RX1
REFERENCE RECEIVER

TECHNICAL MANUAL V. 1.1

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Contents

Part I

Introduction

The RX1

The RX1 is unique, totally unique.

Not until now has there been an analog FM receiver that works as you wanted it to.

Using digital signal processing technology the RX1 is able to receive signals clearer than you ever thought possible. With its low distortion, great stereo separation, excellent signal handling and signal processing of the weakest signals the RX1 is the market leading number one choice for FM reception.

The RX1 employs an image cancelling high dynamic range front end mixing system for on channel to IF conversion. Together with the digital signal processed steep IF band filtering the RX1 achieves excellent adjacent channel filtering, making it ideal for reception of distant FM signals when located on a transmitter site.

The digital demodulator of the RX1 is ultimately configurable - providing the user with a degree of flexibility unheard of in FM reception products. RF and audio bandwidths are at the users control and with the adaptive control settings the receiver can be left to adjust itself as necessary, keeping out the noise from your audio while keeping to the limits that you have set. For the first time ever you are able to control the behaviour of the radio - you are now the designer of your own product's performance.

The RX1 has professional level balanced XLR connections for the analog and AES/EBU outputs. As well as recovering pristine audio the RX1 also decodes any transmitted RDS data.

The RX1 front panel control system is state of the art, with two organic LED displays, touch sensitive buttons and a wheel for user input. If placed at a remote site and front panel control not possible the built in web-server allows monitoring and control from anywhere in the world using a web-browser.

The RX1 has a real time clock for time and day mode selection, back panel preset trigger ports and more - each feature designed to make the unit flexible and easy to integrate into any broadcast facility.

We know you love listening to radio; the RX1 loves radio like you do.

Have Fun.

Warranty

Please ensure the Warranty Registration process is completed upon receipt of this product. To do so go to www.bwbroadcast.com/warranty with your product's serial number to hand.

BW Broadcast warrants the mechanical and electronic components of this product to be free of defects in material and workmanship for a period of two (2) years from the original date of purchase, in accordance with the warranty regulations described below. If the product shows any defects within the specified warranty period that are not due to normal wear and tear and/or improper handling by the user, BW Broadcast shall, at its sole discretion, either repair or replace the product. If the unit has a manufacturers fault within twenty eight (28) days then BW Broadcast will pay the freight at their discretion.

If the warranty claim proves to be justified, the product will be returned to the user freight prepaid. Warranty claims other than those indicated above are expressly excluded.

Return authorisation number: To obtain warranty service, the buyer (or his authorized dealer) must call BW Broadcast during normal business hours BEFORE returning the product. All inquiries must be accompanied by a description of the problem. BW Broadcast will then issue a return authorization number. Subsequently, the product must be returned in its original shipping carton, together with the return authorization number to the address indicated by BW Broadcast. Shipments without freight prepaid will not be accepted.

Warranty regulations: Warranty services will be furnished only if the product is accompanied by a copy of the original retail dealer's invoice. Any product deemed eligible for repair or replacement by BW Broadcast under the terms of this warranty will be repaired or replaced within 30 days of receipt of the product at BW Broadcast.

If the product needs to be modified or adapted in order to comply with applicable technical or safety standards on a national or local level, in any country which is not the country for which the product was originally developed and manufactured, this modification/adaptation shall not be considered a defect in materials or workmanship. The warranty does not cover any such modification/adaptation, irrespective of whether it was carried out properly or not. Under the terms of this warranty, BW Broadcast shall not be held responsible for any cost resulting from such a modification/adaptation.

Free inspections and maintenance/repair work are expressly excluded from this warranty, in particular, if caused by improper handling of the product by the user. This also applies to defects caused by normal wear and tear, in particular, of faders, potentiometers, keys/buttons and similar parts.

Damages/defects caused by the following conditions are not covered by this warranty: Misuse, neglect or failure to operate the unit in compliance with the instructions given in BW Broadcast user or service manuals. Connection or operation of the unit in any way that does not comply with the technical or safety regulations applicable in the country where the product is used. Damages/defects caused by force majeure or any other condition that

is beyond the control of BW Broadcast. Any repair or opening of the unit carried out by unauthorized personnel (user included) will void the warranty.

If an inspection of the product by BW Broadcast shows that the defect in question is not covered by the warranty, the inspection costs are payable by the customer.

Products which do not meet the terms of this warranty will be repaired exclusively at the buyer's expense. BW Broadcast will inform the buyer of any such circumstance. If the buyer fails to submit a written repair order within 6 weeks after notification, BW Broadcast will return the unit C.O.D. with a separate invoice for freight and packing. Such costs will also be invoiced separately when the buyer has sent in a written repair order.

Warranty transferability: This warranty is extended exclusively to the original buyer (customer of retail dealer) and is not transferable to anyone who may subsequently purchase this product. No other person (retail dealer, etc.) shall be entitled to give any warranty promise on behalf of BW Broadcast.

Claims for damages: Failure of BW Broadcast to provide proper warranty service shall not entitle the buyer to claim (consequential) damages. In no event shall the liability of BW Broadcast exceed the invoiced value of the product.

Other warranty rights and national law: This warranty does not exclude or limit the buyer's statutory rights provided by national law, in particular, any such rights against the seller that arise from a legally effective purchase contract. The warranty regulations mentioned herein are applicable unless they constitute an infringement of national warranty law.

Safety

CAUTION: To reduce the risk of electrical shock, do not remove the cover. No user serviceable parts inside. refer servicing to qualified personnel.

WARNING: To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture.

Figure 3.1: This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure—voltage that may be sufficient to constitute a risk of shock.

Figure 3.2: This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.

DETAILED SAFETY INSTRUCTIONS:

All the safety and operation instructions should be read before the appliance is operated.

Retain Instructions: The safety and operating instructions should be retained for future reference.

Heed Warnings: All warnings on the appliance and in the operating instructions should be adhered to.

Follow instructions: All operation and user instructions should be followed.

Water and Moisture: The appliance should not be used near water (e.g. near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool etc.). The appliance should not be exposed to dripping or splashing and objects filled with liquids should not be placed on the appliance.

Ventilation: The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa rug, or similar surface that may block the ventilation openings, or placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

Heat: The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliance (including amplifiers) that produce heat.

Power Source: The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

Grounding or Polarization: Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.

Power-Cord Protection: Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords and plugs, convenience receptacles and the point where they exit from the appliance.

Cleaning: The appliance should be cleaned only as recommended by the manufacturer.

Non-use Periods: The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

Object and Liquid Entry: Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

Damage Requiring Service: The appliance should be serviced by qualified service personnel when:

- The power supply cord or the plug has been damaged; or

- Objects have fallen, or liquid has been spilled into the appliance; or

- The appliance has been exposed to rain; or

- The appliance does not appear to operate normally or exhibits a marked change in performance; or

- The appliance has been dropped, or the enclosure damaged.

Servicing: The user should not attempt to service the appliance beyond that is described in the Operating Instructions. All other servicing should be referred to qualified service personnel.

CE CONFORMANCE: This device complies with the requirements of the EEC Council Directives: 93/68/EEC (CE Marking); 73/23/EEC (Safety – low voltage directive); 2004/108/EC (electromagnetic compatibility). Conformity is declared to those standards: EN50081-1, EN50082-1.

WARNING: This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions in this manual it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device (pursuant to subpart J of Part 15 FCC Rules), designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, at which case, the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

CANADA WARNING: This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the Radio Interference Regulations of the Canadian Department of Communications. Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limits applicables aux brouillage radioelectrique edicte par le ministere des Communications de Canada.

Quick Start

1. Install the RX1 into the rack.

2. Connect AC power to the unit, and turn on the power.

3. Connect an antenna to the RF In connector.

4. Connect the appropriate audio outputs.

5. Set the frequency: **Tuner** $\Rightarrow$ **Frequency**

6. Turn de-emphasis on: **Tuner** $\Rightarrow$ **Deemphasis**

7. Connect the audio and/or digital outputs as required.

8. Navigate to the Analog (**Audio** $\Rightarrow$ **Analog**) or Digital **Audio** $\Rightarrow$ **Digital** menu

    (a) Set the output levels for the analogue and digital outputs to match the equipment that the processor is connected to.

9. Press softkey **'LOAD'** to select a factory preset. See 'Managing presets' (Section 17, page 45) for details.

    NOTE: The front panel headphone jack connects to the analogue outputs so the sound may be excessively bright if de-emphasis is set to 'off'.
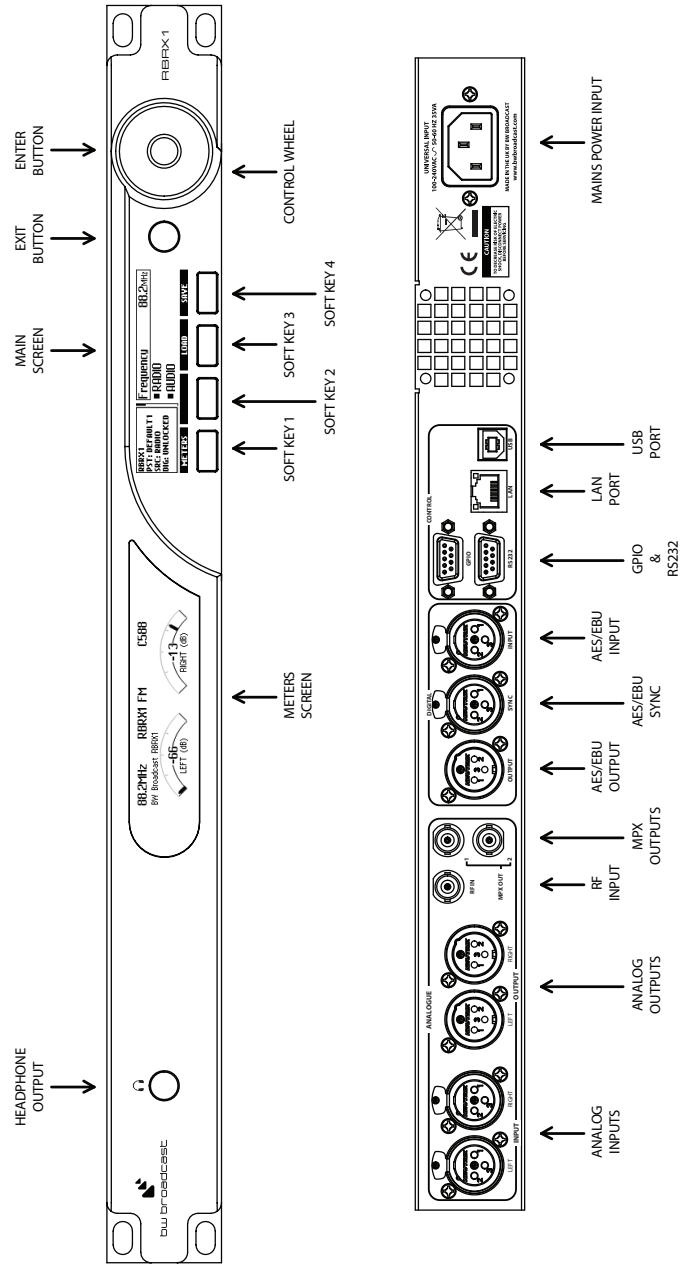
Connections

Figure 5.1: RX1 Front and Back Panels

Part II

Menu Structure

Menu Structure

- **Tuner**
  - ○ **Frequency** Sets the tuner frequency in 50kHz steps.
  - ○ **De-emphasis** Controls the de-emphasis setting of the received audio. Options are Off, 50 uS (Europe) and 75 uS (USA).
  - ○ **Audio lowpass filter** Sets the cut-off frequency for the tuner audio filter.
  - ○ **IF Filter**
    - ❏ **Bandwidth** This parameter allows you to manually set the intermediate frequency filter bandwidth, or configure it to be automatically adjusted.
    - ❏ **Default Bandwidth** Sets the filter bandwidth that will be used under good signal conditions.
    - ❏ **Min Bandwidth** Sets the minimum filter bandwidth.
    - ❏ **Threshold Extension** Sets the minimum filter bandwidth for low signal strengths.
    - ❏ **Max Bandwidth Boost** For signals with large modulation deviation, the default bandwidth may be too small. This parameter allows the maximum bandwidth boost that will be applied for very heavily modulated signals to be set.
  - ○ **Stereo Blend**
    - ❏ **Stereo Width** Sets whether the received signal is received as mono or stereo.
    - ❏ **Signal Threshold** Sets what level the signal needs to drop below to start influencing the amount of stereo blend.
    - ❏ **Signal Attack Tc** Sets how quickly the stereo blend algorithm responds to the signal level reducing.
    - ❏ **Signal Release Tc** Sets how quickly the stereo blend algorithm responds to the signal level increasing.
    - ❏ **Multipath Threshold** Sets what level the multipath detector needs to rise to above to start influencing the amount of stereo blend.
    - ❏ **Multipath Attack Tc** Sets how quickly the stereo blend algorithm responds to the multipath detector increasing.
    - ❏ **Multipath Release Tc** Sets how quickly the stereo blend algorithm responds to the multipath detector decreasing.
    - ❏ **USN Threshold** Sets what level the ultra-sonic noise detector needs to rise to above to start influencing the amount of stereo blend.
    - ❏ **USN Attack Tc** Sets how quickly the stereo blend algorithm responds to the ultra-sonic noise detector increasing.
    - ❏ **USN Release Tc** Sets how quickly the stereo blend algorithm responds to the ultra-sonic noise detector decreasing.
    - ❏ **Pilot Threshold** Sets what level the pilot needs to drop below to start influencing the amount of stereo blend.
    - ❏ **Pilot Attack Tc** Sets how quickly the stereo blend algorithm responds to the pilot level reducing.
    - ❏ **Pilot Release Tc** Sets how quickly the stereo blend algorithm responds to the pilot level increasing.
  - ○ **High Cut**
    - ❏ **Min Audio Bandwidth** Sets the minimum bandwidth of the high cut filter.
    - ❏ **Signal Threshold** Sets what level the signal needs to drop below to start influencing the amount of high cut.
    - ❏ **Signal Attack Tc** Sets how quickly the high cut algorithm responds to the signal level reducing.
    - ❏ **Signal Release Tc** Sets how quickly the high cut algorithm responds to the signal level increasing.
    - ❏ **Multipath Start Threshold** Sets what level the multipath detector needs to rise to above to start influencing the amount of high cut.
    - ❏ **Multipath Attack Tc** Sets how quickly the high cut algorithm responds to the multipath detector increasing.
    - ❏ **Multipath Release Tc** Sets how quickly the high cut algorithm responds to the multipath detector decreasing.
    - ❏ **USN Start Level** Sets what level the ultra-sonic noise detector needs to rise above to start influencing the amount of high cut.
    - ❏ **USN Attack Tc** Sets how quickly the high cut algorithm responds to the ultra-sonic noise detector increasing.

- ❑ **USN Release Tc** Sets how quickly the high cut algorithm responds to the ultra-sonic noise detector decreasing.
- ❍ **Softmute**
  - ❑ **Signal Threshold** Sets what level the signal needs to drop below to start influencing the amount of soft mute.
  - ❑ **Signal Attack Tc** Sets how quickly the soft mute responds to the signal level reducing.
  - ❑ **Signal Release Tc** Sets how quickly the soft mute responds to the signal level increasing.
  - ❑ **Multipath Threshold** Sets what level the multipath detector needs to rise to above to start influencing the amount of soft mute.
  - ❑ **Multipath Attack Tc** Sets how quickly the soft mute responds to the multipath dectector increasing.
  - ❑ **Multipath Release Tc** Sets how quickly the soft mute responds to the multipath detector decreasing.
  - ❑ **USN Start Threshold** Sets what level the ultra-sonic noise detector needs to rise to above to start influencing the amount of soft mute.
  - ❑ **USN Attack Tc** Sets how quickly the soft mute responds to the ultra-sonic noise dectector increasing.
  - ❑ **USN Release Tc** Sets how quickly the soft mute responds to the ultra-sonic noise detector decreasing.
- ❍ **Advanced**
  - ❑ **Audio out gain** Allows the volume of the received audio to be adjusted in the range +/-3dB.
  - ❑ **Frequency step** Selects the frequency step size from options: odd, even, 100kHz, 50kHz.

- ● **Audio**
  - ❍ **Headphone Level** Sets the output level of the front panel headphone port. Range is 0 to 32 with higher numbers equating to more volume.
  - ❍ **Digital**
    - ❑ **Output Level** Controls the peak output level of the digital output. Range is -12dBFS to 0dBFS.
    - ❑ **Output Sample Rate** Sets the output sampling rate for the AES/EBU digital output. The available rates are 32 kHz, 44.1 kHz, 48 kHz, follow digital input rate and follow external sync rate.
  - ❍ **Analog**
    - ❑ **Output Level** Controls the peak output level of the analog output. Range is 6dBu to 24dBu.

- ● **RDS**
  - ❍ **PTY Coding** Selects between RDS (European) PTY coding and RBDS (US) PTY coding.

- ● **Triggers**
  - ❍ **Trigger [1-4]**
    - ❑ **Enable** Enables/disables the trigger.
    - ❑ **Preset Select** Selects which preset to change to if action is set to change preset.
    - ❑ **Send e-mail** Selects if an e-mail will be sent when the alarm state changes.
    - ❑ **(ON) Message** Sets the message that will be sent when the Trigger changes to ON.
    - ❑ **(OFF) Message** Sets the message that will be sent when the Trigger changes to OFF.
    - ❑ **Recipient(s)** Sets who the email will be sent to. Multiple addresses must be separated by commas.

- ● **Alarms**
  - ❍ **Alarm [A-D]**
    - ❑ **Source** Selects which detector is the source for the alarm. Options are signal, pilot, audio level, USN, Multipath, PI, TA and TP.
    - ❑ **Polarity** Selects whether the output is active high or active low.
    - ❑ **On Delay** Sets how long the error condition must occur for before an alarm is triggered.
    - ❑ **Off Delay** Sets how long the error condition must have stopped for before an alarm is untriggered.
    - ❑ **Signal Threshold** Selects the threshold below which the signal will trigger an alarm.
    - ❑ **Pilot Threshold** Selects the threshold below which the pilot level will trigger an alarm.

- ❑ **Tuner Audio Threshold** Selects the threshold below which the tuner audio level will trigger an alarm.
- ❑ **USN Threshold** Selects the threshold above which the USN detector will trigger an alarm.
- ❑ **Multipath Threshold** Selects the threshold above which the USN detector will trigger an alarm.
- ❑ **PI Codes**
  - · **Number of PI codes** Sets the number of valid PI codes.
  - · **PI Code 1** Sets the PI code. If the PI code is different from the PIs set, an alarm will be triggered.
  - · **PI Code 2** Sets the PI code. If the PI code is different from the PIs set, an alarm will be triggered.
  - · **PI Code 3** Sets the PI code. If the PI code is different from the PIs set, an alarm will be triggered.
  - · **PI Code 4** Sets the PI code. If the PI code is different from the PIs set, an alarm will be triggered.
- ❑ **Action** Selects what action the input will trigger. Options are pin only and change preset.
- ❑ **Preset** Selects which preset to change to if action is set to change preset.
- ❑ **Send e-mail** Selects if an e-mail will be sent when the alarm state changes.
- ❑ **Recipient(s)** Sets who the email will be sent to. Multiple addresses must be separated by commas
- ○ **Structure**
  - ❑ **Fallback** Selects the structure of the fallback mechanism. Refer to the manual for further help.

- ● **System**
  - ○ **Date** Sets the date of the Real Time Clock.
  - ○ **Time** Sets the time of the Real Time Clock.
  - ○ **Uptime** Reports the uptime of the unit (i.e. how long has it been powered on for).
  - ○ **Location** The physical location of this device (e.g., 'telephone closet, 3rd floor').
  - ○ **Contact** The contact details for the person who manages this device.
  - ○ **Screen Saver** This allows the time-out before the screensaver starts to be adjusted between 15s and 30 minutes.
  - ○ **Screen Lock** Enables/disables the screen lock code.
  - ○ **Screen Lock Code** Sets the screen lock code.
  - ○ **Clicker** Enables/disables the front panel audio feedback.
  - ○ **Ethernet**
    - ❑ **DHCP** Sets whether the ethernet is configured manually or by DHCP.
    - ❑ **DHCP IP** Reads back the DHCP IP address.
    - ❑ **DHCP SM** Reads back the DHCP subnet mask.
    - ❑ **DHCP GW** Reads back the DHCP gateway.
    - ❑ **DHCP DNS 1** Reads back the DHCP Primary DNS server.
    - ❑ **DHCP DNS 2** Reads back the DHCP Secondary DNS server.
    - ❑ **Static IP** Sets the manual IP address.
    - ❑ **Static SM** Sets the manual subnet mask.
    - ❑ **Static GW** Sets the manual gateway.
    - ❑ **Static DNS 1** Sets the manual Primary DNS server.
    - ❑ **Static DNS 2** Sets the manual secondary DNS server.
    - ❑ **MAC** Reads back the ethernet MAC address.
  - ○ **SMTP**
    - ❑ **Test**
      - · **Test** Sends a test e-mail.
      - · **Recipient(s)** Sets who the test email will be sent to. Multiple addresses must be separeted by commas.
    - ❑ **Host** Sets the IP address of the SMTP server.
    - ❑ **From** Sets the email address of the sender. The unit will send e-mails through this address.
    - ❑ **Username** Sets the username for SMTP authentication. Must be left blank if no authentication is required.
    - ❑ **Password** Sets the password for SMTP authentication. Must be left blank if no authentication is required.

- ❏ **Port** Sets the port number of the SMTP server.
- ❏ **Max emails a day** Sets the maximum number of emails allowed to be sent by the unit in a single day.
- ❏ **Emails sent today** Reports the number of emails sent today.
- ○ **HTTP**
  - ❏ **Enable** Enables/disables the web server.
  - ❏ **Port** Sets the webserver TCP port. Disable HTTP to change.
- ○ **Telnet**
  - ❏ **Enable** Enables/disables the telnet server.
  - ❏ **Port** Sets the telnet TCP port. Disable Telnet to change.
- ○ **RS232**
  - ❏ **Enable** Enables/disables the RS232 remote.
  - ❏ **Baud rate** Sets the RS232 baud rate.
- ○ **SNMP**
  - ❏ **Enable**
  - ❏ **Port** Sets the SNMP port. Disable SNMP to change.
  - ❏ **Community**
  - ❏ **Read Only**
  - ❏ **Name** An administratively-assigned name for this device. By convention, this is the device's fully-qualified domain name.
  - ❏ **Object ID** OID for this device.
  - ❏ **Description** A textual description of the device.
- ○ **Log**
  - ❏ **RS232** Enables/disables logging to RS232.
  - ❏ **File** Enables/disables logging to file.
  - ❏ **UDP**
    - · **Enable** Enables/disables logging messages to a remote UDP logging/syslog server
    - · **IP** Sets the IP address where the log messages should be sent via UDP
    - · **Port** Sets the port where the log messages should be sent via UDP. Disable UDP to change.
- ○ **About**
  - ❏ **Serial Number**
  - ❏ **Software Version** Reads back the software version.
  - ❏ **Control Version** Reads back the control board version.
  - ❏ **Digital Version** Reads back the digital board version.
- ○ **Reboot** Reboots the unit.
- ○ **Factory Reset** Performs a factory reset. All user presets will be lost.

Part III

The Front Panel

Interface

The RX1 has an intuitive interface based around a touch sensitive wheel with a central enter button, an exit button and four soft-key buttons. The action of each soft-key is always indicated on the main screen just above the button.

7.1 Navigating the menu

The menu is navigated by running a finger around the touch sensitive wheel to select an item, and pressing the central enter button to open a submenu. Within in a submenu, pressing exit will return to the parent menu.

7.2 Editing a parameter

To edit a parameter, first find it in the menu, highlight it and press enter. For most parameters this will result in the parameter being highlighted (black text on a yellow background). The value of the parameter can now be modified using touch sensitive wheel. When the correct value is selected, press exit to take you back to menu-navigation mode.

Some parameters require a bit more space to edit (e.g. text fields). For these parameters, a dialog box will pop up allowing more space to edit.

7.3 Text fields

When editing a text field, a dialog box will appear allowing modification of the full text. Pressing enter will toggle between two modes:

- Scrolling through the text: the selected character will have a yellow rectangle around it.

- Modifying the current character: the character will be black on a yellow background. When modifying a letter, one of the soft-keys will allow selection between the four character sets: lowercase letters, uppercase letters, numbers and symbols.
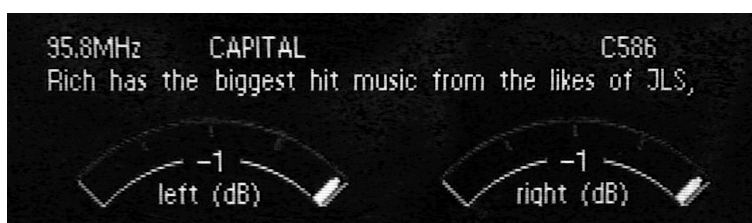
Metering and Status

8.1 Metering

The left screen of the unit holds the metering display.

The RX1 has a very flexible metering system utilizing a high definition OLED display to provide detailed metering of all of the detector measurements. The RX1 provides six screens of meters which can be toggled by pressing the **'METERS'** soft key.

8.1.1 Main screen

This screen displays the tuner frequency, programme service, programme identification, and radio text in addition to the left and right level of the demodulated received signal.

8.1.2 Audio processing screen

This screen indicates the amount of DSP signal conditioning that is being carried out on the received audio.

- **High Cut** High frequency attenuation being applied, 0% corresponds to no attenuation, 100% corresponds to maximum attenuation.

- **IF BW kHz** The current IF filter bandwidth.

- **Softmute** Automatic attenuator, 0% corresponds to no attenuation, 100% corresponds to maximum attenuation.

- **Stereo Blend** Blending being applied, 0% stereo blending corresponds to maximum stereo separation, 100% stereo blending corresponds to mono.

8.1.3 Radio Indicators screen

This screen displays the values of the various RF quality indicators that the tuner measures. These indicators are used as inputs to the DSP signal conditioning block.

- **Signal (dBuV)** RF signal level in dBμV.

- **Pilot (kHz)** Stereo pilot level in kHz

- **USN** Ultrasonic noise indicator

- **Multipath** Multipath noise indicator

8.1.4 RDS screen

This screen provides additional RDS decoding not shown on the summary screen, including PTY, traffic status flags and AF information.

8.2 Status

The home screen (the right screen) on the RX1 is mainly used for parameter adjustment, but the left hand column displays some useful status indications:

- The first line shows the name of the currently active preset

- DIG: Indicates the presence of an AES/EBU signal connected to the digital audio input of the RX1.

- SRC: Indicates which audio source is currently driving the multiplex generator.

Part IV

Remote Control

Ethernet Configuration

<div align="right">9</div>

The RX1 supports static or dynamic IP address allocation. You should check with your network administrator as to which way is best for you to configure your unit. If your network administrator needs the MAC address of your unit, it can be found by navigating to **System** ⇒ **Ethernet** ⇒ **MAC.**

9.1 Dynamic IP address (DHCP)

To configure the Ethernet port for DHCP operation:

1. Navigate to **System** ⇒ **Ethernet**

2. Set **DHCP** to *On*

Once the unit has obtained an IP address from the DHCP server, the parameter DHCP IP will update informing you of the IP address you must use to connect to the unit.

9.2 Static IP address

To configure the Ethernet port with a static IP address:

1. Navigate to **System** ⇒ **Ethernet**

2. Set **DHCP** to *Off*

3. Set **Static IP** to the IP address given to you by your Network Administrator

4. Set **Static SM** to the Subnet mask given to you by your Network Administrator

5. Set **Static GW** to the Gateway given to you by your Network Administrator

6. Optionally set **Static DNS1** to the DNS server given to you by your Network Administrator

7. Optionally set **Static DNS2** to the DNS server given to you by your Network Administrator

Web remote

Important   The web remote utilizes the latest HTML5 web standards. It is important the web browser used to access it is updated to the latest version. If an older web browser is used, some of the features may not be displayed.

Using The Web Remote   Type the IP Address of the RX1 into a web browser to access the Web Remote. Parameters will update on the RX1 as the values are changed on the web remote (N.B. values set with sliders will update when the slider is released).

10.1   Authentication

The RX1 web remote is password protected. To login and change the password:

1. Navigate to the IP Address of the unit (see section 9 on page 26)

2. Log in using the default credentials: **Username** *admin*, **Password** *pass*. If the credentials are unknown, navigate to **System** ⇒ **Users** from the front panel and establish the credentials from there.

3. Navigate to **System** ⇒ **Users** and type the desired login details.

4. The web remote is now password protected.

Please note, this password protection system is not designed to protect the unit from an external directed attack. It is recommended that for remote access outside a private LAN, that secure VPN access is used.

10.2   The Meters

The meters are accessed by clicking the metering icon at the top of the Web Remote. Meters are made visible from the menu reached through the spanner icon.

10.3   Configuration

This provides access to all of the parameters accessible on the front panel. See 'Menu Structure' (Section A, page 63) for details.

10.4   Presets

Upload Preset Clicking this option allows a new preset to be uploaded from the computer.

Save as Clicking this option allows the current settings to be saved as a new preset. Clicking the Save as symbol next to an existing preset overwrites that preset with the current settings.

Download Clicking this symbol next to an existing preset allows it to be saved onto the computer.

Delete Clicking this symbol next to an existing preset permanently deletes it from the unit's memory.

10.5   Firmware Update

Download Downloads the current firmware from the device to the computer.

Upload Uploads new firmware from the computer to the device.

Reboot Reboots the device.

Factory Reset Resets the device, all settings will be returned to as they were when the RX1 left the factory. Presets and backup audio will be preserved on the internal flash memory.

10.6   Backup Audio

Upload Audio File This allows you to upload an audio file, in the .wav format, for use when audio input fails.

Download Clicking this symbol next to an existing audio file allows it to be saved onto the computer.

Delete Clicking this symbol next to an existing audio file deletes it from the unit's memory.

Telnet Remote

All of the settings on the RX1 can be controlled remotely using a telnet interface. To configure the telnet interface:

1. First configure the Ethernet interface (Section 9, page 26)

2. Then Navigate to **System** $\Rightarrow$ **Telnet**

3. Set **Port** to 23 (the default telnet port), or a custom port if necessary

4. Set **Active** to *on*

You can now connect to the telnet remote using any standard telnet client. Once connected you should see the message "Welcome to the RX1!". The telnet interface is a command-line type interface. After typing a command you need to press enter to carry it out. A full list of available commands is presented in Appendix A.

```
help            Displays help message
get             Gets a parameter
set             Sets a parameter
loadPreset      Load a preset
savePreset      Save a preset
listPresets     List all the presets
listAudioFiles  List all the audio files
reboot          Reboot
```

help   This command (without any arguments) displays a list of the commands the unit understands

help $< parameter\_id >$ This command displays a short description of the requested parameter.

get $< parameter\_id >$ This command returns the current value of the parameter requested.

set $< parameter\_id > < parameter\_value >$ This command sets the parameter requested to the value specified.

loadPreset $< preset\_id >$ This command loads the preset specified

savePreset $< preset\_name > [preset\_id]$ This commands stores all of the preset parameters to the preset specified. If a $preset\_id$ isn't specified, the unit will generate one based on the name supplied.

listPresets This command displays a list of all the presets stored in the unit.

listAudioFiles This command displays a list of all the audio files stored in the unit.

reboot This command reboots the unit. Please note- there will be no confirmation stage, if you send this command the unit will reboot immediately, taking your audio off-air.

Email

The RX1 allows the sending of emails to provide notification of an alarm or external trigger being activated.

To send email, the RX1 needs to be configured with your SMTP server details:

1. Navigate to **System** ⇒ **SMTP**.

2. Set the **Host** and **Port** to that of the network SMTP server.

3. Set the **From, Username** and **Password** fields to that of the email account to be used to send from. If the SMTP server requires no authentication the **Username** and **Password** fields must be left blank.

4. Set the **Max emails a day** to a value you find appropriate. The **Max emails a day** allows the number of emails the unit will send to be limited, preventing the RX1 from flooding your inbox. If the limit is reached, an email will be sent to let you know.

5. To test the server settings, navigate to **Test** ⇒ **Recipients** and enter the appropriate email address. Select **Test** and select *Yes*.

Once the SMTP server settings have been entered, for the RX1 to send emails, the email setting must be activated on the Alarm and Trigger menus.

For alarms:

1. **Alarms** ⇒ **Alarm [A]** ⇒ **Send e-mail** *Yes*.

2. Enter the recipient(s) name in the **Recipient(s)** box which has appeared. Use a comma (e.g. *example1@email.com,example2@email.com*) to separate email addresses.

For triggers:

1. **Triggers** ⇒ **Trigger [1]** ⇒ **Send e-mail** *Yes*.

2. Enter the recipient(s) name in the **Recipient(s)** box which has appeared. Use a comma (e.g. *example1@email.com,example2@email.com*) to separate email addresses.

A different email address may be used for each alarm or trigger.

SNMP

The RX1 supports SNMPv1. SNMP can be used to centrally manage all SNMP enabled devices on a network. A third party MIB browser must be used to utilise the features offered.

To use SNMP:

1. Download the MIB file from your RX1: http://*IP_Address*/api/BWB-RX1-MIB.txt

2. Configure the settings on the RX1:

   (a) Navigate to **System** ⇒ **SNMP**.
   (b) Change **Enable** to *Enabled*.
   (c) Change **Community** to the correct name for the network. It is recommended to not use the default *public* community name.
   (d) If it is required to remotely adjust parameters, set **Read Only** to *Off*.
   (e) Change the **Name** and **Description** to appropriate strings.

3. Load the SNMP software of your choice and enter in the connection details. If **Read Only** is set to *Off*, parameters may be changed from here, otherwise they may just be read.

Serial remote

All of the settings on the RX1 can be controlled remotely using an RS232 interface. To configure the RS232 interface:

14.1 Using Hyperterminal

1. Set the connection speed preferred on the unit, default is 19200. (**System** $\Rightarrow$ **RS232** $\Rightarrow$ **Baud Rate**)

2. Set the RS232 port of the unit to active. (**System** $\Rightarrow$ **RS232** $\Rightarrow$ **Active On**)

3. Connect the RX1 RS232 port to the serial port on the computer.

4. Load up hyperterminal (**Start** $\Rightarrow$ **Programs** $\Rightarrow$ **Accessories** $\Rightarrow$ **Communications** $\Rightarrow$ **Hyperterminal**), give the connection a name and set 'Connect Using' to the serial port utilised.

5. Change the connection speed to match the speed set on the unit and check the settings match as below:

Figure 14.1: Hyperterminal Settings
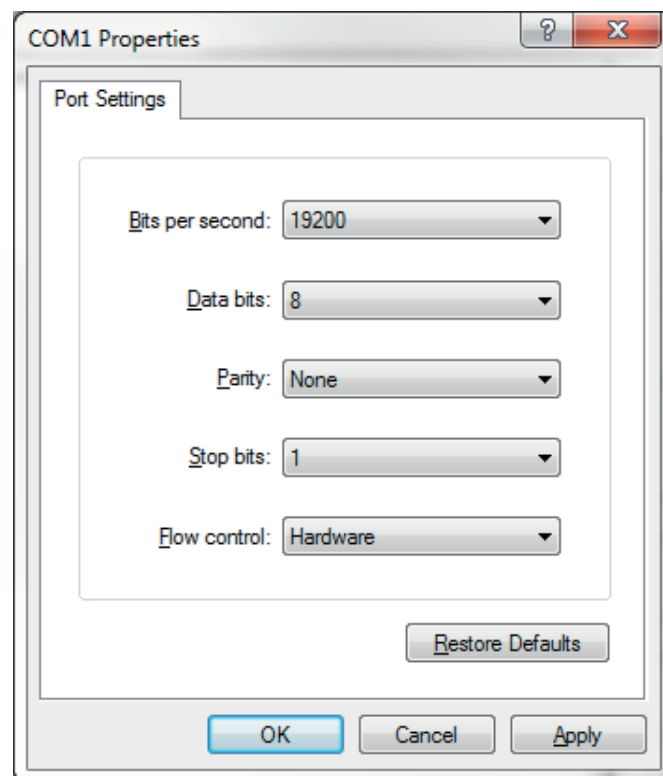
6. Click okay, then press return.

The unit can now be controlled by connecting a suitable 9-pin D-way cable from the device to your PC or other RS232 controller. The commands that the RS232 interface are the same as the telnet remote, with the exception that there is no welcome message (Section 11, page 30). A full list of available commands is presented in Appendix A.

Part V

Processing

Processing structure

The RX1 can be used as a high quality off-air reference receiver and as a rebroadcast receiver. The receiver is very sensitive and offers excellent signal selectivity. It is also capable of advanced digital signal processing to produce the best possible audio signal.

At the IF stage the receiver has an automatic or user adjustable filter to provide adjacent channel suppression. After the signal has be demodulated to base band audio the receiver offers three further processing options, stereo blend, high cut and soft mute. Each of these can be controlled by the RF quality indicators of signal, multipath and ultrasonic noise. The stereo blend function can also be controlled by the pilot level indicator.

In addition to these receiver features the RX1 offers an RDS generator/repeater and a composite clip protected MPX output protecting you rebroadcasted signal from overshoots. Finally, the RX1 has signal quality alarms and features to detect jamming. These control signals can be used to switch in external backup sources (using the analog or digital inputs) or an internal backup audio source.
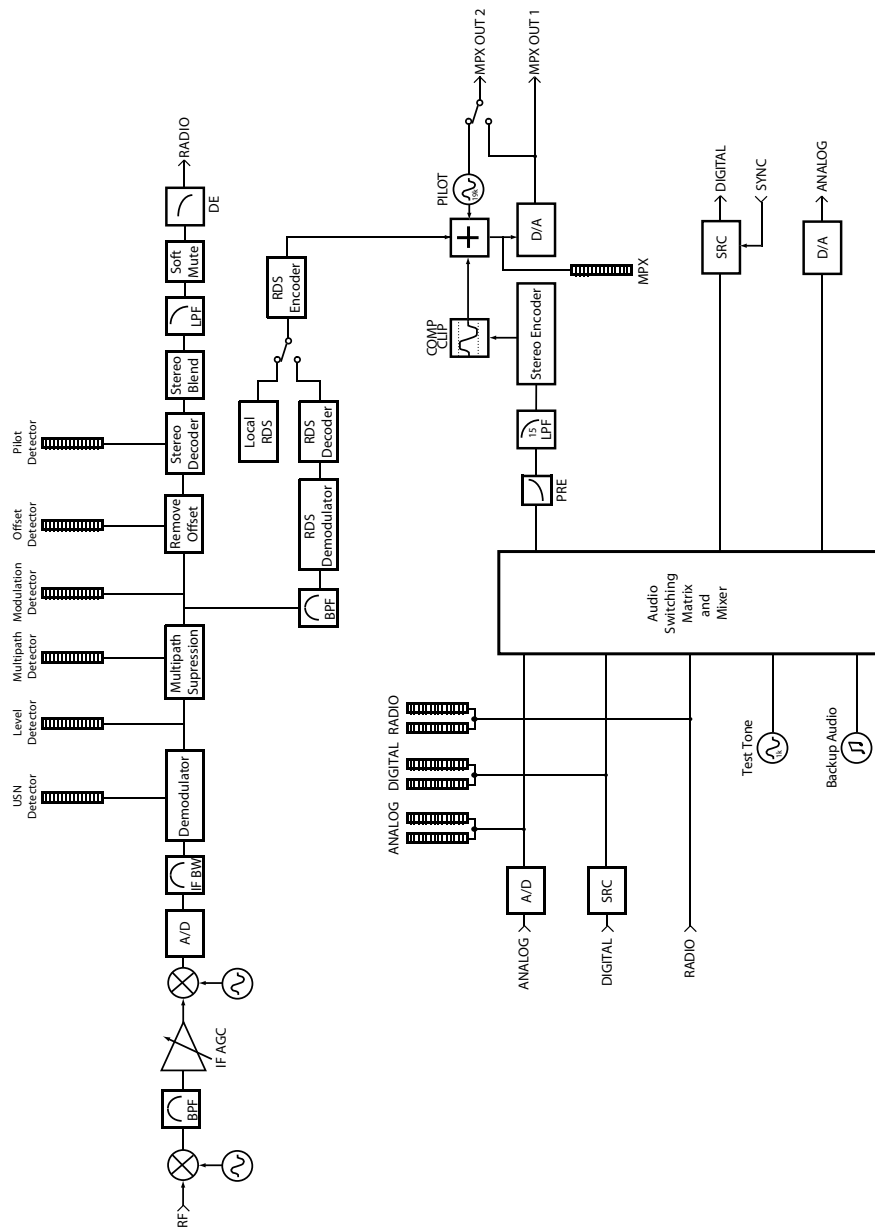
Figure 15.1: RX1 Block Diagram

Tuner 16

This section has more detailed information on setting up the RX1 tuner processing.

16.1 IF Filter

The RX1 has a variable bandwidth adaptive IF filter. This is designed to suppress adjacent channel breakthrough, while minimizing the distortion of the selected channel. The filter can operate in a fixed/manual or in an adaptive/automatic mode.

NB the frequencies quoted in the IF filter configuration are single-sided, but the filter is symmetrical about the channel centre frequency. This means that a bandwidth of 157kHz in the configuration, corresponds to a band-pass filter 314kHz wide.

16.1.1 Manual configuration

To select manual configuration:

- Navigate to **Tuner** $\Rightarrow$ **IF Filter**

- Change **Bandwidth** to select the desired cut-off frequency

When adjusting this parameter, it is recommended that you start with the filter at its widest setting, listening carefully to the level of the noise. As you reduce the bandwidth you should hear the noise reduce, but the distortion increases, the stereo separation decreases and the higher frequencies drop off. Try to select a bandwidth in a position which achieves the best balance between these factors. If you have a good signal strength you should be able to keep the IF filter quite wide, if not you will have to find the best solution for your situation.

16.1.2 Automatic configuration

In automatic mode, the IF filter will adjust its cut-off based on the signal level, modulation level, and an adjacent channel detector. The affect that these detectors have on the filter's cut-off is controlled by four parameters:

- **Default Bandwidth** specifies the bandwidth used for a signal having a signal strength greater than 20dBμV, normal modulation level and no adjacent channel disturbance.

- **Min Bandwidth** specifies the lowest possible bandwidth that the filter can automatically drop to.

- **Threshold Extension** allows you to set the minimum bandwidth for signals with very low signal strength. This can improve the SNR at low signal levels.

- **Max Boost** allows you to set the maximum bandwidth to be used for heavily modulated signals. In the case where the modulation level is large, the default bandwidth may be too small.

The interactions between these parameters and the signal detectors can make finding the optimum settings quite difficult. It is recommended that most users use the settings in the Clean factory preset, perhaps with minor tweaks. Failing that, manual configuration can provide excellent results if the RF environment is reasonably stable.

16.2 Stereo Blend

FM stereo is produced by encoding the usual left and right components into sum (L+R) and difference (L-R) components. The "sum" component is transmitted as baseband audio up to 15kHz and the "difference" signal is modulated onto a 38kHz double-sideband suppressed carrier. This results in the difference signal (which contains all of the stereo information) being more susceptible to interference than the sum signal (which is essentially mono). By lowering the weighting given to the difference signal when decoding back to left and right components the audibility of the interference can be reduced at the expense of reducing the stereo separation.

The RX1 stereo blend algorithm performs this action, automatically adjusting the amount of blending based on four signal quality detectors. They are:

- Signal level

- Multipath

- Ultra sonic noise

- Pilot tone level

You can adjust how much these detectors affect the blending using three parameters per detector:

- **Threshold:** this is the point at which the detector starts to have an effect on the blending

- **Attack:** controls how quickly a deterioration of a detector increases the blending

- **Release:** controls how quickly an improvement of a detector decreases the blending

To disable the stereo blending:

- Navigate to **Tuner** $\Rightarrow$ **Stereo**

- Set **Signal Start** to *Off*

- Set **Multipath Start** to *Off*

- Set **USN Start** to *Off*

- Set **Pilot Start** to *Off*

To disable stereo (mono mode):

- Navigate to **Tuner** $\Rightarrow$ **Stereo**

- Set **Stereo** to *Off*

16.3   High Cut

Interference has more effect on higher audio frequencies. This is why broadcasters pre-emphasize the audio (boosting higher frequencies), allowing receivers to de-emphasize the received signal simultaneously reducing the higher frequencies to the intended level and reducing the level of the noise. For poor quality signals additional high frequency cut can further reduce the high frequency noise, at the expense of signal bandwidth. The RX1 high cut algorithm performs this action, automatically adjusting the amount of high cut based on three signal quality detectors. They are:

- Signal level

- Multipath

- Ultrasonic noise

You can adjust how much these detectors affect the blending using three parameters per detector:

- **Start:** this is the point at which the detector starts to have an effect on the blending

- **Attack:** controls how quickly a deterioration of a detector increases the blending

- **Release:** controls how quickly an improvement of a detector decreases the blending

You can set the minimum bandwidth (i.e. the maximum amount of high cut that can be applied) by navigating to **Tuner** $\Rightarrow$ **High Cut** and setting Limit.

To disable the high cut algorithm:

- Navigate to **Tuner** $\Rightarrow$ **High Cut**

- Set **Signal Start** to *Off*

- Set **Multipath Start** to *Off*

- Set **USN Start** to *Off*

16.4   Soft mute

If there is significant interference, this additional noise can make the perceived level of a station increase. By progressively attenuating the signal as the noise increases, the perceived effect of the noise can be reduced.

The RX1 has a "soft mute" algorithm which automatically applies attenuation based on three signal quality detectors. They are:

- Signal level

- Multipath

- Ultrasonic noise

You can adjust how much these detectors affect the blending using three parameters per detector:

- **Start:** this is the point at which the detector starts to have an effect on the blending

- **Attack:** controls how quickly a deterioration of a detector increases the blending

- **Release:** controls how quickly an improvement of a detector decreases the blending

To disable the soft mute algorithm:

- Navigate to **Tuner** $\Rightarrow$ **Softmute**

- Set **Signal Start** to *Off*

- Set **Multipath Start** to *Off*

- Set **USN Start** to *Off*

16.5   Miscellaneous

16.5.1   Frequency

The RX1 can tune in 50kHz increments between 87.5MHz and 108.5MHz, covering VHF Band II.

16.5.2   De-emphasis

The FM transmission process results in the white noise spectral distribution that is present in RF signals translating into a triangular spectral distribution after demodulation. To compensate for the increased noise level at high frequencies, broadcasters apply high frequency boost (pre-emphasis) before transmission, allowing receivers to apply a corresponding amount of high frequency cut (de-emphasis), improving the SNR at higher frequencies.

The amount of pre-emphasis applied varies between countries. In the USA and Japan, a filter equivalent to a first order RC circuit with a time constant of $75\mu s$ is used; in most of the rest of the world the time constant used is $50\mu s$. In order for the RX1 to correctly de-emphasise the received signal, you must set the De-emphasis parameter to the setting appropriate to your region. Setting this parameter incorrectly will result in an overly dull or bright sound.

If you are using the RX1 to process for FM re-broadcast you will need to disable the de-emphasis filter.

16.5.3   Gain

The peak demodulated audio level is affected by the amount of modulation reserved for the audio in the multiplex. If the pilot or SCA levels are quite high, the peak demodulated audio level will be lower. To allow you to compensate for this the RX1 provides a gain control in the tuner section.

Part VI

Features

Managing Presets

The RX1 has a number of factory presets and provision for over a hundred user presets. The factory presets should provide an excellent template for you to produce user presets.

17.1 Loading Presets

Web Remote   Navigate to **Presets** and click the name of the preset desired.

Front Panel   Press **LOAD** and select the preset desired.

17.2 Factory Presets

17.2.1 Clean

This preset provides a good general purpose set of radio parameters, allowing high quality signals to pass through with very little processing, whilst minimising the increase in noise if the signal deteriorates.

17.2.2 Open

This preset switches out most of the processing, leaving the IF filter open even for very noisy signals.

17.3 Editing Presets

It is advisable to start from the factory preset which most closely matches the sound you desire. Edit the parameters as you wish and save the preset.

17.3.1   Comparing a Preset (Front panel only)

When making processing adjustments it is often desirable to compare against the preset you are adjusting. For example you may wish to modify a factory preset and save it as a user preset.

1. Select a preset and load it, making it active.

2. Change some parameters as desired.

3. Press the **'LOAD'** button. The third softkey will change to **'B'**.

4. Either:

    (a) Press **'B'** to reload the saved preset allowing comparison of the changes. The previously marked **'B'** button will now read **'A'**. Press **'A'** to return to the adjusted preset.

    (b) Pressing **'LOAD'** will reload the original preset, discarding any changes.

5. When the preset is customized, save.

By using the button you can easily make processing adjustments quickly and hear instantly if the change is to your liking. It is very easy to forget where you are sonically so the comparison feature is very useful. You can also use the facility to make one processing parameter change at a time, adjusting it, discarding it or saving it to the preset. You can then repeat the comparison process until you are happy with all of your processing changes.

17.4   Saving a Preset

17.4.1   With the Web Remote

Saving as a New Preset: Click **Presets** $\Rightarrow$ **Save as…** and type the name of your preset as requested.

Overwriting a Preset: Click **Presets** and click the save icon next to the name of the preset to overwrite.

17.4.2   With the Front Panel

Saving as a New Preset: Click **SAVE** $\Rightarrow$ **NEW** and use the touch-wheel to enter the preset name.

Overwriting a Preset: Click **SAVE**, select the preset to overwrite with the touch-wheel. If required, edit the name. Press **SAVE**.

17.5   Downloading a Preset

Downloading a preset from the RX1 to a computer allows you to back up your custom preset and to upload it to your other units.

17.5.1   With the Web Remote

Click **Presets** and click the download icon next to the name of the preset to download.

17.6   Uploading a Preset

Uploading a preset from your computer to the RX1 allows you to restore a backed up preset from your computer, or to upload a preset downloaded off another RX1.

17.6.1   With the Web Remote

Click **Presets** $\Rightarrow$ **Upload Preset** and select the preset from your computer.

Backup Audio

The RX1 can play backup audio from internal storage in the case of the main feed failing. PCM Audio files (files ending with the extension .wav) can be loaded onto the unit via the web remote. From the front panel or the remote a playlist can be created. Backup audio playback can be triggered by the alarms, triggers or manually.

18.1 Managing audio files

Backup audio files can be managed from the web remote. Click on **Backup Audio** in the side navigation bar to see a list of backup audio files on your unit.

To upload an audio file, click on **Upload audio file**. A dialog will appear with the option to **Choose File** and then **Upload**. Be patient while the file uploads.

To delete an audio file, click on the ✖ beside its name.

To download an audio file, click on the ⬇ beside its name.

18.2 Playlist

The playlist can be modified using the front panel or the web remote. Navigate to **Audio** ⇒ **Backup**. If you have uploaded some audio files to the unit, they will appear in the list of values that each Playlist[x] parameter can take. When backup audio is selected, the playlist will loop, and any empty slots will be skipped.

18.3 Triggering playback

The backup audio system is treated like just another audio source to the rest of the RX1. When one of the output's source selector is set to *BACKUP* your playlist automatically starts playing. One or more of the outputs (analog, digital or multiplex) can be set to backup at the same time.

To manually start backup audio playing back, navigate to one of the following and set to *BACKUP*:

- **Audio ⇒ Analog ⇒ Output ⇒ Source**
- **Audio ⇒ Digital ⇒ Output ⇒ Source**
- **MPX ⇒ Generator ⇒ Source**

To trigger playback when the RF signal level drops below a certain threshold:

1. Create a new preset with **MPX Source** $\Rightarrow$ **Generator** $\Rightarrow$ **Source** set to **BACKUP** and the playlist configured to the files you wish to play

2. Navigate to **Alarms** $\Rightarrow$ **Alarm A** (or any other of the alarms)

3. Set **Source** to *Signal*

4. Set **On Delay** to an appropriate period (e.g. 10s)

5. Set **Off Delay** to an appropriate period (e.g. 60s)

6. Set **Signal Threshold** to an appropriate level (e.g. 100μV)

7. Set **Preset** to the preset you created in step one

Now when the signal level drops below 100μV for more than 10s the MPX output will start playing backup audio. The MPX output will revert to its original source once the signal threshold exceeds 100μV for more than 60s.

To trigger playback based on GPIO:

1. Create a new preset with **MPX Source** set to *BACKUP* and the playlist configured to the files you wish to play

2. Navigate to **Triggers** $\Rightarrow$ **Trigger 1** (or any other of the triggers)

3. Set **Active** to *On*

4. Set **Preset** to the preset you created in step one

Now when the corresponding GPIO pin is pulled low, the MPX output will start playing backup audio. The MPX output will revert to its original source as soon as the GPIO pin is released.

Monitoring and Control 19
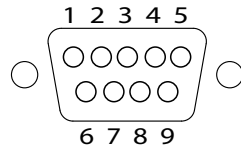
Pin 1	Ground
Pin 2	Alarm C
Pin 3	Alarm A
Pin 4	Trigger 3
Pin 5	Trigger 1
Pin 6	Alarm D
Pin 7	Alarm B
Pin 8	Trigger 4
Pin 9	Trigger 2

```
  1 2 3 4 5
 ○○○○○
  ○○○○
  6 7 8 9
```

Figure 19.1: GPIO D-type connector pinout

19.1   Alarms/Outputs

The RX1 has four alarms, which can be set to provide status outputs through the opto-coupled GPIO output, or change current preset when a meter exceeds a user defined threshold. On-delay and off-delay settings allow brief breaches of the limit to be ignored. The alarms can be configured to produce 5V or 0V through the corresponding GPIO output when active.

Each output is internally connected to a trigger input to facilitate automatic responses to fault conditions.

To configure an alarm output:

1. Navigate to **Alarms** $\Rightarrow$ **Alarm [x]**.

2. Set **Source** to the meter you wish to trigger on.

3. If you want the output to be 0V when idle and 5V when the alarm is active, set Polarity to +ve. If you want the output to be 5V when idle and 0V when the alarm is active, set Polarity to -ve

4. Set **On Delay** to *0s* if you want the alarm to respond to breaches immediately, otherwise set the desired delay.

5. Set **Off Delay** to *0s* if you want the alarm to reset immediately to breaches ending, otherwise set the desired delay.

6. Set the threshold at which you want the alarm to activate.

7. (a) If you do not wish the alarm to cause a change in preset, set **Action** to *Pin only*.
   (b) If you do wish the alarm to cause a change in preset, set **Action** to *Change Preset* and select the preset to switch to.

19.2 n-Stage Fallback

The n-stage fall-back allows you to implement a cascade of backup plans, allowing you to respond to various failure conditions. When a failure condition is detected, the alarm will perform a "change preset" action, loading the selected preset.

In the single mode, all the alarms work independently. In this case if any alarm goes off it will perform a change preset. If multiple alarms or triggers are attempting to change the preset at the same time, the alarm or trigger with highest priority will change the preset.

1. Trigger 1 (highest priority)
2. Trigger 2
3. Trigger 3
4. Trigger 4
5. Alarm A
6. Alarm B
7. Alarm C
8. Alarm D (lowest priority)

The double, triple and quadruple modes can be best explained by a diagram. In all n-stage fall-back modes any alarms or triggers which are not part of the cascade mechanism will continue to operate as independent alarms or triggers, with higher priority than those alarms that are part of the cascade mechanism.

19.2.1 Example 1: Single fall-back

Scenario

The RX1 is being used to rebroadcast an FM signal. The broadcaster has a CD player as an alternative audio source.

Signal failure conditions

Due to loss of power in the main station, the received FM signal is lost.

Fall-back action

Our Plan B will be to play a CD from a CD player connected to the AES/EBU digital input.

Figure 19.2: Quadruple Fallback

System Configuration

First of all, prepare a preset called *Plan B*. In **MPX** ⇒ **Generator** ⇒ **Source**, select *DIGITAL IN*. Alarm D will be configured to select this preset when an FM signal failure is detected.

To enable the single fall-back feature, go to **Alarms** ⇒ **Structure** and configure **Fallback** to be *Single*. Now, go to Alarm D and configure it as follows:

1. Set **Source** to *Signal*

2. Set **Threshold** to an appropriate value

3. Set the **on delay** time to an appropriate value

4. Set the **off delay** time to an appropriate value

5. Set **Action** to *Change Preset*
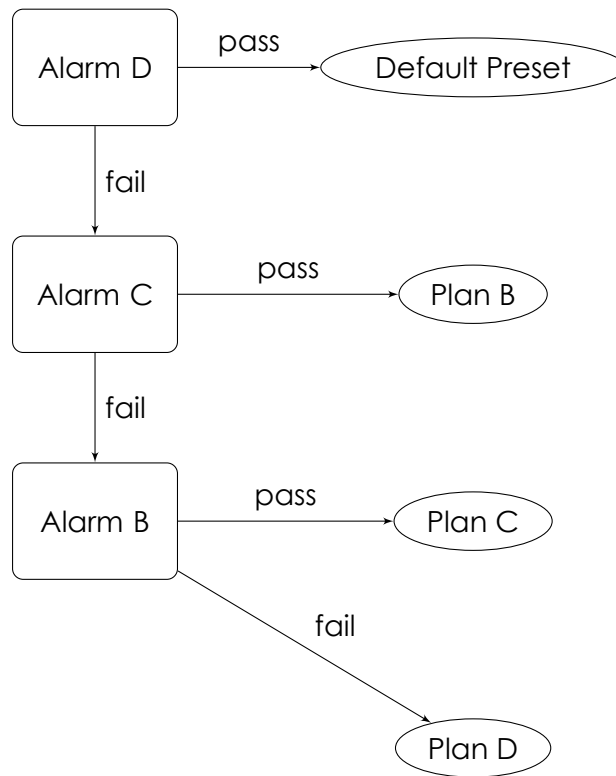
Figure 19.3: Triple Fallback

6. Set **Preset** to *Plan B*

Now, when the unit detects that the received FM signal has dropped for longer than the configured "on delay" time in seconds, it will change to the digital input and the CD will start playing (note that the alarm D signal from the GPIO connector should be used to start the CD playing for this action to be automatic). If the FM signal comes back and stays for longer than the configured "off delay" time in seconds, the unit will switch back to the original audio source (FM signal).

19.2.2 **Example 2: Double fall-back**

Scenario

The RX1 is being used to rebroadcast an FM signal. The broadcaster has a CD player as an alternative audio source and backup audio files stored in the unit.

Signal failure conditions

- Due to loss of power in the main station, the received FM signal is lost. - The CD stops playing (disc ends or CD player stops working).

Figure 19.4: Double Fallback

Fall-back actions

Our Plan B will be to play a CD from a CD player connected to the AES/EBU digital input. Our Plan C will be to play the backup audio files stored in the unit.
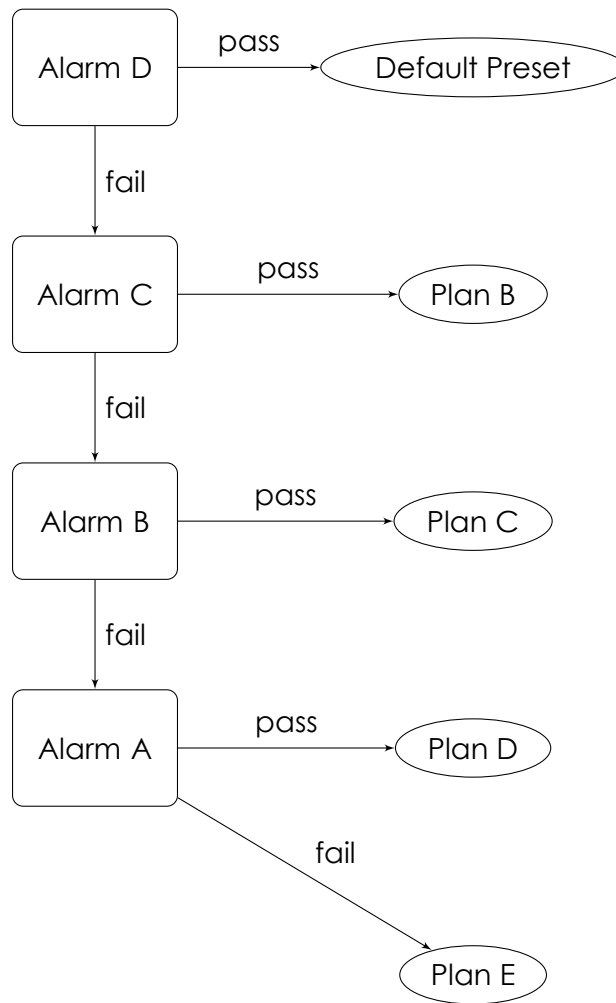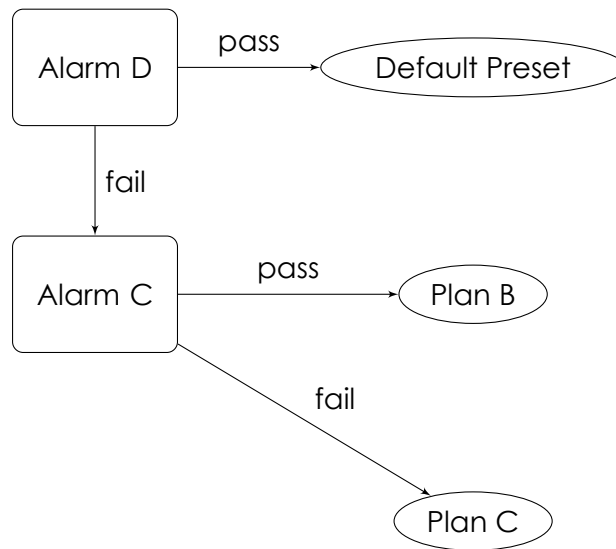
System Configuration

First of all, prepare a preset called *Plan B*. In **MPX** ⇒ **Generator** ⇒ **Source**, select *DIGITAL IN*. Alarm D will be configured to select this preset when an FM signal failure is detected.

Then prepare a preset called *Plan C*. In **MPX** ⇒ **Generator** ⇒ **Source**, select *BACKUP* as the source. Alarm C will be configured to select this preset when a CD player signal failure is detected.

To enable the double fall-back feature, go to **Alarms** ⇒ **Structure** and configure **Fallback** to be *Double*. Now, go to Alarm D and configure it as follows:

1. Set **Source** to *Signal*.

2. Set **Threshold** to an appropriate value.

3. Set the **on delay** time to an appropriate value.

4. Set the **off delay** time to an appropriate value.

5. Set **Action** to *Change Preset*.

6. Set **Preset** to *Plan B*.

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Next, go to Alarm C and configure it as follows:

1. Set **Source** to *Digital In Level*.

2. Set **Threshold** to an appropriate value depending on the level you are expecting from the CD Player.

3. Set the **on delay** time to an appropriate value, factoring in the time it takes for the CD player to start playing.

4. Set the **off delay** time to an appropriate value.

5. Set **Action** to *Change Preset*

6. Set **Preset** to *Plan C*

Now, when the unit detects that the received FM signal has dropped for longer than the configured **on delay** time in seconds, it will change to the digital input and the CD will start playing (note that the alarm D signal from the GPIO connector should be used to start the CD playing for this action to be automatic). If the CD stops playing, alarm C will change to the backup audio source.

If the CD resumes playing for longer that the configured **off delay** the unit will switch back to this audio source. Regardless of the operation of the CD Player, if the FM signal comes back and stays for longer than the configured **off delay** time in seconds, the unit will switch back to the original audio source (FM signal).

19.3   Triggers/Inputs

The RX1 has four opto-coupled inputs which allow external signals to change the current preset. The inputs are activated by pulling the pin low. If more than one trigger is active at the same time and configured to produce conflicting behaviour, the lower trigger number gets priority (external triggers are higher priority than internal (i.e. alarm) triggers).

To configure a trigger input to change the current preset:

- Navigate to **Triggers** ⇒ **Trigger [x]**

- Set **Active** to *On*

- Set **Preset** to the preset you wish to be loaded when the trigger is activated

Log

The RX1 has a comprehensive set of logging features

20.1   Log to File

System $\Rightarrow$ **Log** $\Rightarrow$ **File**. System log messages are stored on the RX1's internal flash memory. Log files are retained for thirty days, starting a new file at 00:00:00hrs each day. The files can be retrieved using a web browser:

- **For the log of the current day:** Navigate to http://*IP_address*/RX1.log

- **For the log of a previous day:** Navigate to http://*IP_address*/RX1.log.*day*. For example, the log from two days previous on a unit with IP address 192.168.0.54 is retrieved from the address: http://192.168.0.54/RX1.log.2

Performing a factory reset does not clear the saved log files.

20.2   Log to RS232

System $\Rightarrow$ **Log** $\Rightarrow$ **RS232** The unit outputs all log information through the serial port if this option is selected. Please refer to 'Serial Remote' (Section 14, Page 34) for further details on how to connect to the serial port.

20.3   UDP Logging

System $\Rightarrow$ **Log** $\Rightarrow$ **UDP** The unit outputs the log using UDP packets to a specified IP address and port. The unit sends the log to the remote host in the Syslog UDP Transport format.

Scheduling

21

Your processor contains a battery backed up real time clock that can maintain the current time and date even when the power has been removed. This allows users to switch between presets at specific times of the day, week or month. This is very useful on a multi-format radio station where one processing preset may not suit all of the formats of music that are broadcast.

21.1 Setting the time

Navigate to **System** ⇒ **Time** and enter the correct time.

21.2 Creating a scheduling trigger

1. Verify the system clock is set to the correct time

2. Navigate to **Scheduler** ⇒ **Event[x]**

3. Set **Enable** to *Yes*

4. Set **Preset** to the preset which is to be activated at the set time

5. To set the trigger to active at a set time every day

    (a) Set **Week day** to *

    (b) Set **Month day** to *

    (c) Set **Hours/Minutes/Seconds** to the required switching time

    (d) If **Hours** is set to *, it is possible to set a trigger to go off at a certain time past each hour (e.g. 0050 0150 0250)

6. To set the trigger to active on a set day of the week (e.g. every Monday)

    (a) Set **Week day** to the required day

    (b) Set **Month day** to *

    (c) Set **Hours/Minutes/Seconds** to the required switching time

7. To set the trigger to active on a set day of the month (e.g. 1st of every Month)

    (a) Set **Month day** to *1*

    (b) Set **Week day** to *

    (c) Set **Hours/Minutes/Seconds** to the required switching time

Security Code Lock

The RX1 has a security lock code which allows the front panel controls to be locked from users without the code. To configure the lock code:

1. Navigate to **System**

2. Set **Screen Lock Code** to your security lock code

3. Set **Screen Saver** to control the timeout after which the screen automatically locks

4. Set **Screen Lock** to *On*

Software Update

The RX1 is designed to allow features to be added to the unit in the field via a software update mechanism. You can register to receive email alerts when new software updates become available at www.bwbroadcast.com. Updates are installed using the Ethernet web remote. To connect to the web remote, follow the Ethernet configuration (Section 9, page 26) and login steps in the Web remote section (Section 10, page 27).

23.1   Installing an update via the web remote

1. Read the update notes included in the ZIP file with the firmware file.

2. Login to the web remote.

3. Click on **Firmware Update**.

4. Click on to create a backup of the currently installed firmware.

5. Click on and then on **Choose File** and select the new firmware file.

6. Click on upload to transfer the update.

7. Click reboot to restart the RX1. The update will be installed as part of the units boot up procedure. The unit will be off air for about 3 minutes at this stage therefore you may wish to upgrade at a quiet time, such as the middle of the night.

23.2   Checking that the update was successful

1. Login to the web remote

2. Click on **Configuration** $\Rightarrow$ **System** $\Rightarrow$ **About**

3. If the Software Version field matches that of the update, your unit is successfully updated. The troubleshooting section provides information on what to do if the software version does not match the update version

Part VII

Specifications

Specifications

Specifications apply for measurements from analog left/right input to stereo composite output and to FM analog left/right output. Measurements apply to FM mode of operation.

Frequency Response (Bypass Mode)

Follows standard $50\mu s$ or $75\mu s$ pre-emphasis curve ± 0.10dB, 20Hz - 15kHz. Analog left/right output and digital output can be user configured for flat or pre-emphasised output.

Noise

Output noise floor will depend upon on the processor settings but is governed by the dynamic range of the A/D Converter. The dynamic range of the digital signal processing is 144dB.

Processing Sample Rate

48kHz - 768kHz depending on processing stage.

Processing Resolution

Internal processing has 24bit (fixed point) or higher resolution.

Analog Audio Output

Configuration: Stereo. Flat or pre-emphasised (at $50\mu s$ or $75\mu s$), software-selectable.
Source Impedance: 10Ω, electronically balanced and floating.
Load Impedance: 600Ω or greater, balanced or unbalanced.
Output Level (100% peak modulation): Adjustable from +6dBu to +24dBu peak, into 600Ω or greater load, software-adjustable.
Signal-to-Noise: >= 90 dB unweighted (Bypass mode, de-emphasised, 20 Hz-15kHz bandwidth, referenced to 100% modulation).
L / R Crosstalk: <= -70dB, 20 Hz-15kHz.
Distortion: <= 0.01% THD (Bypass preset, de-emphasised) 20 Hz-15kHz bandwidth.
Connectors: XLR male. Pin 1 chassis ground, pins 2 (+) and 3 (-) electronically balanced, floating and symmetrical.
D/A Conversion: 48kHz 24bit 128x oversampled
Filtering: RFI filtered.

Digital Audio Output

Configuration: Stereo per AES/EBU standard. Output configured in software as flat or pre-emphasised to the chosen processing pre-emphasis ($50\mu s$ or $75\mu s$).
Sample Rate: Internal free running at 32, 44.1 or 48kHz selected in software. Can also be synced to the AES/EBU digital input at 32, 44.1, 48, 88.1 or 96kHz, as configured in software.
Connector: XLR-type. Pin 1 chassis ground, pins 2 and 3 transformer balanced and floating, 110Ω impedance.
Output Level (100% peak modulation): -20.0dBFS to 0.0dBFS software controlled.

Filtering: RFI filtered.

Remote Control

Serial Port: DB9 (rear panel) Software adjustable speed: 9600, 19200, 38400, 57600 or 115200kbps.
Ethernet Port: 10/100Mbps on RJ45 female connector.
Trigger Inputs: DB9 opto-isolated and floating. Four pull-low inputs.

Alarm Outputs: DB9 opto-isolated and floating. Four pull-low outputs.

Other

Voltage: 100–240 VAC, 50–60 Hz, 35 VA.
Connector: IEC. Detachable 3-wire power cord supplied.
Dimensions (W x D x H): 256mm x 200mm x 44mm

Parameters

- **Tuner**
  - ○ **Frequency** tuner.frequency
  - ○ **De-emphasis** tuner.deemphasis
  - ○ **Audio lowpass filter** tuner.audio_filter.cutoff
  - ○ **IF Filter**
    - ❏ **Bandwidth** tuner.if_filter.bandwidth
    - ❏ **Default Bandwidth** tuner.if_filter.default_bandwidth
    - ❏ **Min Bandwidth** tuner.if_filter.min_bandwidth
    - ❏ **Threshold Extension** tuner.if_filter.threshold_extension
    - ❏ **Max Bandwidth Boost** tuner.if_filter.max_boost
  - ○ **Stereo Blend**
    - ❏ **Stereo Width** tuner.stereo_blend.stereo
    - ❏ **Signal Threshold** tuner.stereo_blend.signal.start
    - ❏ **Signal Attack Tc** tuner.stereo_blend.signal.attack
    - ❏ **Signal Release Tc** tuner.stereo_blend.signal.release
    - ❏ **Multipath Threshold** tuner.stereo_blend.multipath.start
    - ❏ **Multipath Attack Tc** tuner.stereo_blend.multipath.attack
    - ❏ **Multipath Release Tc** tuner.stereo_blend.multipath.release
    - ❏ **USN Threshold** tuner.stereo_blend.usn.start
    - ❏ **USN Attack Tc** tuner.stereo_blend.usn.attack
    - ❏ **USN Release Tc** tuner.stereo_blend.usn.release
    - ❏ **Pilot Threshold** tuner.stereo_blend.pilot.start
    - ❏ **Pilot Attack Tc** tuner.stereo_blend.pilot.attack
    - ❏ **Pilot Release Tc** tuner.stereo_blend.pilot.release
  - ○ **High Cut**
    - ❏ **Min Audio Bandwidth** tuner.high_cut.limit
    - ❏ **Signal Threshold** tuner.high_cut.signal.start
    - ❏ **Signal Attack Tc** tuner.high_cut.signal.attack
    - ❏ **Signal Release Tc** tuner.high_cut.signal.release
    - ❏ **Multipath Start Threshold** tuner.high_cut.multipath.start
    - ❏ **Multipath Attack Tc** tuner.high_cut.multipath.attack
    - ❏ **Multipath Release Tc** tuner.high_cut.multipath.release
    - ❏ **USN Start Level** tuner.high_cut.usn.start
    - ❏ **USN Attack Tc** tuner.high_cut.usn.attack
    - ❏ **USN Release Tc** tuner.high_cut.usn.release
  - ○ **Softmute**
    - ❏ **Signal Threshold** tuner.softmute.signal.start
    - ❏ **Signal Attack Tc** tuner.softmute.signal.attack
    - ❏ **Signal Release Tc** tuner.softmute.signal.release
    - ❏ **Multipath Threshold** tuner.softmute.multipath.start
    - ❏ **Multipath Attack Tc** tuner.softmute.multipath.attack
    - ❏ **Multipath Release Tc** tuner.softmute.multipath.release
    - ❏ **USN Start Threshold** tuner.softmute.usn.start
    - ❏ **USN Attack Tc** tuner.softmute.usn.attack
    - ❏ **USN Release Tc** tuner.softmute.usn.release
  - ○ **Advanced**
    - ❏ **Audio out gain** tuner.gain
    - ❏ **Frequency step** tuner.frequency.step

- **Audio**
  - ○ **Headphone Level** audioio.headphone.level
  - ○ **Digital**
    - ❏ **Output Level** audioio.digital.output.level

- ❑ **Output Sample Rate** audioio.digital.output.samplerate
  - ○ **Analog**
    - ❑ **Output Level** audioio.analog.output.level
- ● **RDS**
  - ○ **PTY Coding** rds.pty_coding
- ● **Triggers**
  - ○ **Trigger [1-4]**
    - ❑ **Enable** trigger[1].active
    - ❑ **Preset Select** trigger[1].preset
    - ❑ **Send e-mail** trigger[1].email.active
    - ❑ **(ON) Message** trigger[1].message.on
    - ❑ **(OFF) Message** trigger[1].message.off
    - ❑ **Recipient(s)** trigger[1].email.recipient
- ● **Alarms**
  - ○ **Alarm [A-D]**
    - ❑ **Source** alarm[1].source
    - ❑ **Polarity** alarm[1].polarity
    - ❑ **On Delay** alarm[1].on_delay
    - ❑ **Off Delay** alarm[1].off_delay
    - ❑ **Signal Threshold** alarm[1].signal_threshold
    - ❑ **Pilot Threshold** alarm[1].pilot_threshold
    - ❑ **Tuner Audio Threshold** alarm[1].tuner_audio_threshold
    - ❑ **USN Threshold** alarm[1].usn_threshold
    - ❑ **Multipath Threshold** alarm[1].multipath_threshold
    - ❑ **PI Codes**
      - · **Number of PI codes** alarm[1].pi.count
      - · **PI Code 1** alarm[1].pi[1]
      - · **PI Code 2** alarm[1].pi[2]
      - · **PI Code 3** alarm[1].pi[3]
      - · **PI Code 4** alarm[1].pi[4]
    - ❑ **Action** alarm[1].active
    - ❑ **Preset** alarm[1].preset
    - ❑ **Send e-mail** alarm[1].email.active
    - ❑ **Recipient(s)** alarm[1].email.recipient
  - ○ **Structure**
    - ❑ **Fallback** alarms.structure.fallback
- ● **System**
  - ○ **Date** system.date
  - ○ **Time** system.time
  - ○ **Uptime** system.uptime
  - ○ **Location** system.location
  - ○ **Contact** system.contact
  - ○ **Screen Saver** system.screen.timeout
  - ○ **Screen Lock** system.screen.lock.enabled
  - ○ **Screen Lock Code** system.screen.lock.code
  - ○ **Clicker** system.clicker
  - ○ **Ethernet**
    - ❑ **DHCP** system.ethernet.dhcp
    - ❑ **DHCP IP** system.ethernet.dhcp.ip
    - ❑ **DHCP SM** system.ethernet.dhcp.sm
    - ❑ **DHCP GW** system.ethernet.dhcp.gw
    - ❑ **DHCP DNS 1** system.ethernet.dhcp.dns[1]

- ❏ **DHCP DNS 2** system.ethernet.dhcp.dns[2]
- ❏ **Static IP** system.ethernet.static.ip
- ❏ **Static SM** system.ethernet.static.sm
- ❏ **Static GW** system.ethernet.static.gw
- ❏ **Static DNS 1** system.ethernet.static.dns[1]
- ❏ **Static DNS 2** system.ethernet.static.dns[2]
- ❏ **MAC** system.ethernet.mac
- ❍ **SMTP**
  - ❏ **Test**
    - · **Test** smtp.test.send
    - · **Recipient(s)** smtp.test.recipient
  - ❏ **Host** smtp.host
  - ❏ **From** smtp.from
  - ❏ **Username** smtp.username
  - ❏ **Password** smtp.password
  - ❏ **Port** smtp.port
  - ❏ **Max emails a day** smtp.limit.daily
  - ❏ **Emails sent today** smtp.counter.today
- ❍ **HTTP**
  - ❏ **Enable** system.httpd.active
  - ❏ **Port** system.httpd.port
- ❍ **Telnet**
  - ❏ **Enable** system.telnetd.active
  - ❏ **Port** system.telnetd.port
- ❍ **RS232**
  - ❏ **Enable** system.rs232d.active
  - ❏ **Baud rate** system.rs232d.baud
- ❍ **SNMP**
  - ❏ **Enable** system.snmpd.active
  - ❏ **Port** system.snmpd.port
  - ❏ **Community** system.snmpd.community
  - ❏ **Read Only** system.snmpd.read_only
  - ❏ **Name** system.snmpd.name
  - ❏ **Object ID** system.snmpd.object_id
  - ❏ **Description** system.snmpd.description
- ❍ **Log**
  - ❏ **RS232** system.logging.rs232.active
  - ❏ **File** system.logging.file.active
  - ❏ **UDP**
    - · **Enable** system.logging.udp.active
    - · **IP** system.logging.udp.ip
    - · **Port** system.logging.udp.port
- ❍ **About**
  - ❏ **Serial Number** system.serial_number
  - ❏ **Software Version** system.software.version
  - ❏ **Control Version** system.control.version
  - ❏ **Digital Version** system.digital.version
- ❍ **Reboot** system.reboot
- ❍ **Factory Reset** system.factory_reset