

# CHAPTER 3

## FUNCTIONAL DESCRIPTION

### 3.1 OVERVIEW

The SelectAmp Channelized Paging Repeater accepts inputs in the 928 – 942 paging band, and selectively passes one discrete channel in each band while rejecting the others. In the forward channels this is accomplished by downconverting the desired signals to a 45 MHz intermediate frequency and using narrowband crystal filters to provide adjacent channel rejection. The reverse path is not channelized, passing all frequencies in the 897 – 903 MHz band.

### 3.2 FUNCTIONAL DESCRIPTION

Refer to Figure 3-1. The amplifier contains two paths; forward for the base station to pager signal and reverse for the pager to base station signal. The forward path includes a diplexer, low noise amplifier and splitter, channelizer, combiner, and power amplifier. The channelizers determine the frequencies to be amplified and provide the gain control. The reverse path includes a diplexer, broadband module (amplifier and filters), and a power amplifier. Diplexing of the forward and reverse channels is accomplished by diplexer filters tuned to the appropriate frequencies.

#### 3.2.1 DIPLEXER

The diplexer module consists of dual filters with a common port on one end and two separate ports on the other. One side of the diplexer is tuned for the forward channel, the other side for the reverse channel. Insertion loss of each filter is 2 dB maximum and 65 dB minimum rejection to the opposite band.

#### 3.2.2 BROADBAND MODULE

The broadband module contains three boards, each mounted in its own compartment. The forward channel signals are routed through the LNA/Splitter and Combiner boards. The reverse channel signal is routed through the 901 MHz board. Each board is described in more detail below.

##### 3.2.2.1 LNA/SPLITTER

The LNA/Splitter module contains the first active devices in the forward channel path. It consists of a low noise amplifier, 3-way power splitter, and a gain stage and filter per path. The amplifiers bias voltages are monitored for a fault condition and reported to the control/distribution module.

##### 3.2.2.2 COMBINER

The Combiner module consists of a 3-way power combiner, a gain stage and filter, and a level detector circuit.

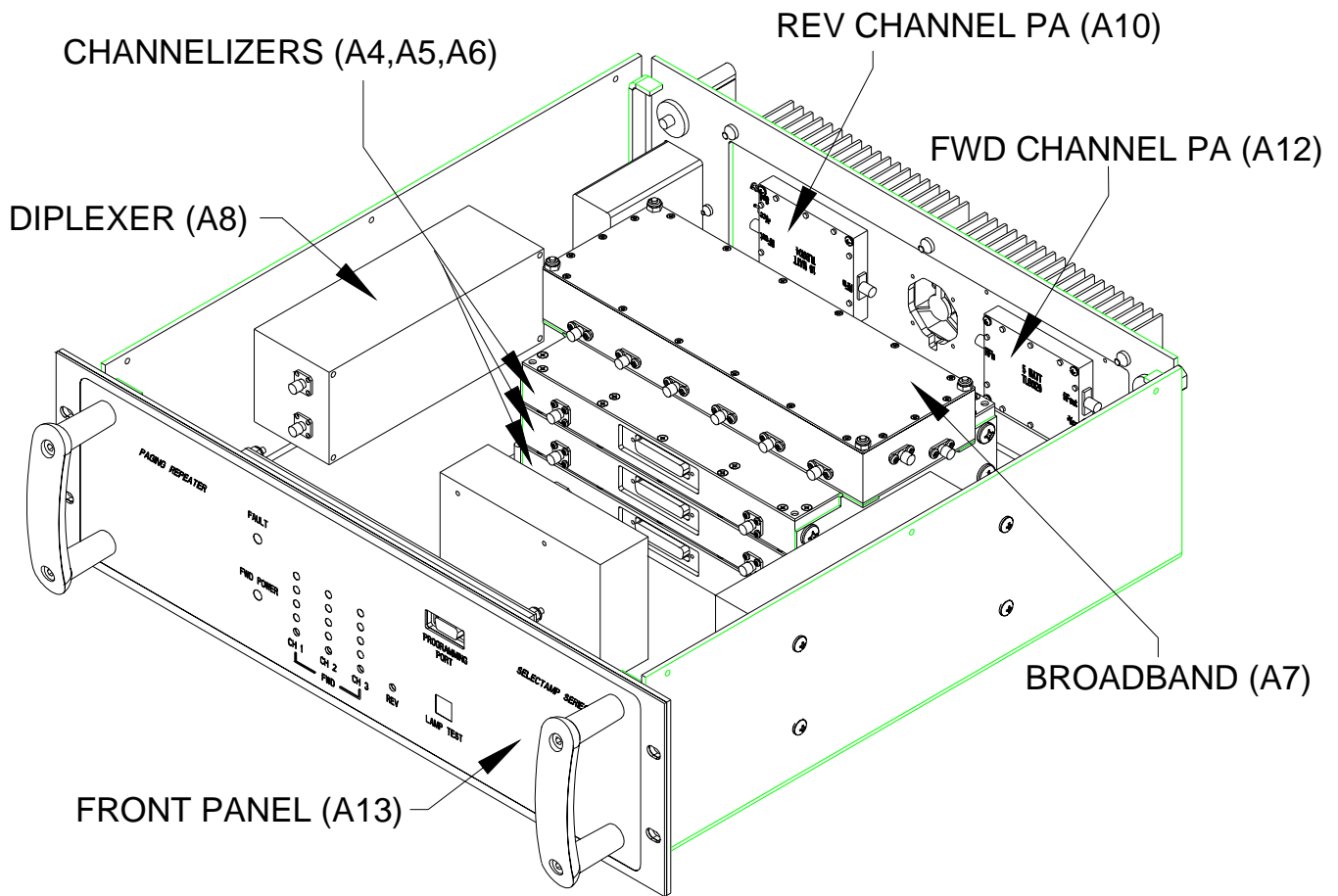


Figure 3-1. SelectAmp NBPCS-900-3 Outline Drawing, front view.

### 3.2.2.3 901 MHZ REVERSE CHANNEL

The 901 MHz reverse channel module provides four gain stages, filtering, and gain adjustment via the front panel.

### 3.2.3 CHANNELIZER

The channelizer module contains three boards, each mounted in their own compartment. These three boards, which are described below, provide the channel selectivity. The channelizer module gain is approximately 40 dB.

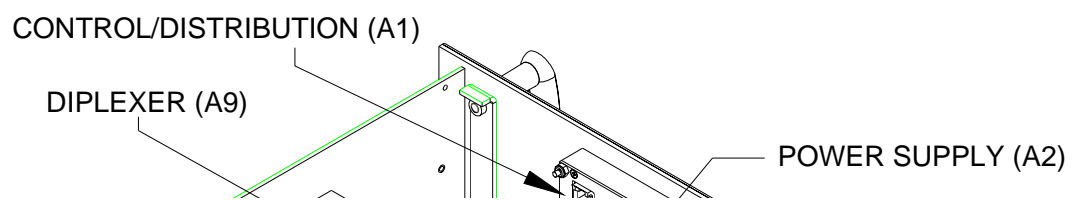


Figure 3-2. SelectAmp NBPCS-900-3 Outline Drawing, rear view.

### 3.2.3.1 DOWNCONVERTER

The downconverter board consists of a mixer driven by a synthesizer, a crystal filter centered at 45 MHz with either a 12.5 KHz (930 MHz channelizer), a 50 KHz (940 MHz ReFlex50 channelizer), or a 25 KHz (940 MHz ReFlex25 channelizer) 1 dB bandwidth. It has one fixed gain stage, and a variable gain stage to provide overall gain adjustment. A Receive Signal Strength Indicator (RSSI) circuit measures the received signal strength and outputs a dc voltage to the Control/Distribution board. The DC current draw of each gain stage is monitored by a window comparator. The window comparator indicates a fault, if the gain stage has an open or short condition. The output of the down converter is fed to the upconverter board.

### 3.2.3.2 UP CONVERTER

The upconverter board mixes the filtered 45 MHz IF with a signal from the synthesizer and outputs the same frequency that was input to the downconverter. The upconverter consists of a mixer, gain stage, and filter. The DC current draw of each gain stage is monitored by a window comparator. The window comparator indicates a fault, if the gain stage has an open or short condition.

### 3.2.3.3 SYNTHESIZER

The synthesizer board consists of a synthesizer circuit that is driven by a reference oscillator and distribution amplifiers. The synthesizer operating frequency is programmed from the Control/Distribution module. The forward channel frequencies are set with a computer that has Andrew designed frequency control software installed on it. This software is a Microsoft Windows 95/98/NT application that allows the operator to input the desired channel frequency. The Control/Distribution module converts the operator's input to the appropriate frequency command for the synthesizer. The output of the synthesizer is divided into a downconverter path and an upconverter path.

### 3.2.4 POWER SUPPLY

The power supply assembly consists of a Power Entry Module and switching power supply. The power supply accepts a 100 to 240 VAC, 3A, 50/60 Hz input and outputs +15 VDC for use by the rest of the amplifier. Power is distributed to the active modules through the Control/Distribution board.

### 3.2.5 CONTROL/DISTRIBUTION MODULE

The control/distribution module distributes power to the other modules, receives and processes status and fault information, and provides forward channel frequency control. Power distribution consists of current monitoring of both the forward and reverse channel PA's, linearly regulating the +15 VDC down to +12 and +5 VDC for various modules. Status functions include monitoring RSSI voltages from the channelizers, monitoring forward output power, and driving the appropriate front panel LED's. Channel frequency selection information is received via RS-232 from the front panel and is processed by an on board microcontroller. This information is also stored in ROM (Read Only Memory), so that frequency settings are not lost if AC input power is lost. The microcontroller sends the frequency information via a three wire interface to the appropriate channelizer. Various faults on the channelizers, broadband, and the control/distribution module itself are monitored and displayed on the front panel. A rear panel contact closure (closed when unit is operating normally) is provided for external monitoring.

### 3.2.6 POWER AMPLIFIER MODULES

The power amplifier module provides the final gain and power stages for the amplifier. A 5 Watt Peak Class A linear amplifier is used for the forward channel. This 5 Watt unit has approximately 27 dB gain. A 1.6 Watt Peak Class A linear amplifier is used for the reverse channel. The 1.6 Watt unit has approximately 30 dB gain. The DC current draw of each power amplifier is monitored by a window comparator.

### 3.3 PROGRAMMING

The amplifier forward channels are set by connecting a laptop computer with the supplied cable to the front panel connector.

Details on setting the channels and software operation are provided in Appendix B.