

# **RX-4**

## **USER'S MANUAL**

**September 19, 1997**  
**Version 1.02**

**BURK Technology**

**7 Beaver Brook Road**  
**Littleton, MA 01460**



# RX-4 USER'S MANUAL

## Contents

<b>INTRODUCTION.....</b>	<b>1</b>
<b>PRODUCT DESCRIPTION .....</b>	<b>2</b>
<b>RX-4 Features and Overview .....</b>	<b>2</b>
<b>Specifications.....</b>	<b>3</b>
<b>RX-4 Front Panel.....</b>	<b>5</b>
<b>RX-4 Back Panel.....</b>	<b>8</b>
<b>INSTALLATION AND CONFIGURATION .....</b>	<b>10</b>
<b>Physical Installation .....</b>	<b>10</b>
<b>Antenna Installation.....</b>	<b>10</b>
<b>Connecting The Audio Outputs.....</b>	<b>11</b>
<b>Making Connections for the Loop-Through (Hot Standby) Feature .....</b>	<b>12</b>
How the Loop-Through Feature Works.....	12
Connecting the Receivers for Hot Standby .....	13
<b>Powering Up.....</b>	<b>14</b>
<b>TUNING AND ADJUSTMENT .....</b>	<b>16</b>
<b>Selecting the Monitoring Frequencies for the Receivers .....</b>	<b>16</b>
AM Receiver Tuning .....	18
FM Receiver Tuning.....	21
WX Receiver Tuning.....	24
<b>Adjusting Audio Output Levels.....</b>	<b>27</b>
<b>Monitor Selection and Volume Adjustment.....</b>	<b>28</b>
<b>Technical Support.....</b>	<b>29</b>
<b>APPENDIX: RX-4 SCHEMATICS</b>	



## INTRODUCTION

This document is a User's Manual for the Burk Technology **RX-4**, a professional-quality, digital-tuned, four-channel radio receiver expressly designed for use with Emergency Alert Systems, in particular the Burk Technology **E<sup>2</sup>A<sup>2</sup>S** unit.

The first part of this User's Manual presents an overall description of the **RX-4**, featuring notes and illustrations on the arrangement and functions of the front and back panel components, plus a set of technical specifications (see "Product Description," p. 2).

In the next section, the instructions are provided for installing and configuring the **RX-4**, including physical installment of the unit (rack-mounting), antenna connections, wiring to the **E<sup>2</sup>A<sup>2</sup>S**, and the implementation of the loop-through feature for hot standby (see "Installation and Configuration," p. 10).

The final section details the operational adjustments required for putting the unit into service, including tuning the receivers (featuring easy-to-use tuning charts for each module), adjusting audio output levels, and selecting the receiver to monitor within the unit (see "Tuning and Adjustment," p. 16).

Schematics (for the AM, FM and WX receivers, and the monitor amplifier) appear in the Appendix.

## PRODUCT DESCRIPTION

This section of the manual features an overall description of the **RX-4**, physically and functionally, including a set of technical specifications -- for the unit as a whole, and for each of its component receivers. It concludes with keyed illustrations of the front and back panels.

### RX-4 Features and Overview

The **RX-4** integrates four modular receivers, designed and packaged to provide a complete single-unit solution to the requirements of Emergency Alert System (EAS) applications. Though it has been designed, along with the **LX-4** audio switch, to be a companion to the Burk **EAS** unit, the **RX-4** will provide superior performance with any EAS equipment.

As its standard configuration the **RX-4** features an AM receiver, two FM receivers, and a NOAA Weather Radio (WX) receiver -- the most adaptable conformation for handling the range of EAS monitoring assignments in a single, easily installed, convenient-to-use unit.

Beyond the essential robustness and quality of its design, materials, and workmanship, the **RX-4** is specifically geared toward EAS applications in the professional environment by virtue of the following features:

- *Digital tuning*, which keeps the **RX-4** receivers locked on frequency, and capable of meeting the strict demands of EAS operations, where receiver drift can mean missed alerts. Furthermore, tuning controls are located *inside* the unit, providing the user with protection against the casual or inadvertent changes in tuning that could cause lapses in compliance.
- *High-performance receivers*, with superior overload protection, enable the unit to be used in high-RF surroundings, and near transmitting equipment, without compromising signal sensitivity or output.
- *Loop-through capability*, that permits chaining of the receivers (within a single unit, or even among separate units) in a "hot standby" mode, both for maximum backup and for automatic coverage when an assigned source is off the air.

Before we proceed to discussing how to install the unit, please take a moment to examine the technical specifications on the next page, and to familiarize yourself with the **RX-4** controls, indicators, and input/output connections, presented in the front- and back-panel illustrations that appear following.

## Specifications

<b>General</b>	
Receivers	4 interchangeable modules in any combination of AM, FM , & NOAA Standard configuration is 1 / AM, 2 / FM, & 1 / WX
Monitor Amp	0.5W audio amp with built-in speaker
Monitor Channel Select	Push-button with LED indication of monitored channel
Audio Connectors	Combicon plug-in terminal strap type
Power Requirements	115VAC, 30W
Power Connector	6-1/2' EIA power cord
Physical Size	EIA rack mount; 19"W x 9"D x 1-3/4"H

<b>AM Receiver Module</b>	
Frequency Range	Digitally tuned 540 - 1720 kHz in 10 kHz steps
Sensitivity	5 microvolts for 12dB SINAD
AGC Range	80dB
Image Rejection	90dB
Adjacent Channel Rejection	45dB
Spurious Rejection	80dB
Overload Level	-10dBm
Antenna	75-ohm Type F connector
THD	<3% @ 30% modulation
Audio Output	10dBm max. into 600 ohms, balanced, fully adjustable

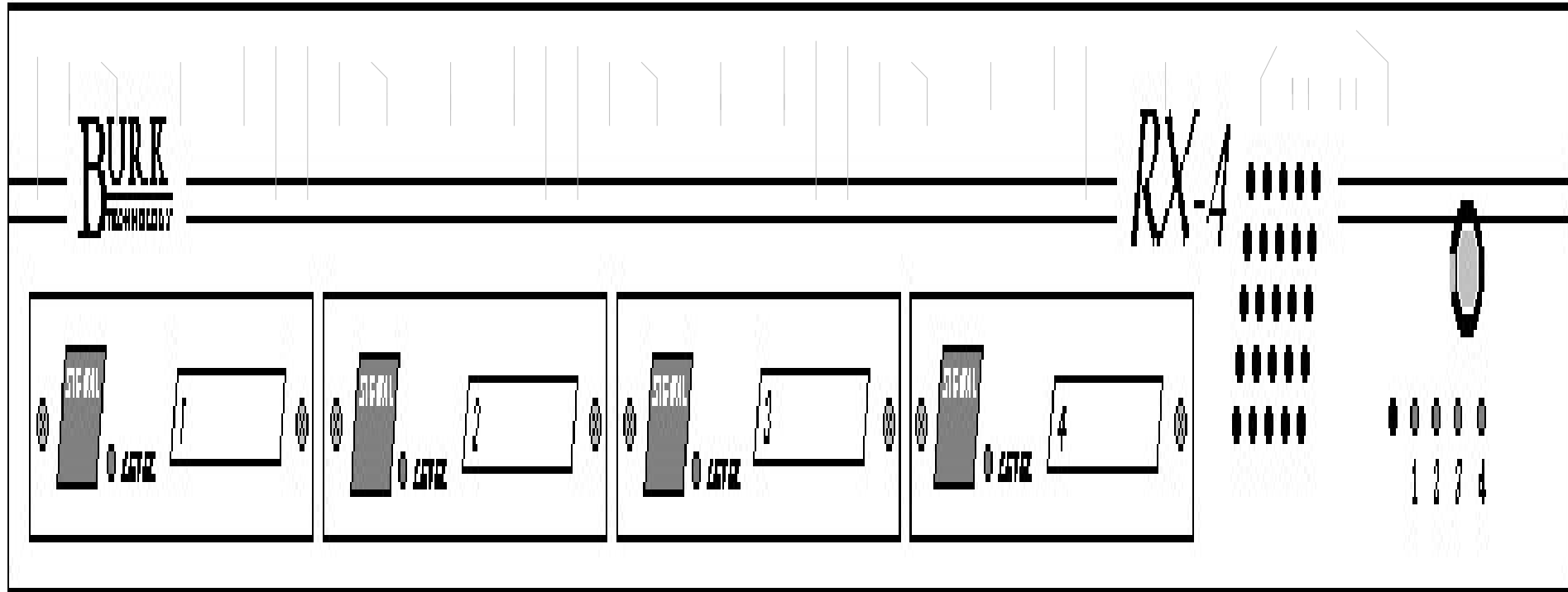
<b>FM Receiver Module</b>	
Frequency Range	Digitally tuned 88 - 108 MHz in 100 kHz steps
Sensitivity	5 microvolts for 12dB SINAD
IF Rejection	90dB
Image Rejection	60dB
Overload Level	+20dBm
Antenna	75-ohm Type F connector
THD	<3% @ 50kHz deviation
Audio Output	10dBm max. into 600 ohms, balanced, fully adjustable

<b>WX Receiver Module</b>	
Tuning Range	Digitally tuned to all 7 NOAA channels
Sensitivity	5 microvolts for 12dB SINAD
Image Rejection	>60dB
Adjacent Channel Rejection	45dB
Spurious Rejection	>60dB
Overload Level	0dBm
Antenna	75-ohm Type F connector
Audio Output	10dBm max. into 600 ohms, balanced, fully adjustable





# RX-4 Front Panel



1 2 3 4

9 11 12

17 18 19 20

25 26 27 28

33 34 35 36

5

13

21

29

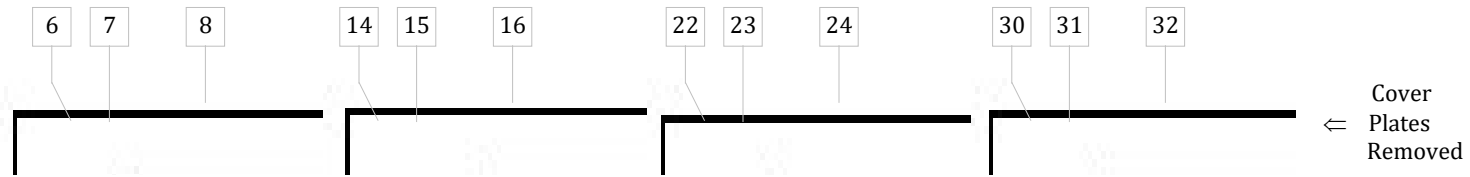
Receiver Module #1 (AM)

Receiver Module #2 (FM)

Receiver Module #3 (FM)

Receiver Module #4 (WX)

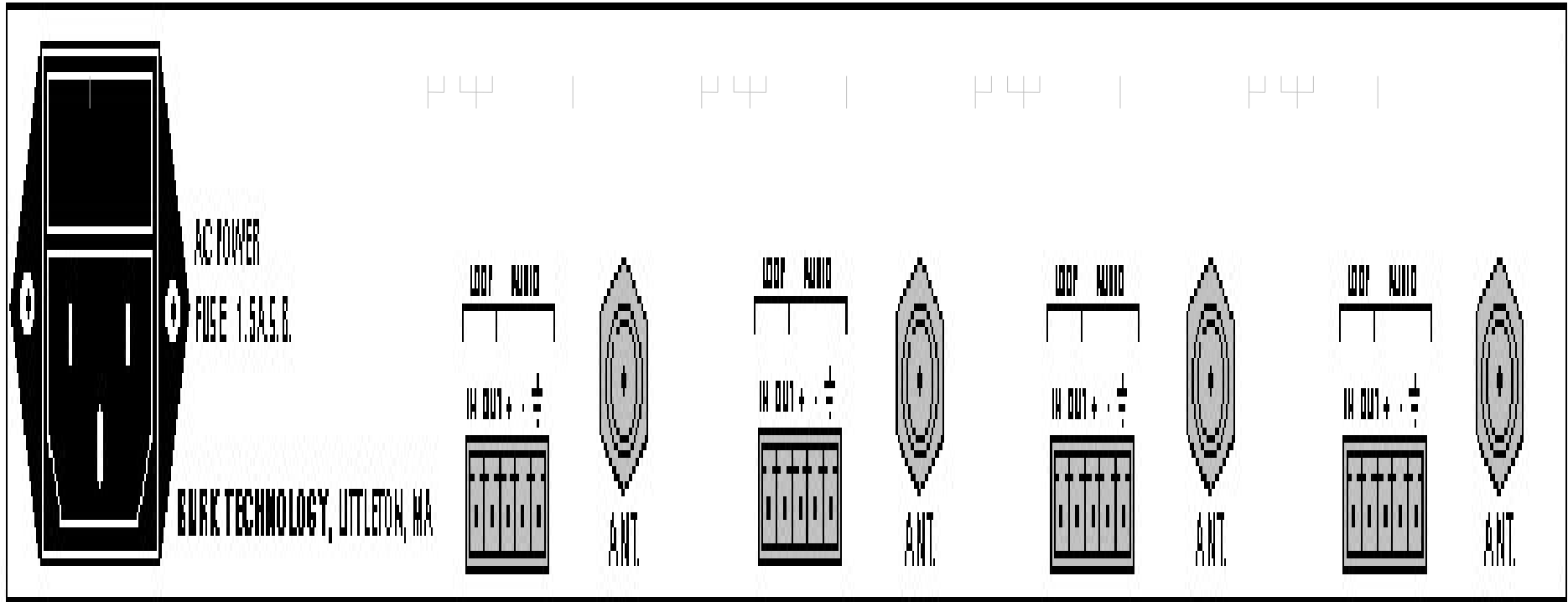
Monitor Section



NOTE: The type, number, and positions of the various receiver modules represent the standard configuration. Your unit may have been ordered with a different modular configuration; if so, disregard the illustrated left-to-right ordering of the individual receiver units and reference them instead by type. If you're not certain which receiver type occupies a particular module, they can be readily distinguished from one another by the number and arrangement of their tuning switches; refer to the Tuning Control illustrations on pp. 18, 21 and 24.

#					ID	Functions / Features
Receiver Module #1 (AM)	Receiver Module #2 (FM)	Receiver Module #3 (FM)	Receiver Module #4 (WX)	Monitor Section		
1	9	17	25		Signal Indicator	Lights when module is receiving signal
2	10	18	26		Output Level Adjustment	Opening for adjusting output audio pot without removing cover plate; admits 0.1" flat-blade mini-screwdriver
3	11	19	27		Cover Plate	Removable panel; detaches for access to tuning controls
4	12	20	28		Write-On Strip (with Module #)	Erasable polycarbonate labeling surface; for marking call letters or frequency of tuning-selected signal source
5	13	21	29		Cover Plate Screws	Phillips-head screws securing cover plate
6	14	22	30		Signal LED	Illumination for signal indicator
7	15	23	31		Output Audio Pot	One-turn potentiometer; for setting output audio level of receiver; adjusted by 0.1" flat-blade mini-screwdriver inserted through output level adjustment opening
8					AM Tuning Controls	10-position DIP switch, accessed by removal of cover plate; settings determine tuning frequency of AM receiver; tuning chart provided on p. 20
	16				FM Tuning Controls	Two banks of DIP switches, 8-position and 4-position, accessed by removal of cover plate; settings determine tuning frequency of FM receiver; tuning chart provided on p. 22
		24			FM Tuning Controls	Two banks of DIP switches, 8-position and 4-position, accessed by removal of cover plate; settings determine tuning frequency of FM receiver; tuning chart provided on p. 22
			32		WX Tuning Controls	7-position DIP switch, accessed by removal of cover plate; settings determine tuning frequency of WX receiver; tuning chart provided on p. 26
				33	Monitor Speaker	Unit studio monitor; plays audio from currently selected receiver
				34	Monitor Select Switch	Push-button switch; sequentially selects receivers 1 -4 for monitoring; fifth selection is OFF (no monitor)
				35	Monitor Select Indicator	Row of LEDs , numbered 1-4; lit when corresponding receiver selected for monitoring
				36	Volume Control	Controls speaker volume (independent of receiver output level adjustment )

# RX-4 Back Panel



1

2 3 4

Receiver #4 (WX)

5 6 7

Receiver #3 (FM)

8 9 10

Receiver #2 (FM)

11 12 13

Receiver #1 (AM)

#	ID	Description / Connections
1	Power Connection	AC input 115 VAC; EIA-type
<b>Receiver #4 (WX) [Weather Radio]</b>		
2	Loop-Through	2 pins of Combicon 5-pin female connector; IN and OUT; provides chaining to other receivers for hot standby
3	Audio Output	3 pins of Combicon female connector; balanced output (+, -, ground) to E <sup>2</sup> A <sup>2</sup> S encoder/decoder
4	Antenna Connector	Female F-type connector; to FM antenna or yagi via male F-type connector
<b>Receiver #3 (FM)</b>		
5	Loop-Through	2 pins of Combicon 5-pin female connector; IN and OUT; provides chaining to other receivers for hot standby
6	Audio Output	3 pins of Combicon female connector; balanced output (+, -, ground) to E <sup>2</sup> A <sup>2</sup> S encoder/decoder
7	Antenna Connector	Female F-type connector; to FM antenna via male F-type connector
<b>Receiver #2 (FM)</b>		
8	Loop-Through	2 pins of Combicon 5-pin female connector; IN and OUT; provides chaining to other receivers for hot standby
9	Audio Output	3 pins of Combicon female connector; balanced output (+, -, ground) to E <sup>2</sup> A <sup>2</sup> S encoder/decoder
10	Antenna Connector	Female F-type connector; to FM antenna via male F-type connector
<b>Receiver #1 (AM)</b>		
11	Loop-Through	2 pins of Combicon 5-pin female connector; only Loop OUT chaining for hot standby (Loop IN non-functional)
12	Audio Output	3 pins of Combicon female connector; balanced output (+, -, ground) to E <sup>2</sup> A <sup>2</sup> S encoder/decoder
13	Antenna Connector	Female F-type connector; to ferrite core antenna via male F-type connector

## INSTALLATION AND CONFIGURATION

This section contains installation information, the procedure for configuring the **RX-4**, and a description of how to implement the loop-through (hot standby) feature.

### Physical Installation

The **RX-4** unit requires a single-unit (1-3/4") rack space. If the receivers are intended as an audio source for an **E<sup>2</sup>A<sup>2</sup>S** unit, then proximity of the two units may be desirable, though not essential. Balanced high-level outputs permit placement of the **RX-4** up to 150 feet from the **E<sup>2</sup>A<sup>2</sup>S**, but it may be operationally advantageous to locate the units immediately above and below one another.

Since switching among the various receiver components may sometimes be necessary, as well adjusting the monitor volume, the **RX-4** should be installed within convenient reach of the operator. (Easy front-panel access is also of value in performing the initial audio-level adjustments.)

Additionally, the unit should be installed in a position and orientation that assures the visibility of the front-panel indicators -- the LEDs that indicate the presence of signal on each of the receiver units, and the LEDs that indicate which receiver is being monitored.

The final consideration in positioning the unit concerns its 9" depth, which is shallower than that of the **E<sup>2</sup>A<sup>2</sup>S**. Depending upon the overall configuration and location of your rack, the difference in depth may make access to the **RX-4** rear panel difficult once it's mounted. If this is the case, you may need to pre-wire the antenna, output, and loop-through connectors (see following sections, pp. 10 and 12), pass them through the rear of the rack, and connect them up while holding the **RX-4** in front of the rack. If you adopt this approach, be sure to make the various leads long enough to accommodate it.

### Antenna Installation

Each component of the **RX-4** must be connected to an appropriate antenna; none of the modular receivers will operate properly without an antenna hookup, preferably to an *outside* antenna. All of the antenna inputs on the rear panel of the **RX-4** unit are F-type female connectors (same as the common cable-TV standard -- see "**RX-4** Back Panel," p. 8) and require a mating F-type male connector on the antenna lead.

- The AM receiver requires connection to a ferrite core or loop antenna; it will not function without one. (Burk Technology manufactures a tunable ferrite core antenna, the **RX-4AFA**, designed specifically for the **RX-4**.)
- The FM receivers can be connected, via a standard TV-type splitter, to a single FM antenna.
- In strong reception areas, the Weather Radio (WX) receiver may also be connected (again, via a splitter) to the FM antenna; in regions where the NOAA signal is weaker, it may be necessary to employ a yagi antenna (a suitable unit is also available from Burk Technology).

To continue the installation procedure, attach the appropriate antenna leads to each of the rear-panel connectors. Refer to the back-panel illustration (p. 8) for proper attachment.

## Connecting The Audio Outputs

The **RX-4** contains four receivers, any of which may be connected to the audio inputs of an EAS encoder/decoder. In the case of the Burk **E<sup>2</sup>A<sup>2</sup>S** unit, there are six audio channels. As of publication of this document, FCC rules require EAS users to monitor two assigned audio sources, but you may connect all four receivers -- as backup, or simply for general monitoring purposes. All six audio inputs on the **E<sup>2</sup>A<sup>2</sup>S** unit are available for monitoring, but please note that Channel 6 also doubles as a line input for recording **E<sup>2</sup>A<sup>2</sup>S** messages. It may be convenient to reserve this input and connect it permanently to a console output for recording -- unless it is more critical at most times to employ Channel 6 for monitoring, in which case the receiver and recording inputs can be switched only when there is a recording to be made.

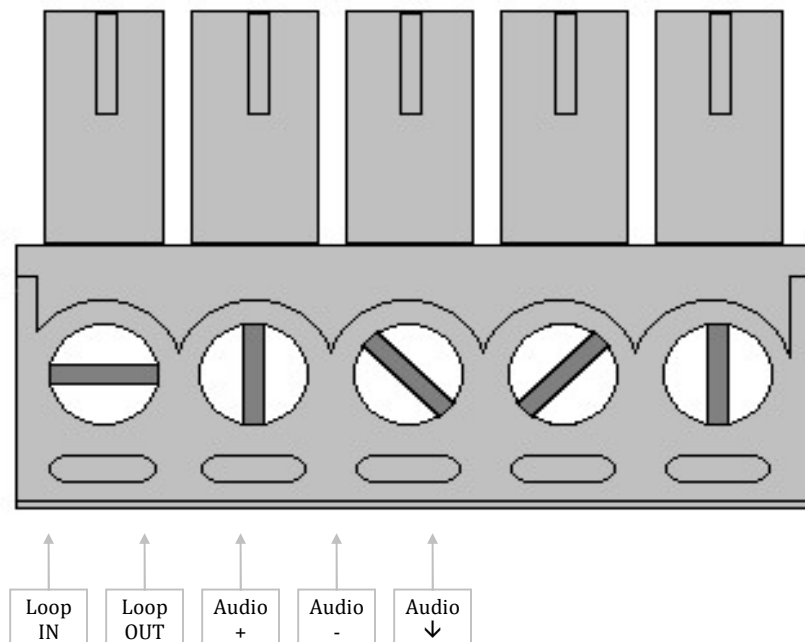
Please note further that if it is desirable to monitor more than four audio sources, a second **RX-4** unit can be connected to any unused **E<sup>2</sup>A<sup>2</sup>S** inputs. (For details on the **E<sup>2</sup>A<sup>2</sup>S** audio inputs and their configuration, see the *E<sup>2</sup>A<sup>2</sup>S* User's Guide.)

The audio outputs are balanced (as are the corresponding audio inputs on the **E<sup>2</sup>A<sup>2</sup>S** unit), therefore it is recommended to use two-wire twisted pair or shielded cables for the connections; Belden 8450 (solid) or 8451 (stranded) are appropriate.

Both the **RX-4** outputs and the **E<sup>2</sup>A<sup>2</sup>S** inputs are Phoenix Combicon connectors (for which mating cable connectors are provided in each case); these are plug-in terminal straps that can be prepared for use with no tools other than a wire stripper and a small slotted screwdriver (such as a green Xcelite mini-screwdriver -- also suited for adjusting **RX-4** output levels, as described below).

The **RX-4** installation kit contains four 5-pin male connectors. In each connector, audio output is carried on the 3 rightmost pins (rightmost, with screwheads facing up, and pins pointing away from you, as in the illustration below -- note also the corresponding labeled female connectors, on rear panel), and the 2 leftmost pins are used to implement the loop feature (see "Connecting the Receivers for Hot Standby," p. 13). At this point, wire only the audio outputs on each mating block.

### Combicon Mating Block



To attach the mating connectors, strip the connecting wires at either end, then loosen the three rightmost screws on the Combicons until they admit the appropriate stripped wire; then tighten the screws.

Install the cable connectors, with the mating plug to the **RX-4** at one end of the cable, the **E<sup>o</sup>A<sup>o</sup>S** mating plug at the other (note that the latter is a 6-pin dual connector, each one carrying two channels, and the **RX-4** outputs can be attached in pairs). If you are in any doubt about how to connect the **E<sup>o</sup>A<sup>o</sup>S** input pairs, consult the **E<sup>o</sup>A<sup>o</sup>S** *User's Guide*.

When attaching the connectors, be careful to observe the correct polarities, as indicated on both units by the rear-panel labels: plus, minus, and ground. The mating connectors can themselves be labeled (with channel numbers, call letters, etc.) by marking with a felt-tip pen on the beveled face at the back of the plug.

If you plan to make use of the loop feature, go on to the following section for further wiring instructions; otherwise, go ahead and insert the plugs to connect the **RX-4** and **E<sup>o</sup>A<sup>o</sup>S** units now.

### **Making Connections for the Loop-Through (Hot Standby) Feature**

The loop-through feature of the **RX-4** allows the individual receivers in the unit to have their inputs and outputs linked so that one component can serve as a “hot standby” for another, if loss-of-signal occurs in the latter unit. This feature is useful both for providing routine backup and for covering particular situations where reception might cease (e.g., if a source one normally monitors is off the air for certain hours of the day).

#### **How the Loop-Through Feature Works**

The operating principle is as follows: The Loop OUT of the standby receiver is connected to the Loop IN of the primary receiver (see “**RX-4** Back Panel,” p. 8, for location of the loop connectors). If audio is squelched on the primary receiver, then the signal from the standby is automatically routed through the squelched channel. The loop will remain in effect until signal is once again detected on the primary receiver; then the standby will cease routing its signal through.

For instance, suppose your EAS monitoring assignments consist of an AM station -- Receiver #1 -- and the FM station to which Receiver #2 is tuned. By running a wire from Loop OUT of Receiver #3 (FM) to Loop IN of Receiver #2, you would back up the primary FM assignment with the alternate FM station.

Furthermore, the individual receivers may be “daisy-chained,” that is, looped in a series of more than two components. In a single **RX-4** unit, for example, one could loop the OUT of Receiver #1 to the IN of Receiver #2, then Receiver #2 to Receiver #3 in similar fashion, and finally, Receiver #3 to Receiver #4. This arrangement would create a hot standby chain in which Receiver #4 is the primary, with Receiver #1 as the final standby component. If there is loss of signal in any or all of Receivers #2, 3, or 4, the output channel of the failed receiver(s) will carry the audio coming in through its (or their) Loop IN. The source of the audio to the non-receiving component(s) will be whichever receiver is the next functional unit up the standby chain.

There is, however, one important exception to the loop feature as so far described: *The AM receiver cannot be looped through; in fact the Loop IN on the AM channel cannot be used* (though AM Loop OUT is fully functional). This situation arises from the general noisiness of the AM band, and the difficulty of determining whether audio is truly squelched in order to trigger activation of the standby; AM loss-of-signal



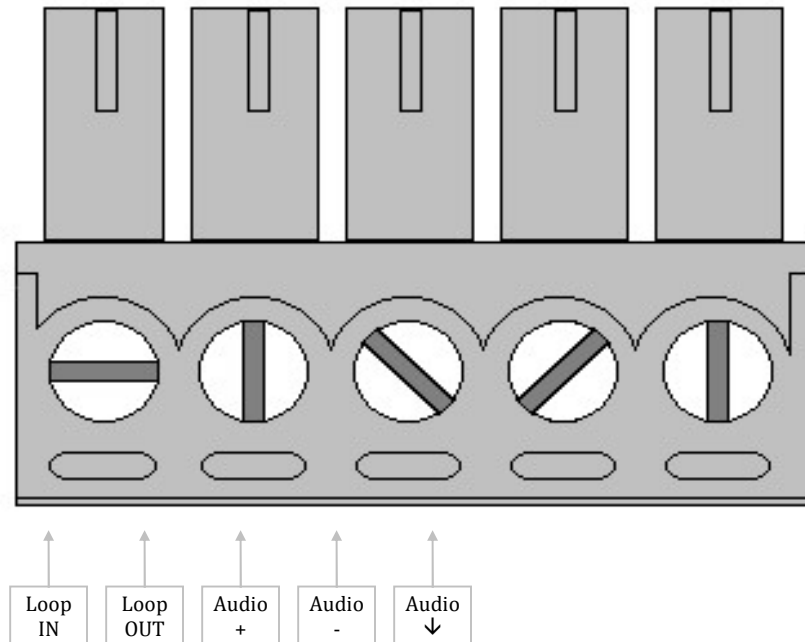
simply cannot reliably be detected. In practical terms, this means that there is no hot standby for the AM receiver (#1), though it can serve dependably as standby for any of the other receivers.

Please note that it is also possible to loop a hot standby connector, or even daisy-chain, from one **RX-4** unit to another (any number of them, in fact). The same considerations apply *between* units as *within* units: the Loop OUT of the standby module goes to the Loop IN of the primary module (except for the AM receiver, where the Loop IN is not functional). In such a case, the units so connected should be adjacent to one another in the rack, for the shortest possible run of loop cable.

### Connecting the Receivers for Hot Standby

Use single-conductor wire to connect the receivers you wish to link in hot standby mode. The wires attach to the Combicon connectors in the same fashion as the audio output cables, discussed above. On each 5-pin mating plug, the leftmost pin is Loop IN and the pin immediately to its right is Loop OUT, as indicated in the figure below. For each individual standby loop, prepare a lead of the proper length and strip both ends. Attach one end of the wire to the Loop IN pin of the *primary* receiver's mating plug; attach the other end of the wire to the Loop OUT pin on the mating plug of the receiver selected for *standby*.

#### Combicon Mating Block



Repeat the process for as many primary-standby pairs as you require, daisy-chaining the connectors where you wish a standby unit to be covered by a standby in turn. You may freely connect between separate **RX-4** units, as well as among individual receivers within a single unit, taking care only to avoid connecting to the Loop IN of the AM receiver's plug, for the reasons noted above.

When all audio output and loop connections have been fashioned, simply plug the assembled 5-pin connectors into the appropriate receiver channels; plug the 6-pin Combicons on the other ends of the cables into the proper channel pairs on the **E<sup>o</sup>A<sup>o</sup>S** back panel. Now you're ready to power the **RX-4** up.

## Powering Up

Once all the proper connections are made, you may power the unit up. Note that the **RX-4** features no power switch. As with the **EAS** unit it is designed to work with, the **RX-4** is meant to be powered up at all times, always supplying audio input to the **EAS** in accordance with the user's assigned monitoring frequencies. Powering up the **RX-4** is simply a matter of attaching and plugging in the EIA power cord provided with the unit. The signal indicators on the front panel will not activate unless the corresponding receiver is tuned to a receivable frequency and connected to a suitable antenna; however, you can verify that the unit is powered up by observing the monitor LEDs -- see "**RX-4** Front Panel," p. 5. (If there are no LEDs activated, it may be because the monitor selection switch is OFF -- press it once, and the Receiver #1 indicator will light up if the unit is powered.)



## TUNING AND ADJUSTMENT

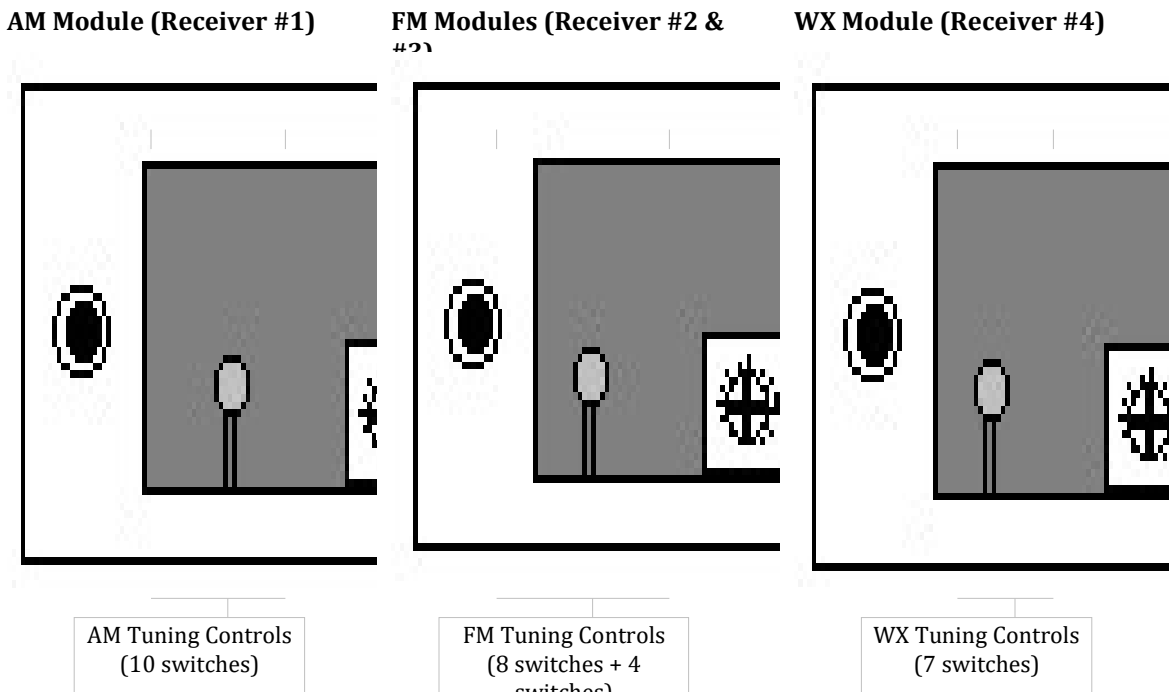
This section describes how to put the **RX-4**, once configured and powered-up, into operation by setting the tuning frequency, adjusting the audio output level of each of the four receivers, and selecting the receiver to monitor within the **RX-4** unit.

### Selecting the Monitoring Frequencies for the Receivers

To minimize the possibility of inadvertent resetting of the receiver frequencies, the tuning controls are situated *inside* the **RX-4** unit, behind the front panel. They are accessed by removal of the four front-panel cover plates that display the labeling for each of the components.

Each cover plate is secured by two Phillips-head screws, at left and right (see “**RX-4** Front Panel,” p. 5). To access the tuning controls for any module, simply remove the two screws with a small Phillips screwdriver (or slotted mini-screwdriver) and pull off the cover plate. In each module, the set of controls is a bank of DIP switches (white switches on a red block) immediately behind the cover plate, on the right.

For each receiver type, there are a different number of switches in the tuning control, as illustrated with cover plates removed in the figure below (and in the magnified illustrations on pp. 18, 21, and 24):



(The “Receiver #” designations refer to the standard configuration. If you have specified a different configuration for your unit, then consider only the module type and refer to the module positions specified on your invoice. If you do have a non-standard unit and lose track of which component is which, you can identify the modules again by removing the cover plates and counting the DIP switches in the tuning controls. As shown in the illustrations above, the AM module features 10 switches; the FM modules have 12 switches, in two banks, of 8 and 4; the WX module has 7 switches.)

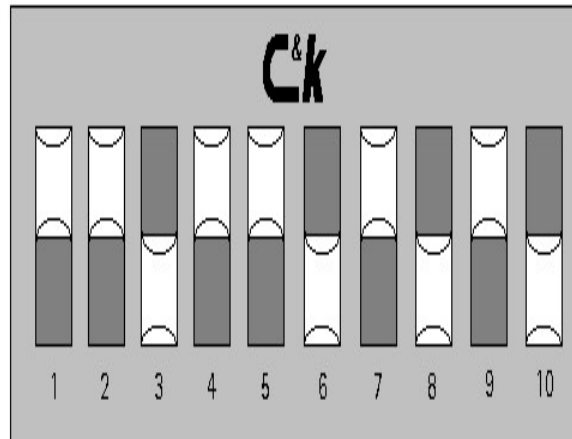
The following sections discuss the frequency settings for each of the receiver modules in turn. If you are setting up your **RX-4** for the first time, you may wish to remove all the cover plates at once and tune all the receivers sequentially. If you are simply resetting an individual receiver, then just remove that individual cover plate and consult the instructions for the appropriate module type, below. There is no need to power the unit down during tuning, though care must be taken to avoid damage to the components during adjustment.

**IMPORTANT NOTE:** A close inspection of the any of the DIP switch banks would reveal a directional arrow labeling the UP position as "On." *Please disregard these labels.* As the instructions in the following sections make clear, the correct switch position for "On" (= "1") in the **RX-4** implementation is DOWN.

## AM Receiver Tuning

With the cover plate removed from the AM module (the leftmost module on the front panel, labeled "1" in the standard configuration), observe the DIP-switch bank on the right side of the opening. Here is a magnified view:

### AM Tuning Control



Switch positions = 0 0 1 0 0 1 0 1 0 1

The AM receiver is tuned by setting the switches in a binary pattern corresponding to the number of the frequency in kHz, with the DOWN position of a switch representing "1" and the UP position representing "0". Setting is accomplished by flipping the switches up or down in the same pattern, left to right, as the 1s and 0s of the binary number.

The actual conversion formula is:

$$\text{Switch setting in binary} = (\text{Frequency in kHz}/10) + 46$$

In the example pictured above, the switches are set for a tuning of 1030 kHz (1030 divided by 10 is 103; plus 46 is 149, which is 0010010101 in binary).

However, you do not need to calculate the switch settings; the complete set of tunings is presented in the chart on the opposite page. Simply look up the AM frequency you wish to tune the receiver to, and the proper DIP switch pattern is shown immediately to the right of that number.

Starting at the left, flip the switches up or down according to the 1s and 0s of the bit pattern in the chart. You will probably find manipulation of the switches more manageable with the tip of a small plastic tuning-type screwdriver (if you use a metal screwdriver or ballpoint pen tip, exercise extreme care; the unit is open and powered-up and there is the possibility of damage to the components).

Tuning will take effect as the switches are set; if you are monitoring the receiver you are tuning, you will hear audio from different stations at the various intermediate switch settings you will pass through before the final pattern is set.

Once the setting is made, compare the switch positions against the chart once more to assure correctness. Then press the Monitor Select Switch (see “**RX-4** Front Panel,” p. 5) until it indicates Receiver #1 (or the appropriate receiver number in a non-standard configuration), adjust the volume control for audibility, and monitor until the station ID is confirmed. To eliminate any later confusion, we recommend that you mark the call letters or frequency of the station in the labeling space provided on the cover plate (the white polycarbonate write-on strip that indicates the module number); pencil or erasable marker may be used, but label maker strips or press-on lettering provide a more finished appearance.

**AM Tuning Chart**

<i>Frequency y in kHz</i>	<i>Switch Settings</i>
550	0001100101
560	0001100110
570	0001100111
580	0001101000
590	0001101001
600	0001101010
610	0001101011
620	0001101100
630	0001101101
640	0001101110
650	0001101111
660	0001110000
670	0001110001
680	0001110010
690	0001110011
700	0001110100
710	0001110101
720	0001110110
730	0001110111
740	0001111000
750	0001111001
760	0001111010
770	0001111011
780	0001111100
790	0001111101
800	0001111110
810	0001111111
820	0010000000
830	0010000001
840	0010000010
850	0010000011
860	0010000100
870	0010000101
880	0010000110
890	0010000111
900	0010001000
910	0010001001
920	0010001010

<i>Frequency y in kHz</i>	<i>Switch Settings</i>
950	0010001101
960	0010001110
970	0010001111
980	0010010000
990	0010010001
1000	0010010010
1010	0010010011
1020	0010010100
1030	0010010101
1040	0010010110
1050	0010010111
1060	0010011000
1070	0010011001
1080	0010011010
1090	0010011011
1100	0010011100
1110	0010011101
1120	0010011110
1130	0010011111
1140	0010100000
1150	0010100001
1160	0010100010
1170	0010100011
1180	0010100100
1190	0010100101
1200	0010100110
1210	0010100111
1220	0010101000
1230	0010101001
1240	0010101010
1250	0010101011
1260	0010101100
1270	0010101101
1280	0010101110
1290	0010101111
1300	0010110000
1310	0010110001
1320	0010110010

<i>Frequency y in kHz</i>	<i>Switch Settings</i>
1350	0010110101
1360	0010110110
1370	0010110111
1380	0010111000
1390	0010111001
1400	0010111010
1410	0010111011
1420	0010111100
1430	0010111101
1440	0010111110
1450	0010111111
1460	0011000000
1470	0011000001
1480	0011000010
1490	0011000011
1500	0011000100
1510	0011000101
1520	0011000110
1530	0011000111
1540	0011001000
1550	0011001001
1560	0011001010
1570	0011001011
1580	0011001100
1590	0011001101
1600	0011001110
1610	0011001111
1620	0011010000
1630	0011010001
1640	0011010010
1650	0011010011
1660	0011010100
1670	0011010101
1680	0011010110
1690	0011010111
1700	0011011000

**Switch Values:**



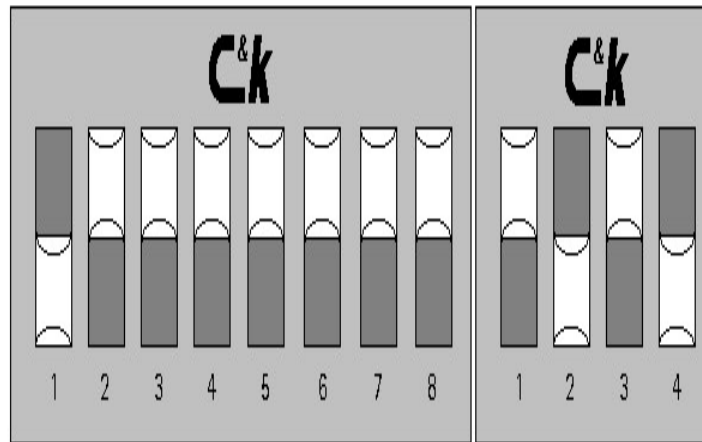
930	0010001011	1330	0010110011	DOWN = 1 UP = 0
940	0010001100	1340	0010110100	

Snap the cover plate back in place and secure it with the two Phillips-head screws. Continue with the FM or WX tuning procedures in the following sections if you are intending to tune those components; otherwise go on to "Adjusting Audio Output Levels" (p. 27).

**FM Receiver Tuning**

With the cover plate removed from one or both of the FM modules (the two central modules on the front panel, labeled "2" and "3" in the standard configuration), observe the DIP-switch bank on the right side of either opening. Here is a magnified view (only one is pictured; both FM controls are identical):

FM Tuning Control



Switch positions = 1 0 0 0 0 0 0 0 0 1 0 1

The FM receiver is tuned by setting the 8 switches of the left-hand bank in a binary pattern corresponding to the number of the frequency in MHz, and the 4 switches of the right-hand bank to the binary number representing tenths of MHz. The DOWN position of a switch corresponds to "1" and the UP position corresponds to "0". Setting is accomplished by flipping the switches up or down in the same patterns, left to right, as the 1s and 0s of the two binary numbers involved.

The actual conversion formulas are:

$$\text{Left-bank switch setting in binary} = (\text{Whole-number frequency in MHz}) + 30$$

$$\text{Right-bank switch setting in binary} = \text{Decimal-fraction frequency in tenths of MHz}$$

In the example shown above, the switches are set for a tuning of 98.5 MHz (for the left-hand bank, 98 plus 30 is 128, which is 10000000 in binary; for the right-hand bank, 0101 is the binary representation of 5, the number of tenths).

It is not necessary, however, to calculate the switch settings; the full set of tunings is listed in the chart on the opposite page. Just look up the whole-number part of the FM frequency you wish to tune the receiver

to, and the proper DIP switch pattern for the left-hand bank is shown next to that number. Then continue across the chart to the column corresponding to the proper fractional part of the FM frequency (.1, .3, .5, or .7), and the 4-bit pattern represents the switch settings for the right-hand bank.

Starting at the left, flip the switches up or down according to the 1s and 0s of both bit patterns referenced in the chart. You will probably find manipulation of the switches more manageable with the tip of a small plastic tuning-type screwdriver (if you use a metal screwdriver or ballpoint pen tip, exercise extreme care; the unit is open and powered-up and there is the possibility of damage to the components).

Tuning will be effected as the switches are set; if you are monitoring the receiver you are tuning, audio from different stations will be received at the various intermediate switch settings you will pass through before the target pattern is set.

When you have set both left- and right-hand banks, double-check the switch positions against the chart once more. Then press the Monitor Select Switch (see "RX-4 Front Panel," p. 5) until it indicates Receiver #2 or #3, whichever module you are currently tuning (or the appropriate receiver number in a non-standard configuration), adjust the volume control for audibility, and monitor until the station ID is confirmed. As an aid to later identification, we recommend that you mark the call letters or frequency of the station in the labeling space provided on the cover plate (the white polycarbonate write-on strip that indicates the module number); the surface will accept marking from a pencil or erasable marker, but press-on lettering or label maker strips present a more finished appearance.

Snap the cover plate back in place and secure it with the two Phillips-head screws. If you need to tune the other FM receiver, repeat the foregoing procedure with the remaining FM module. Continue with the WX tuning procedure in the following section if you are intending to tune that component; otherwise go on to "Adjusting Audio Output Levels" (p. 27).

***FM Tuning Chart***

<i>Frequency in MHz</i>	<b>Left Bank Switch Settings (MHz)</b>	<b>Right Bank Switch Settings (tenths of MHz)</b>				
		<i>.1</i>	<i>.3</i>	<i>.5</i>	<i>.7</i>	<i>.9</i>
88	01110110	0001	0011	0101	0111	1001
89	01110111	0001	0011	0101	0111	1001
90	01111000	0001	0011	0101	0111	1001
91	01111001	0001	0011	0101	0111	1001
92	01111010	0001	0011	0101	0111	1001
93	01111011	0001	0011	0101	0111	1001
94	01111100	0001	0011	0101	0111	1001
95	01111101	0001	0011	0101	0111	1001
96	01111110	0001	0011	0101	0111	1001
97	01111111	0001	0011	0101	0111	1001
98	10000000	0001	0011	0101	0111	1001
99	10000001	0001	0011	0101	0111	1001
100	10000010	0001	0011	0101	0111	1001
101	10000011	0001	0011	0101	0111	1001
102	10000100	0001	0011	0101	0111	1001
103	10000101	0001	0011	0101	0111	1001

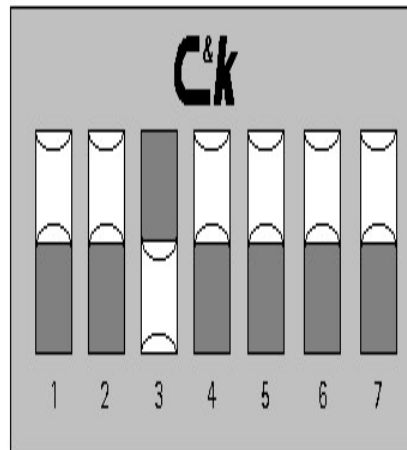
<i>104</i>	<b>10000110</b>	<b>0001</b>	<b>0011</b>	<b>0101</b>	<b>0111</b>	<b>1001</b>
<i>105</i>	<b>10000111</b>	<b>0001</b>	<b>0011</b>	<b>0101</b>	<b>0111</b>	<b>1001</b>
<i>106</i>	<b>10001000</b>	<b>0001</b>	<b>0011</b>	<b>0101</b>	<b>0111</b>	<b>1001</b>
<i>107</i>	<b>10001001</b>	<b>0001</b>	<b>0011</b>	<b>0101</b>	<b>0111</b>	<b>1001</b>
<i>108</i>	<b>10001010</b>	<b>0001</b>	<b>0011</b>	<b>0101</b>	<b>0111</b>	<b>1001</b>

Switch Values:           DOWN = 1  
                                  UP = 0

## WX Receiver Tuning

With the cover plate removed from the WX module (the rightmost module on the front panel, labeled "4" in the standard configuration), note the DIP-switch bank on the right side of the opening. Here is the magnified view:

WX Tuning Control



Switch positions = 0 0 1 0 0 0 0

The WX module tunes to the seven standard NOAA weather frequencies directly; each one of the 7 switches corresponds to a different channel, numbered from left to right (as labeled on the switch bank itself). There is no decimal-to-binary conversion involved.

The DOWN position of a switch indicates selection of the corresponding channel, and the UP position switches that channel off. Tuning is accomplished by flipping DOWN the single switch that represents the desired channel, and flipping all other the switches in the bank to UP. *Note that only ONE switch may be in the DOWN position at any time, or the receiver will not tune properly.*

In the example pictured above, the tuning is set for NOAA Channel 3 (162.475 MHz). For the sake of consistency with the other tuning specifications, the switch positions are shown as a string of binary digits (above, and in the following tuning chart), with "1" representing the DOWN position and "0" representing UP. The tuning chart on the opposite page relates the NOAA channel numbers and frequencies to the appropriate switch patterns.

Flip the switch of the desired channel down, and flip the remaining six switches up. You will probably find manipulation of the switches more manageable with the tip of a small plastic tuning-type screwdriver (if you use a metal screwdriver or ballpoint pen tip, exercise extreme care; the unit is open and powered-up and there is the possibility of damage to the components).

Tuning takes effect as the switches are set; however, reception will be nil if more than one switch is in the DOWN position.

When setting is complete, check that only the desired channel switch is in the DOWN position. Then press the Monitor Select Switch (see "RX-4 Front Panel," p. 5) until it indicates Receiver #4 (or the appropriate

receiver number in a non-standard configuration), adjust the volume control for audibility, and monitor until the channel ID is confirmed. To prevent any later confusion, we recommend that you write the channel number or frequency in the labeling space provided on the cover plate (the white polycarbonate write-on strip that indicates the module number); pencil or erasable marker may be used, but a more finished appearance will be provided by label maker strips or press-on lettering.

Snap the cover plate back in place and secure it with the two Phillips-head screws, then proceed to the following section, "Adjusting Audio Output Levels" (p. 27).

### ***WX Tuning Chart***

<b>NOAA Channel</b>	<b>Switch Settings</b>	<i>Frequency in MHz</i>
1	<b>1000000</b>	<i>162.550</i>
2	<b>0100000</b>	<i>162.400</i>
3	<b>0010000</b>	<i>162.475</i>
4	<b>0001000</b>	<i>162.425</i>
5	<b>0000100</b>	<i>162.450</i>

<b>NOAA Channel</b>	<b>Switch Settings</b>	<i>Frequency in MHz</i>
6	<b>0000010</b>	<i>162.500</i>
7	<b>0000001</b>	<i>162.525</i>

**Switch Values:     DOWN = Select  
   UP = Off**

## Adjusting Audio Output Levels

Each audio output from the **RX-4** into the **E<sup>o</sup>A<sup>o</sup>S** unit must be adjusted so that the level of AFSK tones, EBS tones, and recorded voice from the monitored source are balanced with those that are generated and/or recorded internally (which must be in turn be balanced with respect to one another.) If the source levels are not so adjusted, incoming EAS messages can fail of reception or cause severe clipping -- and received messages which are re-transmitted (forwarded) can suffer such imbalance between internally generated tones and reproduced (and re-broadcast) voice messages that the audio may be too attenuated or distorted to air again.

The following discussion describes how to adjust **RX-4** output, with particular reference to the Burk Technology **E<sup>o</sup>A<sup>o</sup>S**. The **RX-4** is built to function with any EAS unit, but if your system is a non-Burk unit, you will need to consult your system manual for the specifics of how to gauge and set input for that device. On the other hand, the adjustment of *output* audio level from the **RX-4** via the individual module pots is always performed in the fashion described in Steps 3 and 4 below, regardless of the EAS unit it is connected to.

There are six steps to the adjustment process:

1. From the front panel of the **E<sup>o</sup>A<sup>o</sup>S** unit, bring up the **READY** menu, if it is not already on display, and select option 5 -- Monitor Audio Chan.

The **MONITOR AUDIO CHAN** screen will display, with the cursor indicating the number of the current channel selection (from 1 to 6 -- the default setting is "OFF") in a square-bracketed field.

```

MONITOR AUDIO CHAN
Channel: [OFF] ▲▼
Level: |
ESC=Abort ENT=Select

```

2. Determine which of the two or more audio inputs from the **RX-4** to adjust first. Then use the UP (▲) and DOWN (▼) keys on the **E<sup>o</sup>A<sup>o</sup>S** Control Key cluster to increment or decrement (respectively) the channel setting, until the number of that channel appears in the bracketed field.

Let's assume, for purposes of example, that you have an **RX-4** output going to **E<sup>o</sup>A<sup>o</sup>S** channel 1. The following display would appear when you step to that channel:

```

MONITOR AUDIO CHAN
Channel: [ 1 ] ▲▼
Level: |██████████|
ESC=Abort ENT=Select

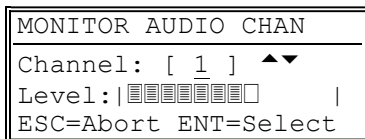
```

Incoming audio from the **RX-4** activates the on-screen peak meter, which will fluctuate in response to audio level. (The preceding sample screen shows the gauge at maximum response; audio would be clipping at this reading.) The adjustment process involves setting the **RX-4** receiver output for that channel so that the normal program audio peaks at the zero point (the blank rectangle) on the gauge, which corresponds to -6 dB.

- Now turn your attention to the RX-4 front panel, and the receiver module which is the source for the E<sup>o</sup>A<sup>o</sup>S channel currently being monitored. Locate the adjustment access in the cover plate for that receiver, a 0.1"-diameter opening labeled "Level," to the right of the signal indicator (refer to "RX-4 Front Panel," p. 5, if necessary).

Behind the adjustment opening, inside the module, is a one-turn pot (see "RX-4 Front Panel," p. 5), adjustable with a green Xcelite mini-screwdriver. *Do not attempt to force a larger screwdriver into the opening, or damage to the front panel or the pot itself may occur.* Insert the screwdriver blade until it meets the pot, rotate it slightly until it engages, then turn clockwise to increase output level, counterclockwise to decrease.

- Observe the displayed audio gauge on the E<sup>o</sup>A<sup>o</sup>S screen as you turn the pot on the RX-4. Raise or lower the output level until the gauge has the following appearance, consistently peaking at the zero point:



This completes the adjustment for the selected channel.

- Now perform the adjustment in turn for each of the remaining RX-4 receivers connected to the E<sup>o</sup>A<sup>o</sup>S. Use the UP (▲) and DOWN (▼) keys to select the proper channel and proceed from Step 3, above. When you have adjusted the last RX-4 output, go on to Step 6.
- Determine which channel, if any, you wish to monitor in-studio. Step to the desired channel number display (or to "OFF") using the UP (▲) and DOWN (▼) keys. Press the ENT key to accept the setting and exit to the READY menu. (If you press ESC instead, the monitor channel will revert to its previously selected value, whatever that may have been.)

The E<sup>o</sup>A<sup>o</sup>S will continue to monitor that channel until it is explicitly reassigned, or until reception of an EAS message (in which case monitoring will return to that channel once the message has been processed).

One further note: where audio is looped-through, in a hot standby arrangement, and the audio is squelched in the primary output channel, the level of standby audio coming through the primary channel will be that of the backup unit.

### Monitor Selection and Volume Adjustment

You can also monitor the RX-4 directly, through its own speaker. The Monitor Select switch cycles through five selections when repeatedly pressed. The first position is OFF, in which no receiver is monitored; successive pressings of the switch will select each receiver in turn, from #1 through #4, before returning to OFF again. In the OFF state, none of the Monitor LEDs are activated; when a receiver is selected, the correspondingly numbered Monitor LED lights to indicate that choice (see "RX-4 Front Panel," p. 5, for location of the switch, LEDs, and volume control).

The volume of the monitored audio is adjusted by the front-panel Volume Control knob. Please note that this control is entirely independent of the output audio adjustment described in the foregoing section. The



Volume Control knob adjusts *only* the monitor level through the front-panel speaker and has no effect on the audio level reaching the E<sup>2</sup>A<sup>2</sup>S unit. Similarly, the individual output level adjusters on each receiver have no effect on the monitored audio level.

When a receiver is selected for monitoring, its audio passes through the **RX-4**'s own front-panel speaker, regardless of which output is being monitored by the E<sup>2</sup>A<sup>2</sup>S unit. It is thus possible to have a different audio source playing simultaneously through either unit. If it is necessary to monitor different sources from each unit, use the front-panel volume control on either the **RX-4** or the E<sup>2</sup>A<sup>2</sup>S to eliminate whichever source audio is unwanted in the studio.

## Technical Support

In case of any difficulty with your **RX-4** unit, Burk Technology Technical Support will provide every assistance. During normal business hours, help is available by calling (978) 486-0086.

**APPENDIX: RX-4 SCHEMATICS**



**RX-4  
WX Receiver**

**RX-4  
AM Receiver**

**RX-4  
Monitor Amplifier**

**RX-4  
FM Receiver**







