

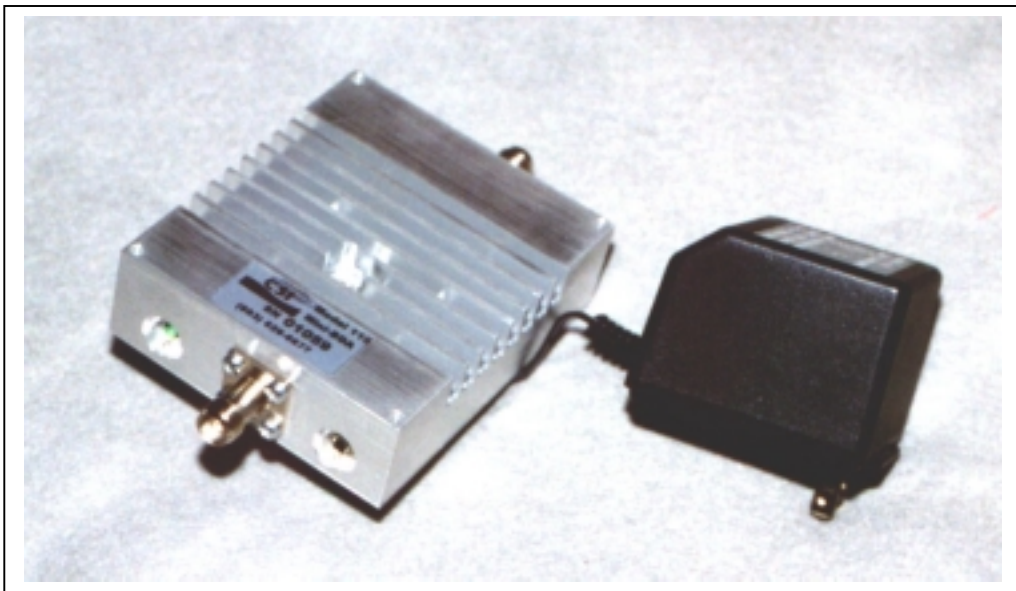
Cellular Specialties, Inc.

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## Model 110 Miniature In-Building Amplifier

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### 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 interior 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 external antenna.

The external 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. Internal 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 three stages of gain in the Downlink and 2 stages in the Uplink for a nominal gain of 40 dB in each link. The maximum linear output power for the Uplink is 500 milli-Watts and 30 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 1<sup>st</sup> 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 2<sup>nd</sup> 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.

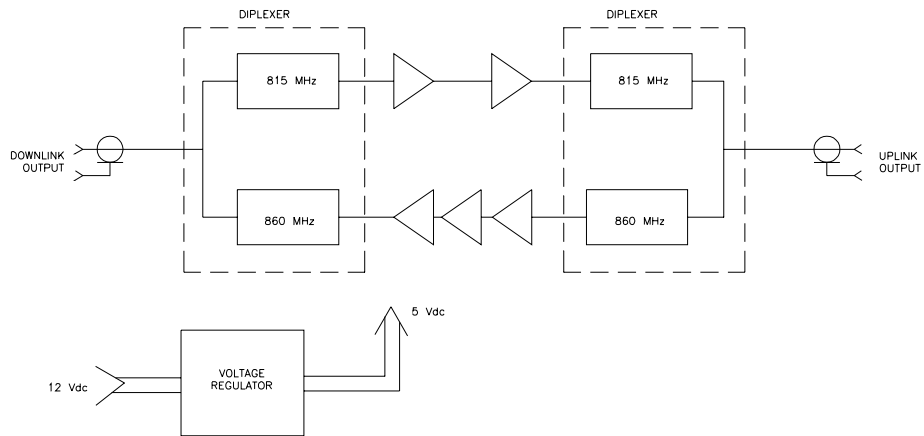


FIGURE 1 Functional Block Diagram

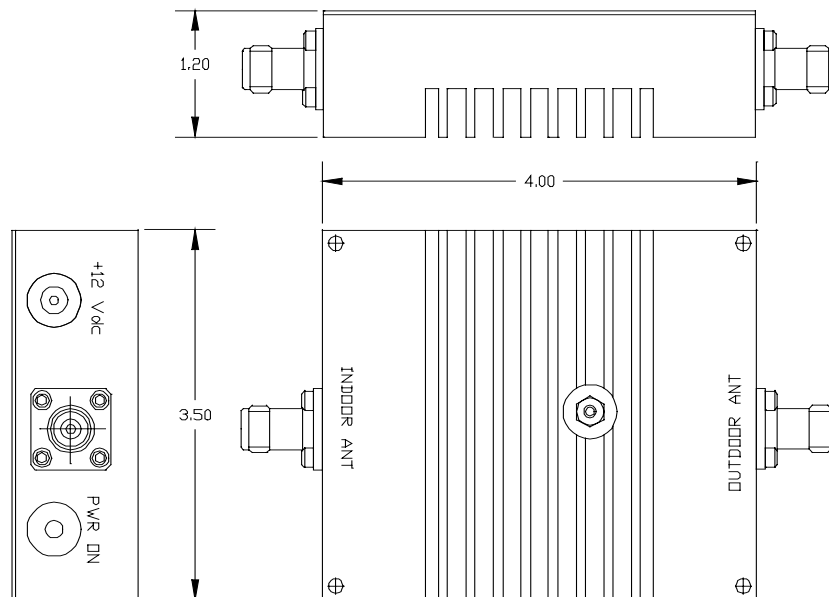


FIGURE 2 Outline Drawing

## 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                  | 850-870 MHz    | 806-824 MHz    |
| Gain                            | 40 dB          | 40 dB          |
| Typical Power Out               | +28 dBm        | +15 dBm        |
| Noise Figure                    | 6 dB           | 6 dB           |
| 3 <sup>rd</sup> 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              | +6 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 6 volt – model number (      )

User Manual

#### ***Optional Accessories***

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

Exterior High Gain Antenna – model number (      )

Exterior Omni Antenna – model number (      )

Interior Omni Antenna – model number (      )

Power Cable w/cigarette lighter adapter – model number (      )

#### ***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 exterior antenna location. Optimum performance will be obtained with RSSI readings greater than –85 dBm.

With the exact location of the exterior 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 external antenna output by connecting a phone to the external antenna and slowly rotating the antenna until a maximum reading is obtained.

The Mini-IBA and interior 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 interior and exterior 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.

## CAUTION



Inside antennas should be positioned to observe minimum separation of 2.3 cm. (~ 1.0 in.) from any workstation. Personnel working in the vicinity of inside (downlink) antennas should observe the following guidelines for minimum distances between the human body and the antenna when establishing the position of new workstations.

The placement of a workstation must be in excess of 2.3 cm. (~ 1.0 in.) from any interior antenna. Exceeding this minimum separation will ensure that the employee does not receive RF-exposure beyond that Maximum Permissible Exposure according to section 1.1310 i.e. limits for General Population/Uncontrolled Exposure.