

EXHIBIT D
INSTRUCTION BOOK

A. INSTRUCTION BOOK:

The User's Guide for this product has been included as Exhibit
D.

USER'S GUIDE
for the
SELECTAMP CDMA1900-1H
CDMA CHANNELIZED AMPLIFIER SERIES

MANUAL NO. AE02B-A3602
REVISION --

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CHAPTER 4

MAINTENANCE

4.1 MAINTENANCE PROCEDURES

The SelectAmp contains no user-serviceable parts. To verify operation check the amplifier against the electrical specifications provided in Chapter 1. If the amplifier does not meet these specifications, return the defective unit to the address below for repair:

Technical Services
Andrew Corporation
2908 National Drive
Garland, Texas 75041
Telephone 972-864-6228
Fax 972-278-9379

To ensure the rapid repair and return of defective items, certain information must accompany any return. Please call the Andrew SciComm Technical Support Hot Line and request the Customer Return Instructions. The hot line is available, 8:00 a.m. to 5:00 p.m. CST, Monday through Friday, by calling (972) 864-6228.

3.2.7 Battery Back Up Option

The battery back up (BBU) provides emergency operating power in case of AC power loss. Under normal conditions, the BBU is charged by an internal charger. If AC power loss occurs, the BBU automatically comes on-line and this condition is reported to the status and control module. The BBU will power the SelectAmp for approximately two hours. The unit has been sized for back up capability over the full -40° to +60°C temperature range.

3.2.8 Mounting Kit Options

A mounting kit (Andrew P/N: EENCL-90004) is available for installing the unit on walls or poles. Installation instructions are included with the kit.

3.3 Programming

The amplifier and channel number are set by connecting a laptop computer with the supplied cable and adapter to the LOCAL port. Remote access is available by wireline connection to the RJ-11 port.

3.2.3.2 Upconverter

The upconverter board mixes the filtered 140 MHz IF with a signal from the synthesizer and outputs the same frequency that was input to the downconverter. Like the downconverter, each upconverter path consists of a mixer and two gain stages. 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 status and control module. The uplink and downlink frequencies are set with a computer that has Andrew designed frequency control software installed on it. This software is a Microsoft Windows application that allows the operator to input the desired RF frequency and gain setting. The frequency of the synthesizer is determined as follows:

$$\begin{aligned}\text{Uplink} &= 1710 \text{ MHz} + (50 \text{ KHz} \times N) \\ \text{Downlink} &= 1790 \text{ MHz} + (50 \text{ KHz} \times N) \\ \text{Where } N &= \text{Channel Number (0-1199)}\end{aligned}$$

The status and control 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 an in-line EMI filter, switching power supply, and interface cable. The power supply accepts a 90 to 264 VAC input and outputs +24 VDC for use by the rest of the amplifier. Power is distributed to the active modules through the interconnect board.

3.2.5 Status and Control Module

The status and control module includes a microprocessor to monitor module status, control LNA/Attenuator gain and Channelizer module channel settings. Nine pin D-subminiature connectors distribute power to, and return status from the modules. A 2400 baud modem is also included for remote monitoring by telephone wireline connected to an RJ-11 connector. The operator can control the unit locally from a PC RS-232 port connected to an RJ-45 connector on this board.

3.2.6 Power Amplifier Module

The power amplifier module provides 45 dB of gain for the amplifier. It's maximum output is 10 Watts CDMA. The module provides fault status, temperature fault, and output power level indications.

CHAPTER 3

FUNCTIONAL DESCRIPTION

3.1 OVERVIEW

The SelectAmp Channelized Amplifier accepts a broadband input in the 1850-1910 MHz uplink and 1930-1990 MHz downlink bands, and selectively passes one CDMA discrete channel in each band while rejecting the others. This is accomplished by downconverting the desired signals to a 140 MHz IF and using narrowband SAW filters to provide adjacent channel rejection.

3.2 FUNCTIONAL DESCRIPTION

Each path in the SelectAmp consists of four major modules: Diplexer, LNA/Attenuator, Channelizer, and Power Amplifier. Power is provided by a +24V power supply and by regulators in the Status and Control Module. Power distribution and status reporting is also provided by the Status and Control Module. Diplexing of the uplink and downlink signals is accomplished by diplexer filters tuned to the required PCS band (A/D, B/E, and F/C).

These modules perform the function of selecting one 1.25 MHz channel out of a predetermined PCS band for amplification.

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 uplink band, the other side for the downlink band. Insertion loss of each filter is 2 dB maximum and 65 dB minimum rejection to the opposite band.

3.2.2 LNA/Attenuator

The LNA/attenuator module contains three gain stages and a digitally controlled attenuator. The overall gain of each path can be adjusted between 65 and 95 dB.

3.2.3 Channelizer

The channelizer module contains three boards shielded by aluminum dividers. These three boards, which are described below, provide the channel selectivity for the SelectAmp. Channelizer module gain is 24 dB minimum.

3.2.3.1 Downconverter

The downconverter board consists of a mixer driven by a synthesizer, a SAW filter centered at 140 MHz with a 1.5 MHz, 3 dB bandwidth, and two gain stages. The DC current draw of each gain stage is monitored by a window comparator for status. The window comparator will indicate a fault, if the gain stage has an open or short failure. The output of the down converter is fed to the upconverter board.

CHAPTER 2

OPERATIONAL OVERVIEW

2.1 OVERVIEW

The SelectAmp channelized amplifier accepts a broadband input in the 1850 - 1910 uplink and 1930 - 1990 MHz downlink bands, and selectively passes one CDMA discrete channel in each band while rejecting the others. This is accomplished by downconverting the desired signals to a 140 MHz intermediate frequency and using narrowband SAW filters to provide adjacent channel rejection.

2.2 RF DISTRIBUTION

The amplifier contains two paths; forward for the base station, and reverse for the mobile signal. Each path includes a diplexer, low noise amplifier, channelizer, and power amplifier. The diplexers and channelizers determine the frequencies to be amplified.

2.3 POWER DISTRIBUTION

Main power for the amplifier is provided by a 12 amp power supply operating at +25 VDC. The power supply accepts 90 - 260 VAC inputs. The interconnect board distributes +25 volts, +5 volts, and -5 volts to the various modules.

2.4 CONTROL DISTRIBUTION

The operator has control over the gain and operating frequency of each path. Computer inputs for gain and channel settings are routed to each low noise amplifier and channelizer. The gain setting is a four bit word that sets gain from +2 to +32 dB. The channel setting is a three wire serial input to a synthesizer in each channelizer. Each module outputs a status message to indicate the overall condition of the active devices. If an active device fails, the module reports a fault.

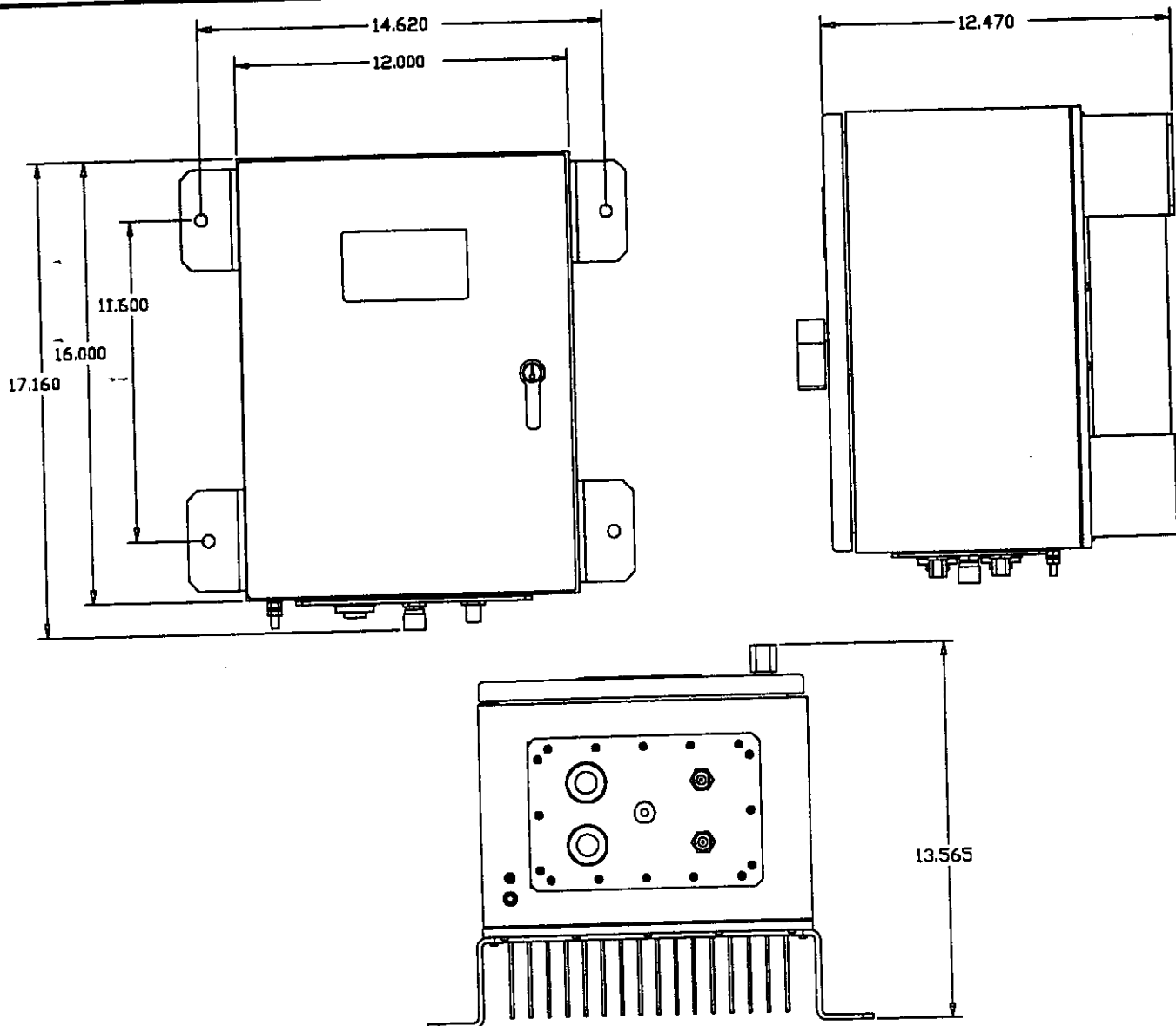


Figure 1-1 SelectAmp 1800 Outline Drawing

1.3 MECHANICAL SPECIFICATIONS

Table 1-2 below contains the mechanical specifications for the Band Selective Amplifier.

Table 1-2 Mechanical Specifications	
Parameters	Specification
Size	Amplifier: Height: 41 cm (16.3 inches). Width: 31 cm (12 inches). Depth: 31 cm (12 inches). (Excluding heatsinks, connectors, handles, and feet.)
Weight	Amplifier: 55 lbs (25 kg).
Mounting	Four holes spaced (295 x 371 mm) (11.6 x 14.62 inches). Hole diameter = 0.453 inches.
Power Connections	+ 24 VDC (seven meter cable supplied with unit).
RF Connections	Type N female.

1.4 ENVIRONMENTAL SPECIFICATIONS

Table 1-3 below contains the environmental specifications for the Band Selective Amplifier.

Table 1-3 Environmental Specifications	
Parameters	Specification
Temperature Range (Operating)	Operating: -40 to +60°C (Vertically mounted with unobstructed airflow.) Storage: -40° to +70°C.
Humidity Range (Operating)	Up to 90 percent non-condensing.
Environmental Protection	NEMA type 4 (IP 66).

1.5 TECHNICAL ASSISTANCE

Technical assistance on this or any other Andrew product is available 24 hours per day through:

Andrew Customer Service
 Telephone: 1-800-255-1479
 Fax: 1-708-349-5444

CHAPTER 1

DESCRIPTION

1.1 OVERVIEW

The SelectAmp CDMA1900-1H bi-directional channelized amplifier provides selective frequency amplification of user specified frequencies in the 1850 -1910 MHz Uplink and 1930 -1990 MHz Downlink PCS bands. This unit will selectively filter for one 1.25 MHz CDMA channel in the Uplink and Downlink band as determined by the operator. Frequency selection, gain adjustment and fault monitoring is accomplished with monitor and control circuitry and firmware.

Within this manual, "Uplink" refers to the RF signal path from the mobile unit to the base station (Donor Cell) and the "Downlink" refers to the RF signal path from the base station to the mobile unit.

1.2 ELECTRICAL SPECIFICATIONS

Table 1-1 below contains the electrical specifications for the Band Selective Amplifier.

Table 1-1 Electrical Specifications	
Parameters	Specification
Frequency Range	Uplink = 1850 - 1910 MHz. Downlink = 1930 - 1960 MHz.
AC Power Requirements	Three wire, 90 to 260 VAC @ 240 watts.
3 dB Bandwidth	1.5 MHz.
Filter Roll Off	40 dB @ 6 MHz BW tot. 50 dB @ 15 MHz BW tot.
Noise Figure	8 dB maximum.
RF Port Impedance	50 ohms nominal.
Maximum Input Signal Without damage	+10 dBm with no attenuation.
CDMA Power Output	10 Watts.
Spurious Emissions (Meets J-STD-008 @ 8 Watts channel power)	(Measured from filter center frequency). -45 dBc min @ $\pm$ 885 KHz. -13 dBm max @ $\pm$ 1.25 MHz and out
In-Band Spurious	-30 dBm or better at 80 dB gain.
Power Gain, Each Channel	65 to 95 dB, adjustable in 2 dB steps.
DC Power Requirements	+24 VDC $\pm$ 10 percent @ 10 amps typical.

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SAFETY SUMMARY

High voltage is used in the operation of this equipment. Death on contact may result if personnel fail to observe the following safety precautions:

- Do not be misled by the term "Low Voltage." Potentials as low as 50 volts may cause death under adverse conditions.
- Do not crush, puncture, disassemble, or otherwise mutilate batteries. Leaking batteries can cause serious damage to equipment and injury to personnel.
- Do not remove covers or access plates on the equipment unless you are authorized to do so.
- Do not work on electronic equipment unless there is another person nearby who is familiar with the operation of the equipment and is trained in administering first aid.
- Whenever possible, disconnect the equipment from the power source before beginning maintenance.
- To prevent electrical shock or damage to the equipment, do not operate it until you thoroughly understand the operation and function of all controls, indicators, and connectors.
- Turn off all power to the equipment before replacing any fuses.

FIRST AID

In case of electrical shock:

- Do not try to pull or grab the individual.
- If possible, turn off the electrical power.
- If you cannot turn off the electrical power, pull, push, or lift the person to safety using a dry wooden pole, a dry rope, or some other insulating material.
- Send for help as soon as possible.
- After the injured person is no longer in contact with the source of electrical shock, move the person a short distance away and immediately administer first aid and artificial resuscitation as required.

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:

Original O 21 Dec 1998

**TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 42
CONSISTING OF THE FOLLOWING:**

Page	Change No. (O = Original Page)
Title Page	O
List of Effective Pages (i)	O
Safety Summary (ii)	O
Table of Contents (iii - iv)	O
Chapter 1 (1-1 thru 1-5)	O
Chapter 2 (2-1)	O
Chapter 3 (3-1 thru 3-4)	O
Chapter 4 (4-1 thru 4-5)	O