

Cellular Specialties, Inc.

Model 110 Miniature In-Building Amplifier

Operation and Users Manual

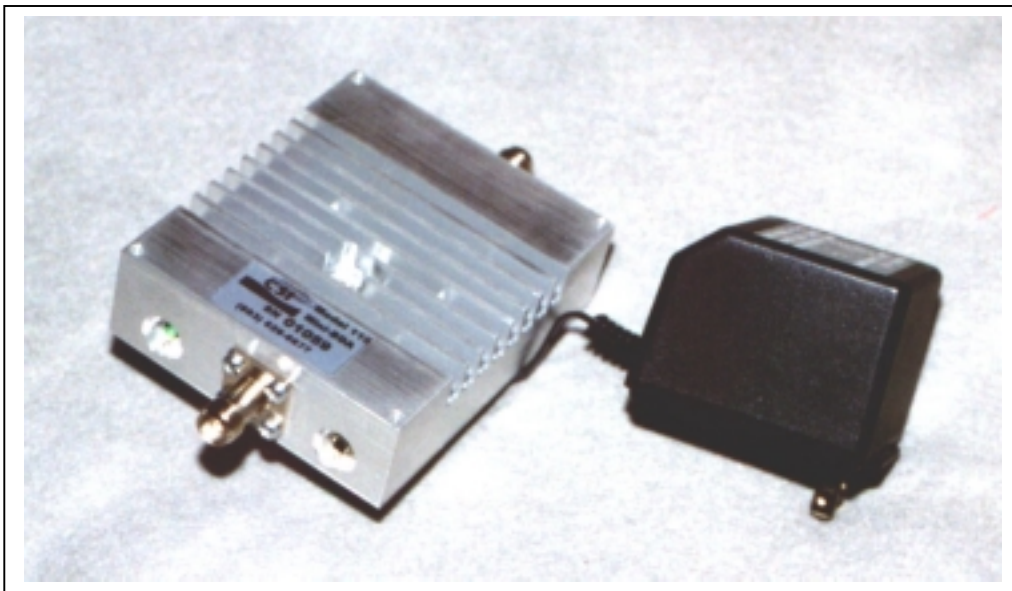


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1. Product Description

Background

The performance of a cell phone can be easily degraded when in enclosed structures where signals from a local cell site are not sufficient for reliable phone operation. The Model 110 Miniature In-Building Amplifier (Mini-IBA) was developed by Cellular Specialties, Inc. (CSI) to enhance cellular performance within these enclosed structures. Specifically, the Mini-IBA is designed to cover small areas such as home offices, small workshops, etc.

Functional Description

The Mini-IBA boosts the cellular performance by providing amplification of both transmit and receive signals. The unit receives the portable phone's signal through an inside antenna, amplifies it and then sends it to an outside antenna. This signal is referred to as the "Uplink". The Mini-IBA also receives signals from the Cell Site base station through the outside antenna. This signal is amplified and re-radiated to the portable phone and is referred to as the "Downlink". It is necessary that sufficient signal be available at the outside antenna.

The outside antenna is usually a directional type such as a "Yagi", however an Omni-directional antenna may be used when the structure is located in close proximity to one or more cell sites. Inside antennas are usually Omni-directional although other types, such as low profile wall or ceiling mount, may be used for special installations.

As shown in Figure 1, there are 2 stages of RF gain in both the Downlink and Uplink for maximum gains of 30 dB and 40 dB respectively. The maximum linear output power for the Uplink is 300 milli-Watts and 25 milli-Watts for the Downlink.

An LED indicator on the unit shows the application of power.

Circuit Description

Uplink

The uplink rf circuit consists of two stages of gain. Each gain stage is a monolithic integrated circuit (mmic) mounted to a printed circuit board (PCB). The signal received by the inside antenna is directed to the 1st mmic stage by a frequency diplexer, which separates the uplink frequency (806-824 MHz) from the downlink frequency (851-869MHz). This signal is amplified by both mmic stages and directed to an identical diplexer at the output of the 2nd stage. Both stages are biased for linear operation. The overall gain from the inside antenna terminal to the outside antenna terminal is nominally 40 dB. Each diplexer provides 60 dB of rejection between the uplink amplifier chain and the downlink.

Downlink

The downlink circuit is similar in operation to the uplink, in that it also uses two stages of mmic amplification. The major differences are the downlink frequency (851-869 MHz), the overall gain (30 dB) and signal flow in the opposite direction.

Power Supply

All the mmic amplification stages, in both the uplink and downlink, operate from a single supply voltage of +5 Vdc. A linear regulator is used to provide the 5 volts from an input of 12 Vdc. All internal dc circuits are filtered and de-coupled from the rf circuits. A 115 Vac to 12 Vdc “Wall” supply is provided as part of the unit. The overall current at 12 Vdc is less than 1.0 Amp.

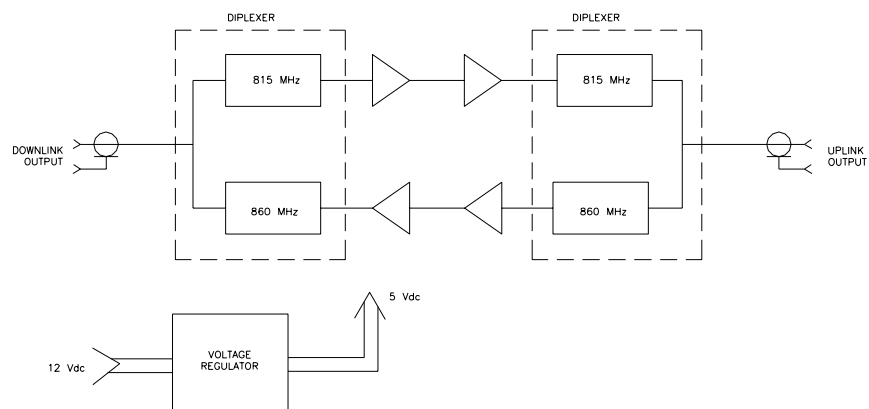


FIGURE 1 Functional Block Diagram

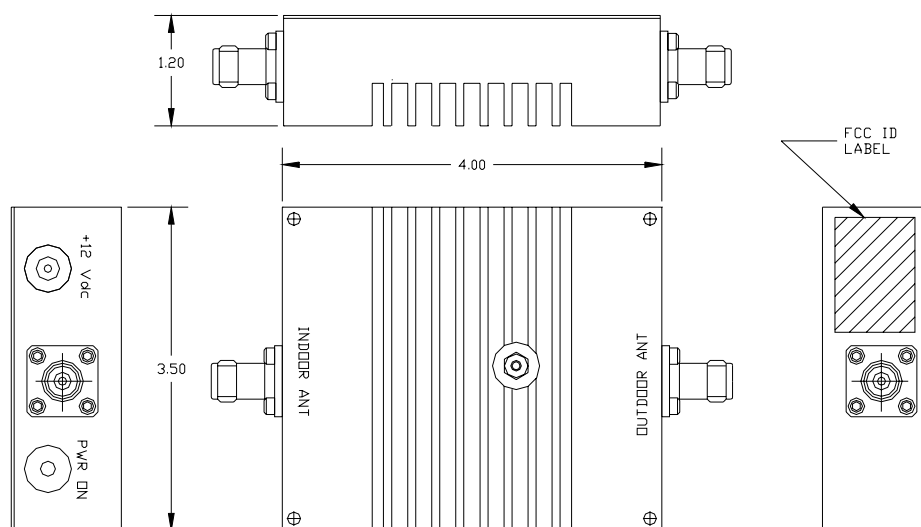


FIGURE 2 Outline Drawing

2. General Specifications

All specifications stated as typical unless otherwise noted. Cellular Specialties, Inc. reserves the right to change these specifications at any time without prior notice.

	Downlink	Uplink
Frequency Band	851-866 MHz	806-821 MHz
Linear Gain (dB)	25 min / 30 max	35 min / 40 max
Typical Power Out (max)		
1 dB Compression	+17 dBm	+27 dBm
Linear	+14 dBm	+25 dBm
Noise Figure	6 dB	6 dB
3 rd Order Intercept	+43 dBm	+27 dBm
Propagation Delay	<1 microsecond	<1 microsecond
VSWR	<2:1	<2:1
Passband Ripple (max)	2 dB pk-pk	2 dB pk-pk
Connectors	Mini-UHF	
Power Requirements	+12 Vdc, 1.0 A	
Dimensions	3.5"x4.0"x1.2"	
Weight	1 lbs.	
Indicator LED	"Power-On"	

3. Inspection and Installation

Inspection

Inspect the equipment as soon as possible after purchase. If any part of the equipment has been damaged in transit, report the damage to the transportation company and also to the company where purchased.

Contents

The unit package contains the following:

Model 110 Mini-IBA

Power Transformer, 110 volt to 12 volt – model number ()

User Manual

Optional Accessories

Accessories are available directly from Cellular Specialties, Inc. or any of CSI's distributors.

Outside High Gain Antenna – model number ()

Inside Omni Antenna – model number ()

Installation

Note:

The Installer should refer to the **Safety Precautions**, in the following section, for proper antenna selection and installation

The installation of the Mini-IBA is relatively simple. If possible, measurements of the Received Signal Strength Indicator (RSSI) should be recorded as close as possible to the proposed outside antenna location. Optimum performance will be obtained with RSSI readings greater than –85 dBm.

With the exact location of the outside antenna and the coordinates of the cell sites closest to the building in which the unit is being installed, the distance and bearings to each of the local cells can be determined. The first choice would be the closest site unless there is blockage in the form of buildings or terrain. If blockage exists, an alternate site may be available.

If coordinates are not available, measure the RSSI at the outside antenna output by connecting a phone to the outside antenna and slowly rotating the antenna until a maximum reading is obtained.

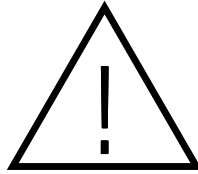
The Mini-IBA and inside antenna should be centrally located, keeping coaxial cable runs to a minimum. A maximum length of 100 feet of low loss cable is recommended. The actual coax used should be RG-8 type with a flame retardant rating as a minimum. If the coax is run through an area where heating and/or cooling air is channeled, a plenum rated coax should be used. When mounting the amplifier, take care to avoid areas of high heat or extreme cold. In general, do not place the unit on or near the top of high ceilings, by heaters or in cold storage areas.

During installation, care must be taken to provide the maximum isolation between inside and outside antennas. This isolation should be in the order of 70 dB to prevent any re-generative feedback in the system. Feedback of this nature may cause the amplifier to emit a continuous signal at maximum amplitude and could, in some cases, interfere with the normal operation of the cell site.

There are no installation or user adjustments or tuning on this unit.

Safety Precautions

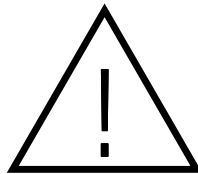
CAUTION



For INDOOR use, an Omni-Directional Antenna with a maximum gain of 3dBi is authorized for use with this unit.

Inside antennas must be positioned to observe minimum separation of 20 cm. (~ 8 in.) from all users and bystanders. For the protection of personnel working in the vicinity of inside (downlink) antennas, the following guidelines for minimum distances between the human body and the antenna must be observed.

The installation of an INDOOR antenna must be such that, under normal conditions, all personnel cannot come within 20 cm. (~ 8.0 in.) from any inside antenna. Exceeding this minimum separation will ensure that the employee or bystander does not receive RF-exposure beyond the Maximum Permissible Exposure according to section 1.1310 i.e. limits for General Population/Uncontrolled Exposure.



For OUTDOOR use, a Directional Antenna up to a maximum gain of 11dBd is authorized for use with this unit.

The Outside antenna must be positioned to observe minimum separation of 120 cm. (~ 4 ft.) from all users and bystanders. For the protection of personnel working in the vicinity of outside (uplink) antennas, the following guidelines for minimum distances between the human body and the antenna must be observed.

The installation of an OUTDOOR antenna must be such that, under normal conditions, all personnel cannot come within 120 cm. (~ 4 ft.) from the outside antenna. In all installations, the antenna should never be mounted such that the main beam is directed toward an area where workers or bystanders may be present. Exceeding this minimum separation will ensure that the worker or bystander does not receive RF-exposure beyond the Maximum Permissible Exposure according to section 1.1310 i.e. limits for General Population/Uncontrolled Exposure.