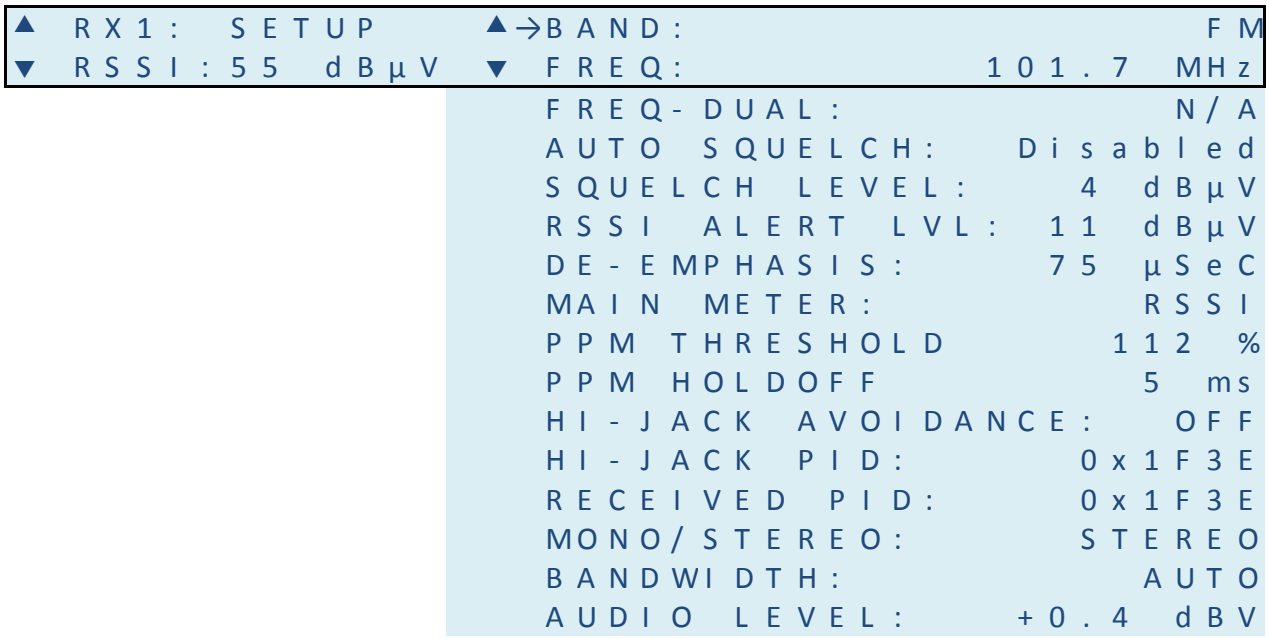

Figure 8 - Tuner Setup Menu

Band: The user can select the broadcast band to receive. Each tuner is capable of receiving AM, FM, NOAA Weather band, Dual NOAA Weather band and Public Service band. The dual NOAA weather band feature allows the user to receiver two NOAA weather band channels on one tuner. In the dual band receiver mode frequency #1 audio is output to the left channel and frequency #2 audio is output to the right channel. Dual NOAA weather band mode requires a software key to enable the feature.

Frequency: This menu allows the user to program the received frequency for each band. The channel spacing and band limits are determined based on the band and region settings.

Frequency dual: This menu is only used in the dual NOAA weather band mode. This menu allows tuning of the second frequency for this tuner. Recall that the audio output of frequency #2 will only be available on the right channel while the audio for frequency #1 will be available on the left channel.

Auto Squelch: This menu item will allow the audio levels to be squelched when the RSSI level is below a particular threshold. For Tuner #1, the MPX composite level will also be squelched. During Dual NOAA Weather band operation the squelch will only trigger on the first frequency selected and not frequency #2.

Squelch Level: This control allows the user to determine the RSSI level where the audio squelch will occur. This control has units of dBµV in 1dB steps. If the received RSSI level drops below the currently set squelch control level, the audio outputs will mute. If this occurs on Tuner #1, the MPX output of the receiver will also mute, keeping a transmitter equipped with a silence detector from broadcasting "dead air." The RFBA will automatically un-mute the audio (and MPX output for Tuner #1) when the input RSSI level is more than 6dB above the currently set squelch control level. Email

alerts will be sent whenever the unit is squelched or un-squelched. The email alert must be properly configured in the Ethernet interface for this to function correctly.

RSSI Alert Level: This control allows the user to determine the RSSI level where an email alert will be sent out. If the email alerts are not set properly then the email alerts will not be received. This control has units in dBµV in 1dB steps. This setting has no effect on the audio or MPX output levels. This feature is useful for a station engineer to monitor a change in the receive antenna which might require adjusting.

De Emphasis: This allows control of the receiver de-emphasis. Options are OFF, 50 µsec or 75 µsec. Some options are not available based on the Region setting.

Main Meter: This allows the user to determine which bar graph to be displayed on the main menu. If the modulation analyzer is not available then the user may only select RSSI.

PPM Threshold: This allows control of the peaks per minute readings in the "Peaks/Minute" section of the modulation analyzer. The user can adjust the percentage modulation trigger threshold in which the PPM counter will start counting. The nominal setting for this control is 105%.

PPM Holdoff: This allows control of the peaks per minute readings in the "Peaks/Minute" section of the modulation analyzer. The user can adjust the time in which the PPM counter can re-trigger for an over modulation event. The nominal setting for this control is 5 mSec.

Hi-jack Avoidance: This menu item will allow the user to monitor the received RDS PID and perform user selectable tasks if the RDS PID is not received or is invalid. This is useful when a rogue station is broadcasting on your frequency. Email alerts will be sent whenever the unit is hijacked or un-hijacked. Note: the email alert must be properly configured via the Ethernet interface for this to function correctly.

Hi-jack PID: This allows the user to program the desired PID to be monitoring on the received frequency.

Received PID: This is a visual aid of the currently tuned station PID. It is intended to assist the user while setting the Hi-jack PID. This value cannot be adjusted.

Mono/Stereo: This allows the user to force the receiver to mono or stereo reception. This is useful under very weak signal conditions where stereo reception produces undesirable levels of noise. When setting the signal to mono on tuner #1 the MPX output will also output a mono signal (L+R only). RDS will still be encoded if it is turned on, however.

Bandwidth: This allows the user to program the receiver IF bandwidth. The allowed settings are "AUTO" or "WIDE". The receivers used in the RFBA are state of the art DSP based receivers and in most conditions the AUTO setting is highly recommended. If the primary use of a specific receiver is as a modulation analyzer, then the WIDE setting will give the most accurate results.

Volume Level: This allows the user to adjust the audio output levels on the Phoenix connector. The user can adjust the output level in 0.1 dB steps. The default setting is 0 dBV, which is equivalent to 1 V_{RMS} into a 600 ohm load single ended. The signal is twice that level if using the differential signals. The user can select between +10dBV and -40dBV. The volume level should not be set above +3.0dBV for a received station broadcasting 75 kHz deviation. Exceeding that level will start to cause distortion in the output audio. If using a single ended configuration, use the + outputs and GND as the audio reference. In Figure 9 below, conversions from dBV to V_{rms} and V_{pk-pk} are included for reference. Note that the V_{rms} and V_{pk-pk} are actually twice that level when using the differential signals.

dBV	3.0	2.5	2.0	1.5	1.0	0.5	0.0	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0	-3.5
V_{rms}	1.413	1.334	1.259	1.189	1.122	1.059	1.000	0.944	0.891	0.841	0.794	0.750	0.708	0.668
V_{pk-pk}	3.995	3.772	3.561	3.362	3.174	2.996	2.828	2.670	2.521	2.380	2.247	2.121	2.002	1.890

dBV	-3.5	-4.0	-4.5	-5.0	-5.5	-6.0	-6.5	-7.0	-7.5	-8.0	-8.5	-9.0	-9.5	-10.0
V_{rms}	0.668	0.631	0.596	0.562	0.531	0.501	0.473	0.447	0.422	0.398	0.376	0.355	0.335	0.316
V_{pk-pk}	1.890	1.785	1.685	1.591	1.502	1.418	1.338	1.263	1.193	1.126	1.063	1.004	0.947	0.894

Figure 9 - Audio Level Conversions

Tuner Monitor Menu

Each tuner has a separate monitor menu and can be viewed independently. While in the monitor menu the user is not allowed to modify any of the tuner setup parameters, only viewing of the received parameters are allowed. The menu structure for all tuners are identical thus the following descriptions is relevant for all three tuners. A description of each of the monitor features is detailed below:

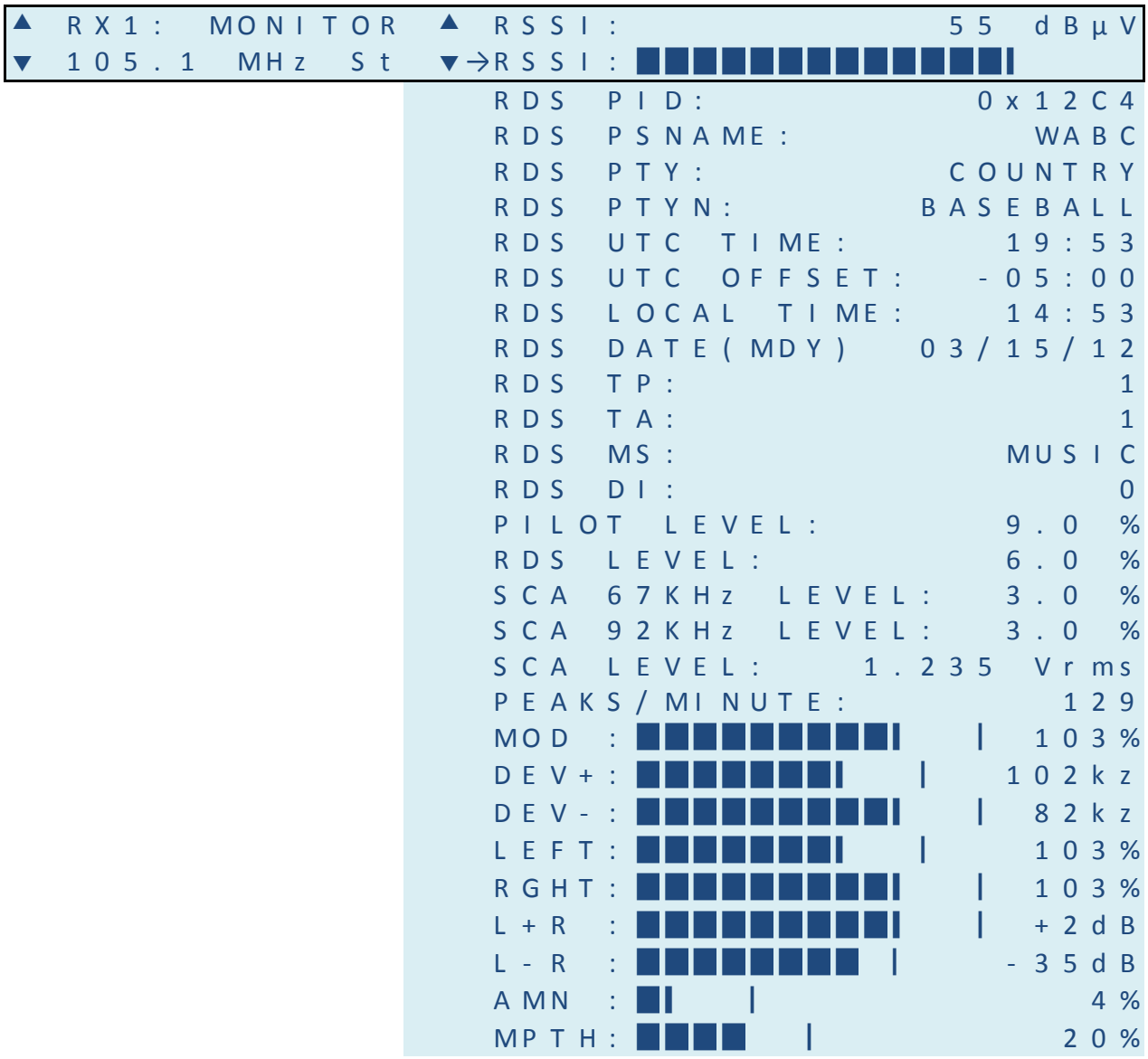

Figure 10 - Tuner Monitor Menu

RSSI dBµV: This is the Received Signal Strength Indicator and is displayed in units of dB relative to 1µV at the antenna input. The RSSI range is valid from 0 dBµV to 65 dBµV.

RSSI: This is the Received Signal Strength Indicator bar graph and gives a visual indication of the RSSI amplitude. Maximum scale is 65 dBµV and minimum scale is 0 dBµV

RDS PID: This is the decoded RDS PID value expressed as a 4 digit Hexadecimal number (e.g. 1F7E).

RDS PSNAME: This is the decoded RDS Program Service name (PSNAME) value expressed as an 8 character string.

RDS PTY: This is the decoded RDS Program Type (TYP) flag. It is a value from 0-31 and is displayed as the actual program type, not value based on the region.

RDS PTYN: This is the decoded RDS Program Type Name (PTYN) value expressed as an 8 digit character. This is used to allow additional descriptions of the program content (e.g. "Baseball").

RDS UTC TIME: This is the decoded RDS Coordinated Universal Time (UTC) value.

RDS CT OFFSET: This is the decoded RDS Clock Time Offset (CT OFFSET) value. This time should indicate the offset based on the time zone and daylight savings time setting.

RDS LOCAL TIME: This is the decoded RDS Clock Time (CT). This is the calculated value of the current time based on RDS DATE, UTC and CT OFFSET.

RDS DATE: This is the decoded RDS Date (DATE). The Date value is expressed in MM/DD/YYYY format.

RDS TP: This is the decoded RDS Traffic Program (TP) flag. It is used in conjunction with the Traffic Announcement (TA) flag for traffic announcements.

RDS TA: This is the decoded RDS Traffic Announcement (TA) flag. It is used in conjunction with the Traffic Program (TP) flag for traffic announcements.

RDS MS: This is the decoded RDS Music/Speech switch. A "0" indicates a Speech program and a "1" indicates a Music Program.

RDS DI: This is the decoded RDS Decoder Information (DI) value. The DI value ranges from 0-15 and identifies various operating modes for the RDS decoders.

Pilot Level: This is the received FM pilot amplitude and is referenced to 75 kHz deviation. Maximum scale is 25.5 % and minimum scale is 0 %.

RDS Level: This is the received FM RDS amplitude and is referenced to 75 kHz deviation. Maximum scale is 25.5 % and minimum scale is 0 %.

SCA 67 kHz Level: This is the received FM 67 kHz SCA amplitude and is referenced to 75 kHz deviation. Maximum scale is 25.5 % and minimum scale is 0 %.

SCA 92 kHz Level: This is the received FM 92 kHz SCA amplitude and is referenced to 75 kHz deviation. Maximum scale is 25.5 % and minimum scale is 0 %.

PPM: This is a running count of the number of peaks above a specified threshold in one minute. The default threshold is 105% of 75 kHz. . Maximum scale is 255 and minimum is 0. This count is reset every time a frequency is tuned.

Modulation: This is the FM modulator output and is expressed in percent, referenced to 75 kHz. Maximum scale is 127%. In AM mode the reading is expressed in percentage, relative to 100% modulation. In WX or PS band the reading is expressed in kHz, referenced to 5 kHz deviation.

Deviation Positive: This is the positive peaks of the FM modulator output and is an absolute reading expressed in kHz. Maximum scale is 95.625 kHz and minimum scale is 0 kHz. In AM mode the reading is expressed in percentage.

Deviation Negative: This is the negative peaks of the FM modulator output and is an absolute reading expressed in kHz. Maximum scale is 95.625 kHz and minimum scale is 0 kHz. In AM mode the reading is expressed in percentage.***Audio Left:*** This is the output of the stereo decoder, measuring the Left signal amplitude and is expressed in percent, referenced to 75 kHz. Maximum scale is 127 %.

Audio Right: This is the output of the stereo decoder, measuring the Left signal amplitude and is expressed in percent, referenced to 75 kHz. Maximum scale is 127 %.

Audio Left+ Right: This is the output of the stereo demodulator prior to the demux operation of the stereo decoder. This is measuring the level of the L+R portion of the composite signal. This reading is expressed in log units of dB, referenced to 75 kHz.

Audio Left- Right: This is the output of the stereo demodulator prior to the demux operation of the stereo decoder. This is measuring the level of the L+R portion of the composite signal. This reading is expressed in log units of dB, referenced to 75 kHz.

AMN: AM NOISE: This is the measure of amplitude modulation on the FM signal. This is measured in percent modulation. This measurement is only valid for a strong signal with no multipath. It is normally meant to measure any AM modulation that might occur in the power amp stages of the FM transmitter. This is usually best measured with a direct monitor output from the transmitter.

MPTH: Multipath: This is the measure of multipath noise on the signal. This is measured in percent. Values greater than 30% indicate several signal paths at the receiver. The user should use this indicator to verify proper antenna setup during installation. If this reading is high, the accuracy of many of the modulation analyzer parameters will be greatly compromised and may be inaccurate.

MPX Setup Menu

This menu allows user configuration of the MPX output. A description of each of the monitor features is detailed below:

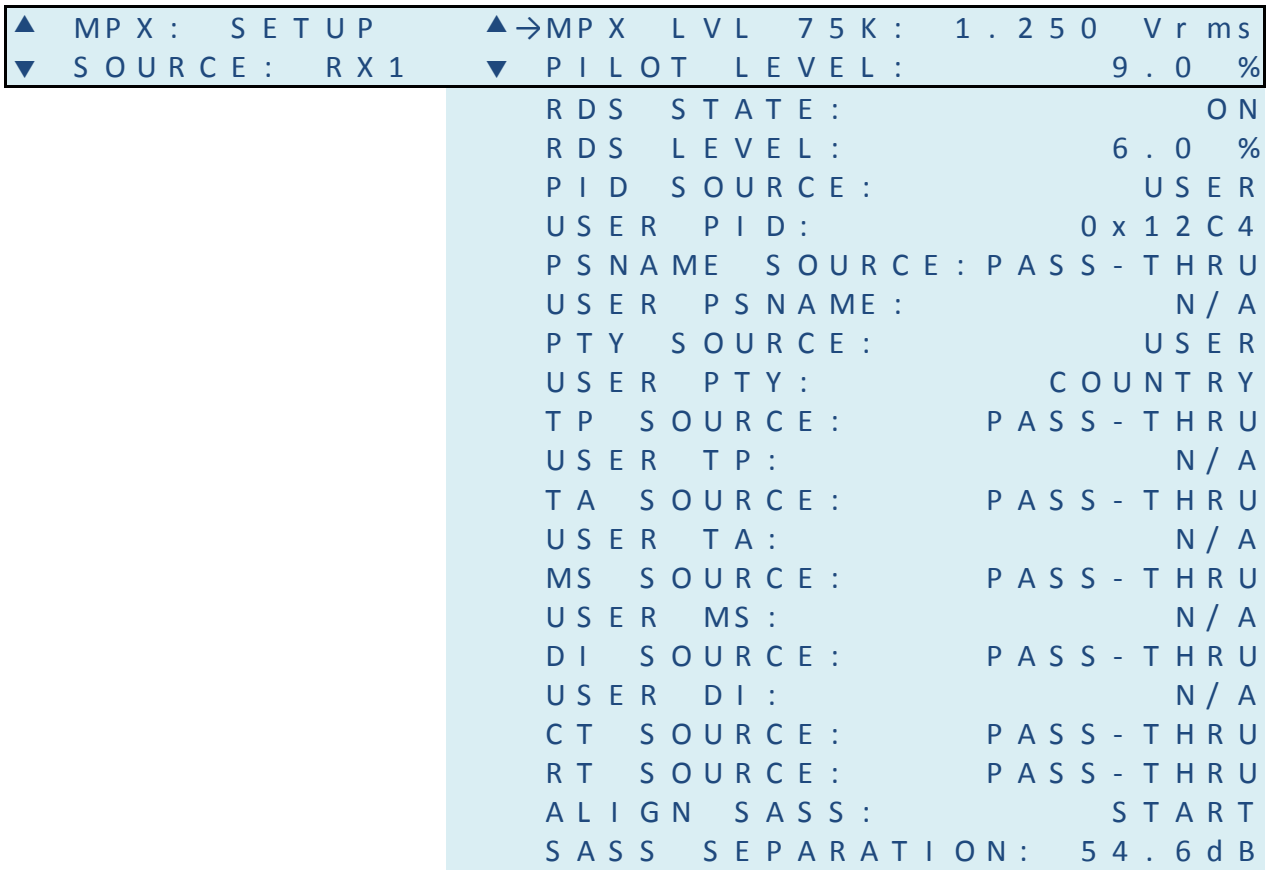

Figure 11 - MPX Setup Menu

MPX Level: The user can adjust the MPX output amplitude. The default setting is 1.25 V_{RMS} into a 600 ohms load. The user can adjust this level up to a maximum of 1.414 V_{RMS} in 1 mV steps.

Pilot Level: The user can adjust the 19 kHz pilot on the composite output. The value is referenced to the MPX Level as a percentage. The user can adjust the pilot level in 0.1 % steps. The default setting is 9% and has a range between 0 % and 10%.

RDS STATE: The user can turn the RDS encoder on or off with this adjustment. If the off state is chosen then the remaining parameters for RDS adjustment will not be adjustable.

RDS Level: The user can adjust the 57 kHz RDS signal on the composite output. The value is referenced to the MPX Level as a percentage. The user can adjust the RDS level in 0.1 % steps. The default setting is 6% and has a range between 0 % and 20%.

PID SOURCE: The user can set the RDS encoder to use the received PID from Tuner #1 ("PASS-THRU") or the user specified PID ("USER"). Use the navigation keys to select the PID state. Push the enter button to have the RFBA accept the new RDS PID state.

USER PID: The user can set the RDS encoder PID to a specified value. Use the navigation keys to select the PID value. Push the enter button to have the RFBA accept the new RDS PID. If the

RDS state is set to “OFF” or the PID SOURCE is not set to “PASS-THRU” then this parameter will not be adjustable.

PSNAME SOURCE: The user can set the RDS encoder to use the received PSNAME from Tuner #1 (“PASS-THRU”) or the user specified PSNAME (“USER”). Use the navigation keys to select the PID state. Push the enter button to have the RFBA accept the new RDS PSNAME state.

USER PSNAME: The user can set the RDS encoder Program Service Name (PSNAME) to a specified value. Use the navigation keys to select the PS Name. Push the enter button to have the RFBA accept the new RDS PS Name. If the RDS state is set to “OFF” or the PSNAME SOURCE is not set to “PASS-THRU” then this parameter will not be adjustable.

PTY SOURCE: The user can set the RDS encoder to use the received PTY from Tuner #1 (“PASS-THRU”) or the user specified PTY (“USER”).Use the navigation keys to select the PTY state. Push the enter button to have the RFBA accept the new RDS PTY state.

USER PTY: The user can set the RDS encoder Program Type (PTY) to a specified value. Use the navigation keys to select the Program Type. Push the enter button to have the RFBA accept the new RDS Program Type. If the RDS state is set to “OFF” or the PTY SOURCE is not set to “PASS-THRU” then this parameter will not be adjustable.

TP SOURCE: The user can set the RDS encoder to use the received TP from Tuner #1 (“PASS-THRU”) or the user specified TP (“USER”).Use the navigation keys to select the TP state. Push the enter button to have the RFBA accept the new RDS TP state.

USER TP: The user can set the RDS encoder Traffic Program (TP) to a specified value. Use the navigation keys to select the Traffic Program. Push the enter button to have the RFBA accept the new RDS Traffic Program. If the RDS state is set to “OFF” or the TP SOURCE is not set to “PASS-THRU” then this parameter will not be adjustable.

TA SOURCE: The user can set the RDS encoder to use the received TA from Tuner #1 (“PASS-THRU”) or the user specified TA (“USER”).Use the navigation keys to select the TA state. Push the enter button to have the RFBA accept the new RDS TA state.

USER TA: The user can set the RDS encoder Traffic Announcement (TA) to a specified value. Use the navigation keys to select the Traffic Announcement. Push the enter button to have the RFBA accept the new RDS Traffic Announcement. If the RDS state is set to “OFF” or the TA SOURCE is not set to “PASS-THRU” then this parameter will not be adjustable.

MS SOURCE: The user can set the RDS encoder to use the received MS from Tuner #1 (“PASS-THRU”) or the user specified MS (“USER”).Use the navigation keys to select the MS state. Push the enter button to have the RFBA accept the new RDS MS state.

USER MS: The user can set the RDS encoder Music/Speech (MS) to a specified value. Use the navigation keys to select the Music/Speech. Push the enter button to have the RFBA accept the

new RDS Music/Speech. If the RDS state is set to “OFF” or the MS SOURCE is not set to “PASS-THRU” then this parameter will not be adjustable.

DI SOURCE: The user can set the RDS encoder to use the received DI from Tuner #1 (“PASS-THRU”) or the user specified DI (“USER”).Use the navigation keys to select the DI state. Push the enter button to have the RFBA accept the new RDS DI state.

USER DI: The user can set the RDS encoder Decoder Identification (DI) to a specified value. Use the navigation keys to select the Decoder Identification. Push the enter button to have the RFBA accept the new RDS Decoder Identification. If the RDS state is set to “OFF” or the DI SOURCE is not set to “PASS-THRU” then this parameter will not be adjustable. The valid values for DI are 0-15 where the least significant bit represents a mono/stereo flag. The RFBA will always use an internal reference for the stereo pilot and this flag will always be “1”. Thus the RFBA only had valid values of the odd numbered settings for DI {1, 3, 5…13, 15}.

CT SOURCE: The user can set the RDS encoder to use the received Clock Time (CT) from Tuner #1 (“PASS-THRU”) or off (“OFF”).Use the navigation keys to select the CT state. Push the enter button to have the RFBA accept the new RDS CT state.

RT SOURCE: The user can set the RDS encoder to use the received Radio Text (RT) from Tuner #1 (“PASS-THRU”) or off (“OFF”).Use the navigation keys to select the RT state. Push the enter button to have the RFBA accept the new RDS RT state.

SASS Alignment: The Stand-alone Automatic Stereo Separation alignment menu is used to initiate the stereo separation routine. To start this routine, connect the MPX output to the RF modulator (transmitter). Connect the output of the RF Modulator to the Tuner #1 input at a level of 60 dBµV – 117 dBµV (+10dBm). Make sure that tuner #1 is set to the output frequency of the RF modulator (this is done in the Tuner #1 setup menu). Once the connections are complete and tuner #1 is tuned to the correct frequency then start the calibration. This will take less than 10 seconds. During the calibration, the display will show the stereo separation as the algorithm achieves the maximum value. Upon completion of the SASS the new calibration value will be stored in EEPROM. This calibration should only need to be completed upon initial setup.

Network Setup Menu

The RFBA has capability to operate via an Ethernet connection. This menu allows the user to set the IP and Subnet address for the RFBA. A description of each of the monitor features is detailed below:

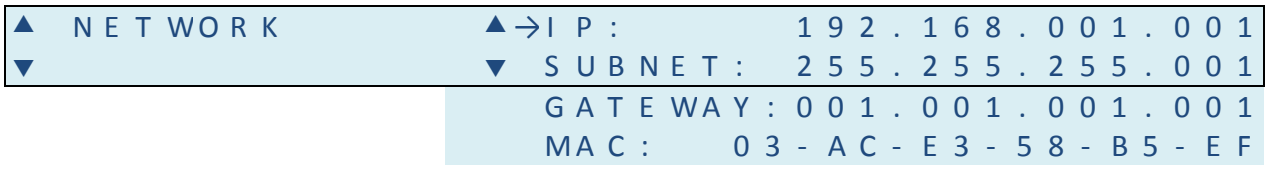

Figure 12 - Network Setup Menu

IP: This displays the current IP address of the RFBA. The user can modify this address by using the buttons to navigate and change. Once the user input is complete, push the

enter button to have the RFBA accept your request to change IP address. This change will not take effect until the RFBA is rebooted either through the soft reset command or cycling power.

SUBNET: This displays the current subnet address of the RFBA. The user can modify this address by using the buttons to navigate and change. Once the user input is complete, push the enter button to have the RFBA accept your request to change the subnet address. This change will not take effect until the RFBA is rebooted either through the soft reset command or cycling power.

GATEWAY: This displays the current gateway address of the RFBA. The user can modify this address by using the buttons to navigate and change. Once the user input is complete, push the enter button to have the RFBA accept your request to change the subnet address. This change will not take effect until the RFBA is rebooted either through the soft reset command or cycling power.

MAC: This displays the MAC address of the RFBA. The user cannot modify this value. It is used for display purposes only.

System Setup Menu:

The RFBA system menu is designed to show the general features of this product. A description of each of the monitor features is detailed below:

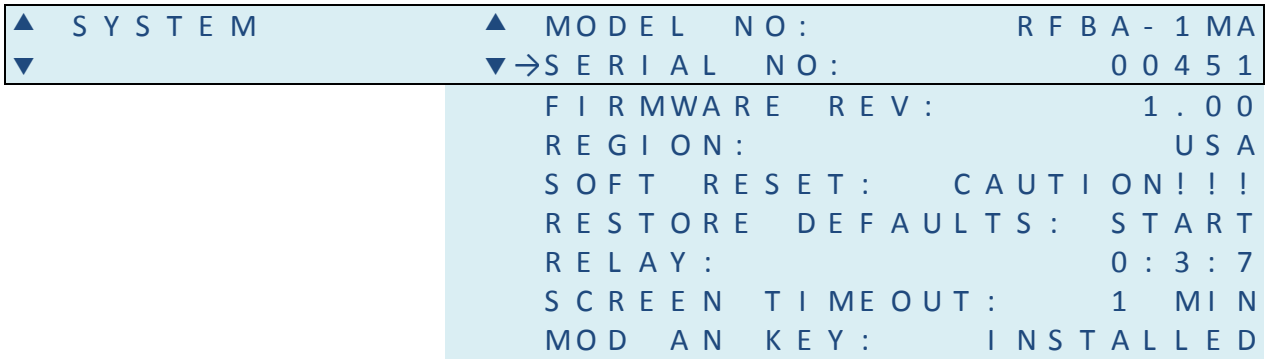

Figure 13 - System Menu

Model Number: This is the Model number of your unit. This value can't be changed by the user.

Serial Number: This is the Serial number of your unit. This value can't be changed by the user.

Firmware Revision: This is the Product firmware revision. This value can't be changed by the user.

Region: This is the region setting of the RFBA. The RFBA can be set to USA, Europe or Japan bands. Changing the region setting will change the band frequencies, channel spacing, and de-emphasis for all tuners. It is not possible to set only some tuners to a particular band. All tuners will be set to the band selected.

Soft Reset: This will perform a soft reset on the product. There is an additional confirmation menu that you must confirm you really want to reset. Once in the confirmation screen, select the YES/NO via the left or right keys. Once you've made your selection press the enter key. If you selected "NO" then you will return to the previous screen.

Restore Factory Defaults: This will reset all user adjustable parameters to the factory defaults. There is an additional confirmation menu that you must confirm you really want to restore the factory defaults. Once the selection is confirmed the unit will perform a software reset and all factory settings will be restored to defaults. The factory calibrations and the SASS calibration will not be affected by restoring factory defaults.

RELAY: The relay can be programmed to close on many events. The user can select the various combinations based on the codes shown in Figure 14. The user may also set these parameters via the Ethernet connection. The LCD control will show three values separated by a colon. The first value represents the squelch control for tuner #1, the second value for tuner #2 and the third value for tuner #3. For example, "1:0:4" would trigger the relay on a "Low RSSI" event on tuner #1 or a Squelch event on Tuner #3. Please note that if you are using the Tuner #3 audio outputs in a differential output mode then the relay must be removed or placed in the off state "0:0:0".

	Tuner #1			Tuner #2			Tuner #3		
RELAY CODE	**Squelch**	**Hi-Jack**	**Low RSSI**	**Squelch**	**Hi-Jack**	**Low RSSI**	**Squelch**	**Hi-Jack**	**Low RSSI**
O	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
2	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
3	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON
4	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
5	ON	OFF	ON	ON	OFF	ON	ON	OFF	ON
6	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
7	ON	ON	ON	ON	ON	ON	ON	ON	ON

Figure 14 - Relay Codes

Screen Timeout: The user may select the timeout setting of the display. If this setting is set to one minute then after one minute of no user activity then the unit will return to the main menu.

Mod An Key: The user may enter the 16 byte modulation analyzer key by entering into this menu. A second menu will be displayed and the user may enter the full 16 byte key. If your product

is already enabled for a modulation analyzer then the display will show “INSTALLED” and the secondary menu will not be available.

Front Panel Lock Out

The RFBA has a feature that will lock the front panel from any user input. By default the unit will be in the unlocked state. To toggle the lock/unlock state, press and hold the up and down button simultaneously for more than 5 seconds. You will see a screen indicate the current state of the product for 2 seconds and then return to main screen.

Broadcast Appliance Remote Control

User Interface

The RFBA includes a web server that allows monitor and control access through the Ethernet port. The various screens can be accessed by the navigation area in the upper left of the web page as shown in FIGURE 15.

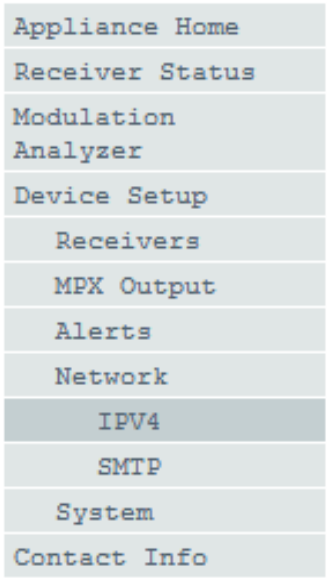

Figure 15 – Web server Navigation Menu

Appliance Home

The Appliance Home page shows the Model Number, Serial Number, Firmware Revision, and whether or not the Modulation Analyzer is installed.

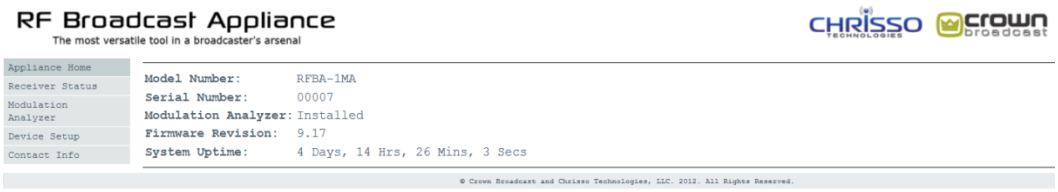

Figure 16 - Appliance Home

Receiver Status

The Receiver Status page shows the band and station of each tuner as well as the available RDS information, RSSI (Received Signal Strength Indicator), and Total Deviation. If the Modulation Analyzer is not installed, then Tuner 2 and Tuner 3 will show 'Not Available' in the Total Deviation cells. It also shows any Alerts that are active for the RFBA such as 'Squelched', 'Low RSSI', or 'Hi-Jacked!'.

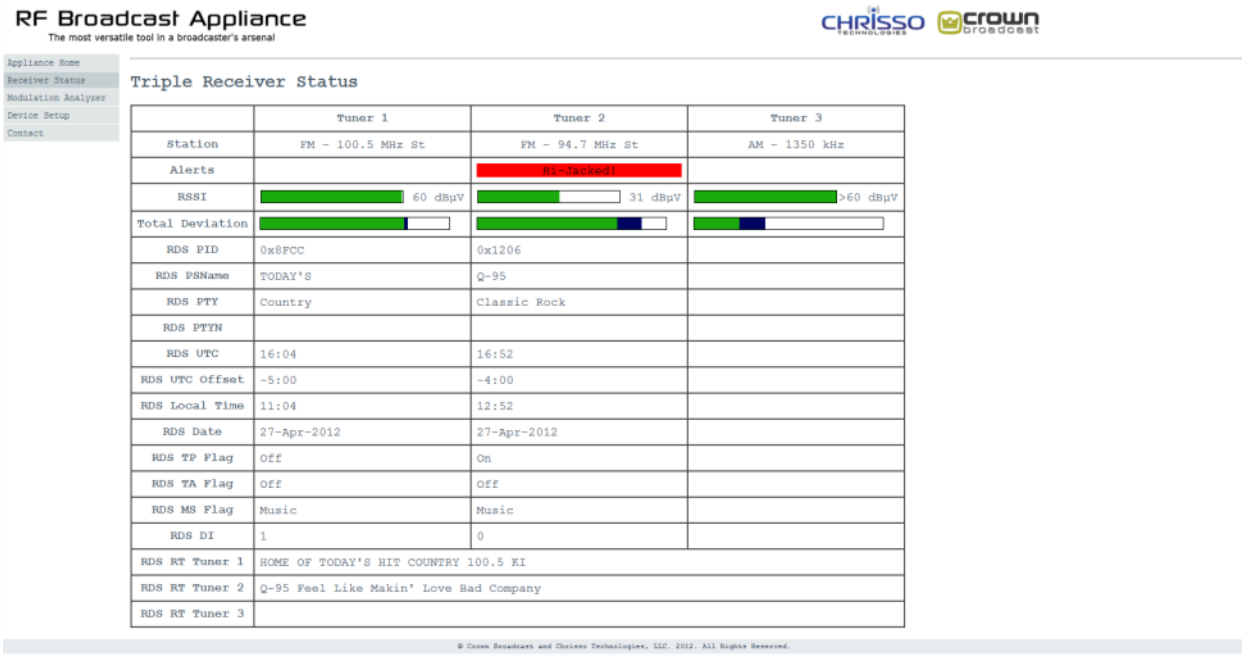

Figure 17 - Receiver Status

Modulation Analyzer

The Modulation Analyzer page shows the complete breakdown of the received signals for all three tuners. A description of each item can be found in the TUNER MONITOR MENU section.

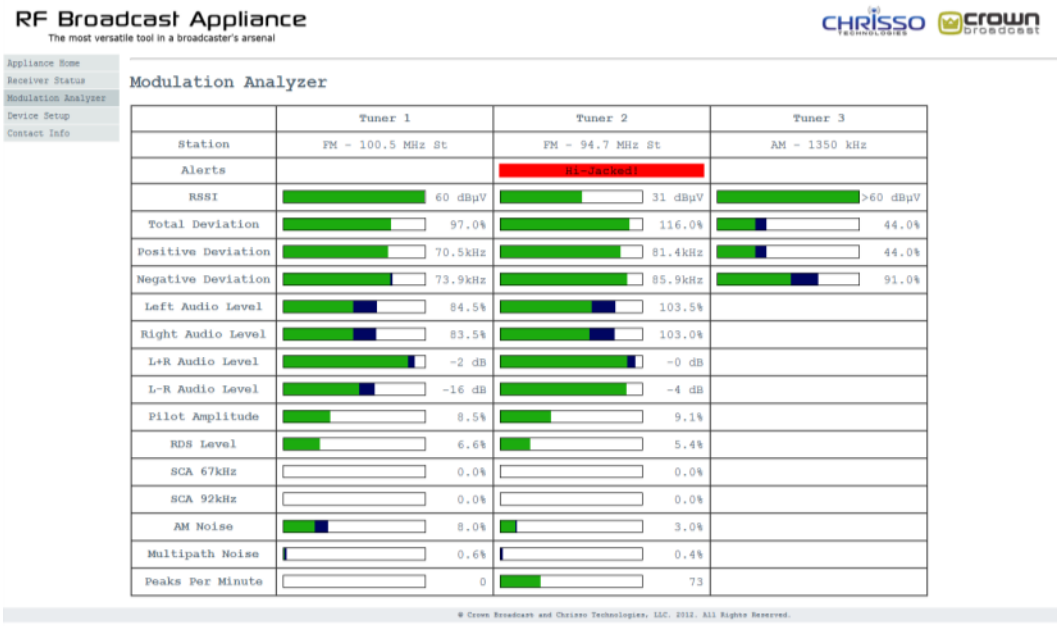

Figure 18 - Modulation Analyzer

Device Setup

The Device Setup page contains configuration control for the three tuners, the MPX output, Alerts, Network, and System settings. On each page within the Device Setup, the user must click submit before any of the changes will be sent to the RFBA.

Receivers

The Receivers page allows the user to set the region for the device (North America, Europe, Japan), the desired band (AM, FM, Weather (WX), Public Service (PS)), and the frequency which can be selected from a pull-down box to ensure valid frequencies for that band and region. In FM Band, the user can also select whether to enable De-Emphasis in the audio and whether to force the receiver to Mono (forcing the receiver to Mono on Tuner 1 will also set the MPX output for a Mono signal). There is a pull-down box to set the update rate for the "Modulation Analyzer" and "Receiver Status" pages. The default update rate is 1.0 second but it can be adjusted to 500msec for fast Ethernet connections or 1 minute for very slow connections. A description of the Bandwidth Filter, Audio Output Level, PPM Threshold, and Holdoff Time can be found in TUNER SETUP MENU section.

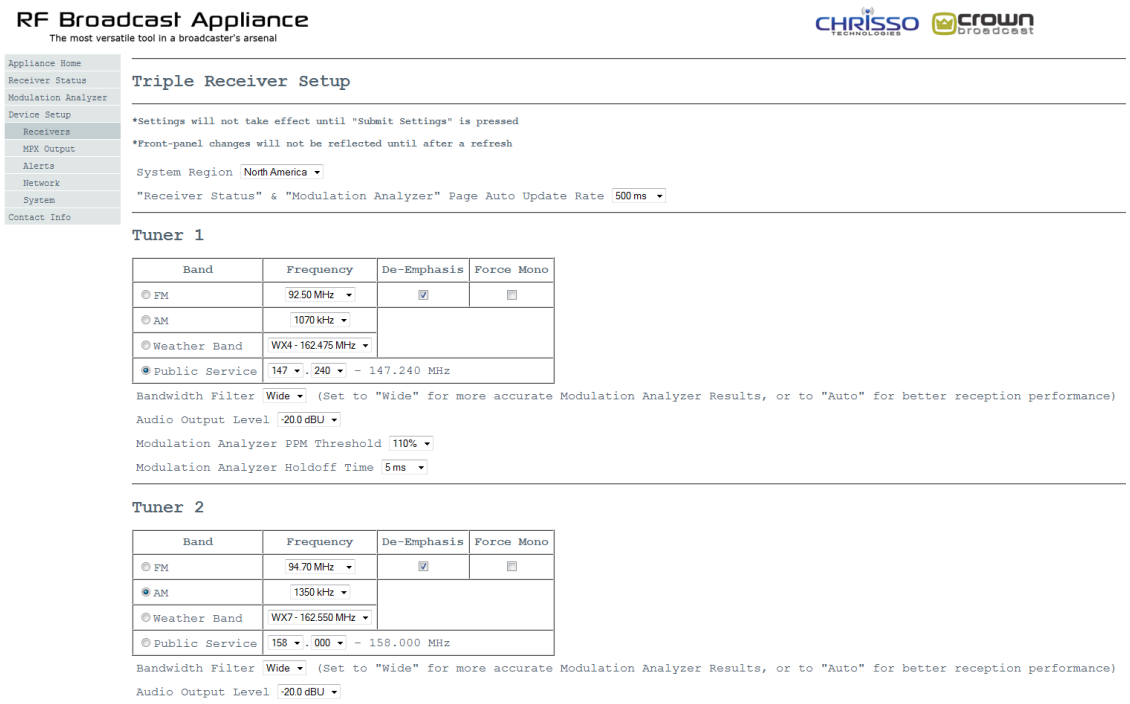

Figure 19 - Device Setup -> Receivers

MPX Output

The MPX Output page allows the user to configure the MPX (FM Multiplex) signal including the percentages for Pilot, RDS, and output amplitude. The default amplitude is 1.25V_{rms} but is adjustable in 1mV increments. This page also allows for selection of user settings or pass-through of received RDS data.

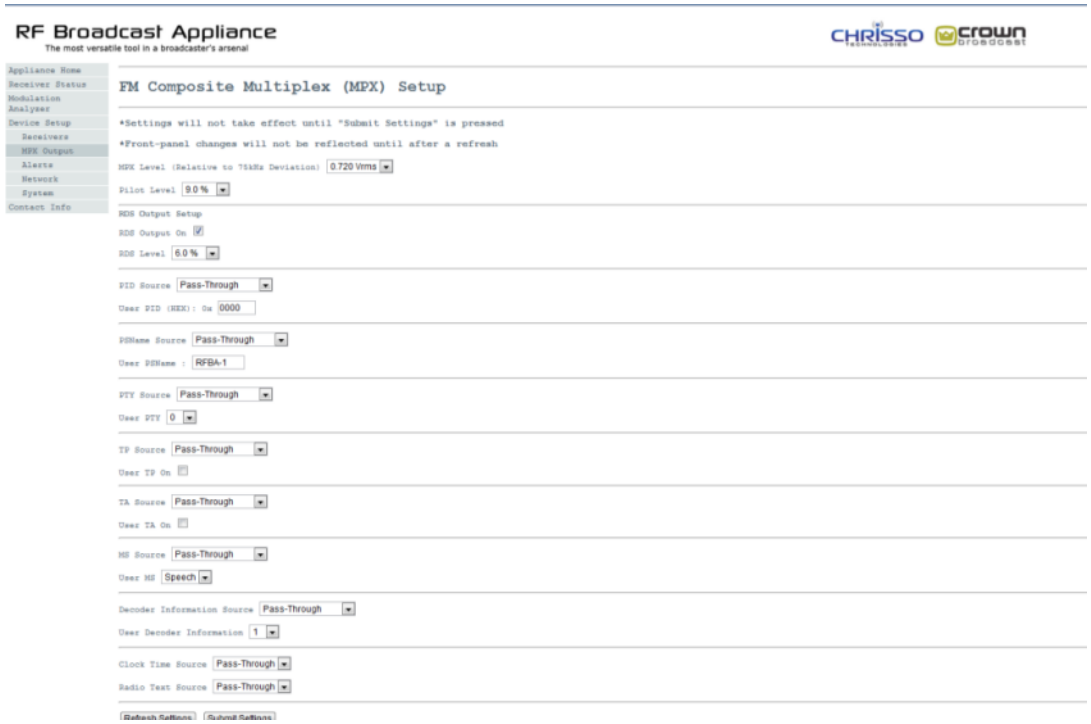

Figure 20 - Device Setup -> MPX Output

Alerts

The Alerts page allows the user to configure alerts for each tuner. The user can also select the option to trigger a relay, send an email, or both based on the alerts. Details for the Alerts can be found in TUNER SETUP MENU.

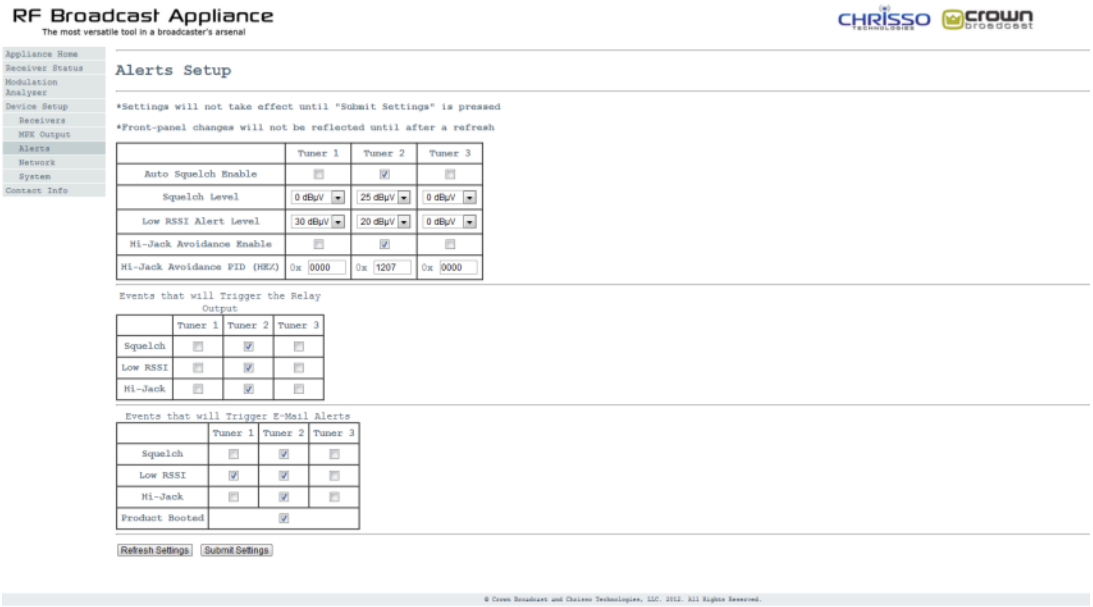

Figure 21 - Device Setup -> Alerts

Network->IPV4

The IPV4 page allows the user to configure the Ethernet settings including the IP Address of the RFBA, the Subnet Mask, and the Default Gateway address. It also displays the MAC address for the RFBA. The "Bandwidth Reduction" pull-down box is used to enable the Ethernet Nagle algorithm which is used to packetize the Ethernet data. This function can be enabled for long latency, low bandwidth applications such as remote sites with a satellite connection.

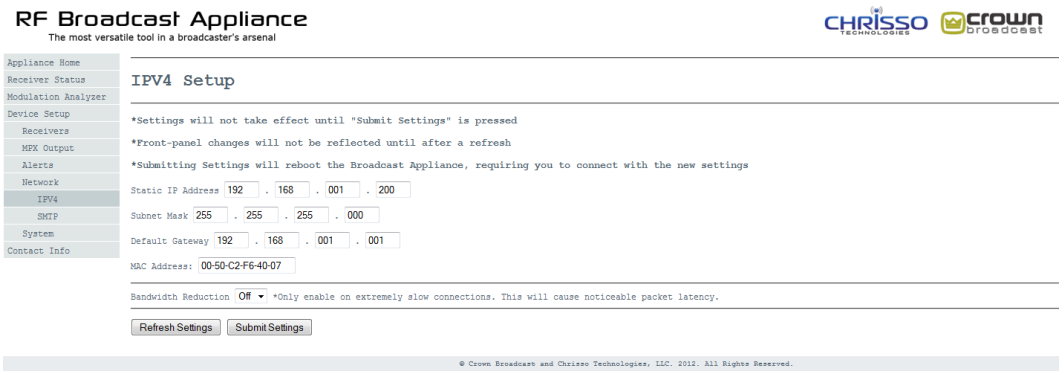

Figure 22 - Device Setup -> Network -> IPV4

Network->SMTP

The SMTP page allows the user to configure the email account settings for use with email alerts.

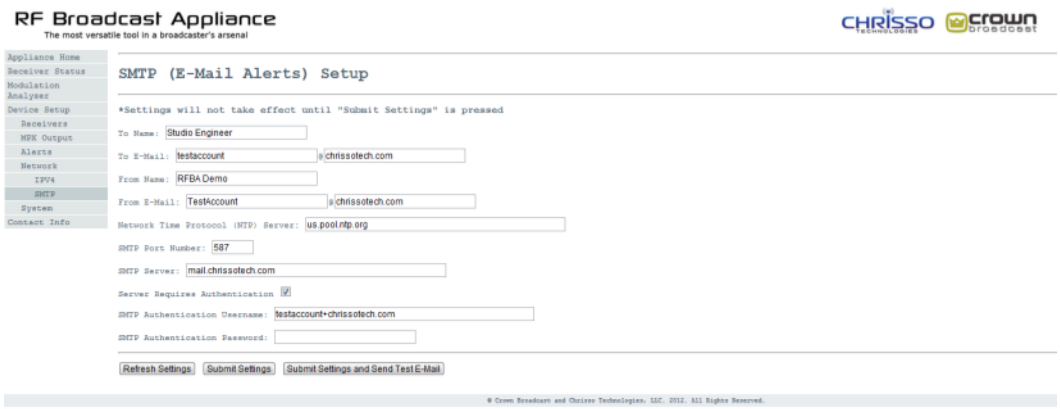

Figure 23 - Device Setup -> Network -> SMTP

System

The System page displays the same information as the Application Home page, but also includes the input method for the user to add software keys to add features such as the Modulation Analyzer. Each key is a 128 bit value represented by 4 groups of 8 hexadecimal characters.

Figure 24 - Device Setup -> System

Contact Info

The Contact Info page contains contact information for both Chrisso Technologies and Crown Broadcast.

Figure 25 - Contact Info

Product Specifications

Parameter	Note	Min	Typ	Max	Units
FM Tuner					
Tuning Range		76.0		107.9	MHz
Step Size	Region dependant	50		200	kHz
Sensitivity	30 dB SINAD		-0.5		dBµV
	12 dB SINAD		-9.5		dBµV
THD			0.05		%
SNR		75			dB
Stereo Separation			55		dB
Adjacent Channel Rejection	Noise limited		82		dB
RF Input impedance			50		ohms
De emphases	Region Dependant	Off		75	µsec
AM Tuner					
Tuning Range		520		1710	kHz
Step Size	Region dependant	9		10	kHz
Sensitivity	20 dB SINAD, 80%AM		1		$dB\mu V_{emf}$
THD	80% AM		0.15		%

Parameter	Note	Min	Typ	Max	Units
SNR	80% AM		69		dB
NOAA Weather Tuner					
Tuning Range		162.40		162.55	MHz
Step Size			25		kHz
Sensitivity	12 dB SINAD		-6.0		dBµV
Adjacent Channel Rejection			60		dB
Public Service Tuner					
Tuning Range		144.000		175.000	MHz
Step Size			5		kHz
Sensitivity	12 dB SINAD		-6.0		dBµV
MPX Output					
Amplitude	R_{load} = 75 Ω	1		4	V_{p-p}
THD			0.1		%
Balanced Audio Output					
Amplitude	R_{load} = 600 Ω	0.25		1.1	V_{rms}
THD			0.1		%
Relay					
Switching Voltage	Max DC/Peak AC			200	Volts
Carry Current	Max DC/Peak AC			1	Amps
Static Contact Resistance		0.200			ohms
Power Supply					
Voltage		9	12	14	V_{dc}
Current			1		A_{dc}

Figure 26 - Specifications

Software Updates

The RFBA has a USB port that can be used for firmware updates to the device. The firmware update must be loaded onto a flash drive at the root level. The flash filename will always be 'image.cmg'. Each time the RFBA boots, it will look to see if there is a flash drive with the 'image.cmg' file located on it. If it is found, it will check the file to make sure it is intact and compare the software revision level. If the software revision level currently in the RFBA is greater than the 'image.cmg' file, then the RFBA will boot as normal. If the 'image.cmg' file is newer, then the RFBA will display that it is updating the firmware. It is important that the USB drive and the power are not removed during this process. It usually takes 10-20 seconds to complete, and the RFBA will reboot once the update is complete. It is possible to update the software to an older version by holding the enter key when the power is connected to the RFBA. This will skip the version check and force the update.

Starting with firmware revision 1.03 there will also be an EEPROM update. This update is similar to the flash update. The EEPROM filename must always be 'image.cei' on the USB drive. After the RFBA has loaded the latest flash firmware update it will check to verify that it also has the correct EEPROM image. If the EEPROM image is out of date then it will load the valid image from the USB drive. If the valid image is not found the product will not boot. Note that it is critical that the firmware and the EEPROM revision must be compatible for the product to boot. EEPROM updates are rare and will work with multiple flash firmware updates. For example EEPROM v1.00 will work with flash version 1.00 thru 1.02. EEPROM v1.03 will work with flash firmware v1.03 and higher (v1.03 is the latest release).

USB flash drive requirements

The RFBA will accept USB drives that conform to the USB specification and are formatted as FAT or FAT32 (NTFS is not supported). The RFBA does not contain a full operating system such as Windows or Linux and thus does not contain USB drivers from every USB flash drive manufacturer. As such the RFBA will only work with devices manufactured that conform to the specifications set forth by the USB Flash Drive alliance.

Current USB Flash Drive Alliance Members:

- Buffalo Technology
- Corsair Memory
- Crucial Technology
- Infineon Technologies
- Kingston Technology
- Lexar Media
- Microsoft
- Phison
- PNY Technologies
- Samsung
- SimpleTech

FCC / IC Compliance

Class A Product:

Per US Federal Communications Commission Part 15.105(a):

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this

equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Per Industry Canada ICES-003e:

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Class B Product:

Per US Federal Communications Commission Part 15.105(b):

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Per Industry Canada ICES-003e:

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Contact Information

Chrisso Technologies

Website: www.ChrissoTech.com

Email: Info@ChrissoTech.com

Crown Broadcast

Website: www.CrownBroadcast.com

Sales

Toll Free: 1-866-262-8972

Email: FMSales@irec1.com

Service

24-Hour Toll Free: 1-866-262-8917

Email: Service@irec1.com