

EXHIBIT E

Paragraph 2.983(d)(8)

Instruction Manual



Retlif Testing Laboratories

Test Report Number No. R-3244N
FCC ID: NVRCSI210-01

Instruction Manual for Model 110 In-Building Amplifier

Introduction

Cellular Specialties, Inc. developed the Model 110 In-Building Amplifier (IBA) for use in enclosed structures where sufficient signal from local cell sites to operate cell phones was unavailable within the building. It is, of course, necessary that sufficient signal be available on the roof of the structure. The IBA is connected to an external antenna, usually on the roof, and to one or more internal antennas placed strategically throughout the area where phone service is desired.

The external antenna is usually a directional type such as a "yagi" however an omni-directional antenna may be used when the building is located in close proximity to a cell site. Internal antennas are usually omni-directional although various other types may be used for certain installations. The IBA amplifies both the "uplink" and "downlink" signals thus facilitating communications to and from the local cell site.

Installation

Pre-installation Survey

A pre-installation survey shall be performed prior to commitment to installation. Measurement of Received Signal Strength Indication (RSSI) should be recorded throughout the building in all areas where cell phone coverage is desired. RSSI levels around the exterior of the building as well as on the roof top or as close to the point where the exterior antenna will be installed should also be recorded. RSSI readings at the position where the outside antenna will be installed should be greater than -90 dBm. Successful installations may be made with lower readings in some cases.

The exact location of the proposed outside antenna should be measured with a GPS unit and the coordinates of the cell sites closest to the building in which the system is being installed should be obtained. With these coordinates the distance and bearing to each of the local cell sites can be computed and made available to the installation team. The first choice should be the closest site unless there is blockage in the form of buildings or terrain between the building and this cell site. If blockage exists an alternate site may be available.

The location of the IBA and the interior antennas should be determined through the use of floor plans of the building in which the antenna is to be installed. It is important to locate the IBA at a central location and try to keep the coax runs from the amplifier to the antennas as short as possible. A maximum length of 200 feet is suggested although longer runs might be accommodated. This assumes that a coax with loss at 800 MHz of approximately 3.5 dB per 100 feet is used. The coax used should be a nominal RG-8 with

a fire retardant rating except when installed in space where moving air (heating and/or cooling) exists. In which case the coax must be "plenum" rated. Of primary concern is the isolation between the outside antenna and the inside antennas. **Important note: A high degree of isolation must be afforded in order to prevent any re-generative feedback in the system. Feedback of this nature causes the amplifier to emit a continuous signal of maximum amplitude and will in some cases interfere with normal operation of the cell site. This isolation should be in the order of 70 dB and is usually obtained by mounting the outside antenna away from the edges of the roof. The use of windows mounts or other non-rooftop mountings should be avoided.**

Physical Installation

The coaxial cable discussed above should be pulled from the rooftop location to the space designated for the amplifier installation. Additional coax should be pulled from the amplifier to the where power splitters are located and thus to the position designated for the omni-directional antennas. Usually this is accomplished by using existing cableways and running the cable above suspended ceilings. In many cases the omni-directional antennas can be located above the suspended ceilings however when this is not possible alternatives such as ceiling or wall mounted antennas may be used.

Amplifier Adjustments

In most cases the IBA will need very little adjustment. After connecting the coax and powering up the IBA the signal levels within the previously surveyed areas should be checked for adequate RSSI and Signal Quality Equivalent (SQE) levels. Measurements should be made at the perimeter of the building both inside and outside. It is important that the RSSI levels measured outside the building remain close to those measured prior to installation of the IBA. If communication with the cell phones are not possible in areas remote from the interior antennas then the gain of the uplink and/or the downlink may be increased by turning the gain controls of these links clockwise. If unsatisfactory cell phone performance is obtained when the phone is in close proximity to the interior antenna it may be necessary to decrease the gain of the links by turning the gain controls counter-clockwise. It is important to adjust the gain controls by approximately the same amount in each instance to preserve the link balance of the overall system.

Troubleshooting

All cables should be carefully checked for "shorts" and "opens". The rooftop antenna, if directional, should be checked for proper alignment along the proper calculated azimuth. If cables and alignment are O.K. it may be necessary to use a spectrum analyzer to examine the signal environment in which the IBA is operating. The existence of strong analog signals within the frequency bands can cause problems particularly on the downlink. In some cases additional filtering might be required to reject these unwanted signals. There may be some cases where the interference from outside signals is so great that they can not be filtered or otherwise reduced or eliminated without expensive and

possibly prohibitive measures. In these cases it may not be practical to use the IBA for providing coverage at these sites.

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