

**FCC PART 22 TYPE APPROVAL
USER MANUAL
FOR
CELLULAR SPECIALTIES, INC.**

670 N. Commercial St.
Manchester NH 03101

FCC ID: NVRCSI310-04

February 4, 2000

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Amplifier
Test Engineer: John Chan	
Test Date: January 24, 2000	
Reviewed By: John Y. Chan – Engineering Manager	
Prepared By: Bay Area Compliance Laboratory Corporation 230 Commercial Street, Suite 2 Sunnyvale, CA 94086 (408) 732-9162	

Note: This report may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

TABLE OF CONTENTS

1 - GENERAL INFORMATION..... 3

- 1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)..... 3
- 1.2 OBJECTIVE 3
- 1.3 RELATED SUBMITTAL(S)/GRANT(S) 3
- 1.4 TEST METHODOLOGY..... 3
- 1.5 TEST FACILITY 4
- 1.6 TEST EQUIPMENT LIST 4
- 1.7 EQUIPMENT UNDER TEST (EUT)..... 5
- 1.8 SUPPORT EQUIPMENT 5
- 1.9 EUT CONFIGURATION DETAILS AND LIST 5
- 1.10 EXTERNAL I/O CABLING..... 5

2 - SYSTEM TEST CONFIGURATION..... 6

- 2.1 JUSTIFICATION 6
- 2.2 BLOCK DIAGRAM 6
- 2.3 TEST SETUP BLOCK DIAGRAM 7
- 2.4 EQUIPMENT MODIFICATIONS 8

APPENDIX A – AGENCY AUTHORIZATION LETTER..... 9

APPENDIX B – USER MANUAL..... 11

1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Cellular Specialties, Inc.*, FCC ID *NVRC SI310-04 (AMPLIFIER)* or the "EUT" as referred to in this report is a device using in enclosed structures where sufficient signal from local cell sites to operate cell phones was unavailable within the building. The device 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 EUT measures 10" L x 12" W x 3.5" H.

1.2 Objective

This type approval report is prepared on behalf of *Cellular Specialties, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and B, and Part 22 Subpart H, of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for output power, 20 dB bandwidth, occupied bandwidth, spurious emission at antenna terminal, two-tone test, conducted and radiated margin.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Suite 2, Sunnyvale, California, USA.

Test sites at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-674 and R-657. The test sites has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1993, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Data
HP	Spectrum Analyzer	8566B	2610A02165	12/6/00
HP	Spectrum Analyzer	8593B	2919A00242	12/20/00
HP	Amplifier	8349B	2644A02662	12/20/00
HP	Quasi-Peak Adapter	85650A	917059	12/6/00
HP	Amplifier	8447E	1937A01046	12/6/00
A.H. System	Horn Antenna	SAS0200/571	261	12/27/00
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/00
Com-Power	Biconical Antenna	AB-100	14012	11/2/00
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/00
Com-Power	LISN	LI-200	12208	12/20/00
Com-Power	LISN	LI-200	12005	12/20/00
BACL	Data Entry Software	DES1	0001	12/20/00
Rohde & Schwarz	Signal Generator	SMIQ03B	1125.5555.03	7/10/2002
Rohde & Schwarz	I/Q Modulation Generator	AMIQ	1110.2003.02	8/10/2002

1.7 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCC ID
Cellular Specialties, Inc.	Amplifier	310 AMPS	None	NVRC SI310-04

1.8 Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
Rohde & Schwarz	Signal Generator	SMIQ03B	1125.5555.03	Doc
Rohde & Schwarz	I/Q Modulation Generator	AMIQ	1110.2003.02	Doc

1.9 EUT Configuration Details and List

NOT APPLICABLE

1.10 External I/O Cabling

Cable Description	Length (M)	Port/From	To
Shielded BNC Cable	2.0	Rohde & Schwarz	EUT

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

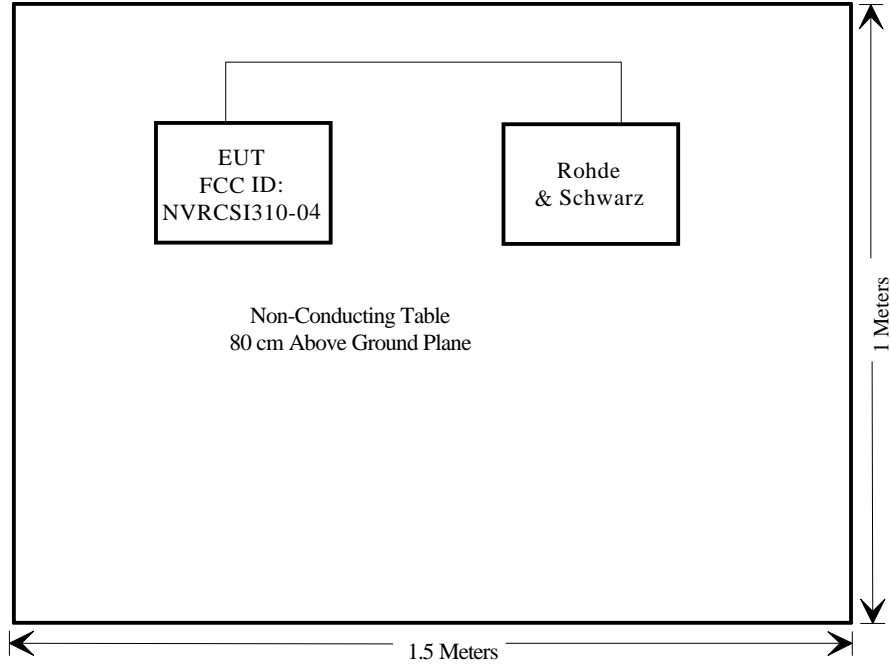
The EUT was configured for testing in a typical fashion (as normally used in a typical application).

The final qualification test was performed with the EUT operating at normal mode.

2.2 Block Diagram

Appendix A contains a copy of the EUT's block diagram as reference.

2.3 Test Setup Block Diagram



2.4 Equipment Modifications

No modifications were necessary for the EUT to comply.

Appendix A – AGENCY AUTHORIZATION LETTER



Cellular Specialties 670 N. Commercial St. Manchester NH 03101
Ph: 603-626-6677 Fax: 603-626-6042

17 January 2000

FEDERAL COMMUNICATIONS COMMISSIONS
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Subject: Agent Authorization

To whom it may concern:

Cellular Specialties, Inc. hereby authorizes Bay Area Compliance Laboratory Corporation to act on its behalf in all matters relating to application for equipment authorization, including the signing of all documents relating to these matters. All acts carried out by Bay Area Compliance Laboratory Corporation on our behalf shall have the same effect as our own action.

Sincerely,

A handwritten signature in cursive script, appearing to read "Fred Goodrich".

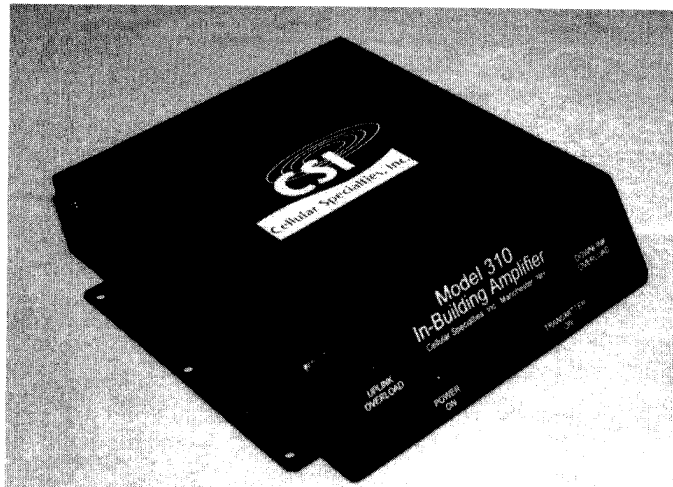
Fred Goodrich, President
Cellular Specialties, Inc.

APPENDIX B – USER MANUAL

Cellular Specialties, Inc.

Model 310_{ATPS} In-Building Amplifier

Installation and Users Manual



The serial number may be found on the label on the rear panel of the unit. For your convenience, note this number below, and retain this manual, along with proof of purchase, to serve as a permanent record of your purchase in the event of a theft, or for future reference.

MODEL NUMBER

DATE OF PURCHASE

SERIAL NUMBER

NAME OF COMPANY

**FCC ID NVRCSI310-04**

This device complies with part 22 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and this device must accept any interference that may cause undesired operation.

DISCLAIMER

All information and statements contained herein are accurate to the best of the knowledge of Cellular Specialties, but Cellular Specialties makes no warranty with respect thereto, including without limitation any results which may be obtained from the products described herein or the infringement by such products of any proprietary rights of any persons. Use or application of such information or statements is at the user's sole risk, without any liability on the part of Cellular

Specialties, Inc. Nothing herein shall be construed as license or of recommendation for use, which infringes upon any proprietary rights of any person. Product material and specifications are subject to change without notice. All sales of the product or products described herein are subject to Cellular Specialties' standard terms of sale and the specific terms of any particular sale.

TABLE OF CONTENTS

1.0 SAFETY GUIDELINES	3
2.0 PRODUCT DESCRIPTION	4
MECHANICAL OUTLINE DRAWING	5
3.0 GENERAL SPECIFICATIONS	6
4.0 INSTALLATION	7
5.0 AMPLIFIER ADJUSTMENT	9
6.0 TROUBLESHOOTING	10

MANUAL310AMPS REV -

1.0**SAFETY GUIDELINES**

The general safety information in this guideline applies to both operation and service personnel. Specific warnings and cautions will be found in other parts of this manual where they apply, but may not appear in this summary. Failure to comply with these precautions or specific warnings elsewhere in the manual violates safety standards of design, manufacture, and intended use of equipment. Cellular Specialties, Inc. assumes no liability for the customer's failure to comply with these requirements.

➤ GROUNDING

This amplifier system is designed to operate from single-phase 120VAC power and should always be operated with both the neutral and ground wires properly connected. Do not remove or otherwise alter the grounding lug on the power cord.

➤ EXPLOSIVE ATMOSPHERES

This product has an integral circuit breaker, which may cause an electrical flash if the breaker should reset. To avoid explosion or fire, do not operate this product in the presence of flammable gases or fumes.

➤ LIGHTNING DANGER

Do not install or make adjustments to this unit during an electrical storm.

➤ NO USER SERVICEABLE PARTS INSIDE

MANUAL310AMPS REV -

HAZARDOUS VOLTAGES ARE PRESENT WHEN THE COVER IS REMOVED. Opening the chassis will void your warranty. If you suspect a malfunction with this product, call your dealer or the Cellular Specialties Support Line at (603) 626-6677.

2.0

PRODUCT DESCRIPTION

Cellular Specialties, Inc. developed the Model 310_{amps} 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 one or more cell sites. Internal antennas are usually omni-directional although various other types may be used for certain installations. The IBA amplifies both the "uplink" (phone to tower) and "downlink" (tower to phone) signals thus facilitating communications to and from the local cell site

There are four amplification stages on the downlink and four on the uplink for a total of +57dB nominal gain for each link. (see Figure 2.1) Both links have manual gain control settings accessed through DIP switches on the back panel plus an AGC control for both the uplink and downlink. There are LED indicators on the front panel for power on, transmitter on, uplink overload and downlink overload.

An automatic amplifier safety shutdown circuit is also present which will disable the transmitters for ten seconds should the uplink and downlink overloads be reached simultaneously to prevent excessive intermodulation and oscillation.

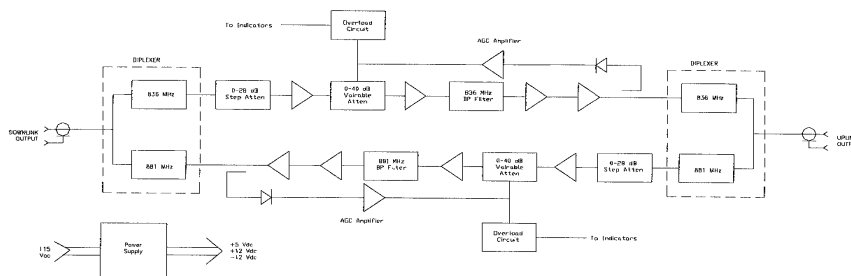


FIGURE 2.1 Functional Block Diagram

MANUAL310AMPS REV -

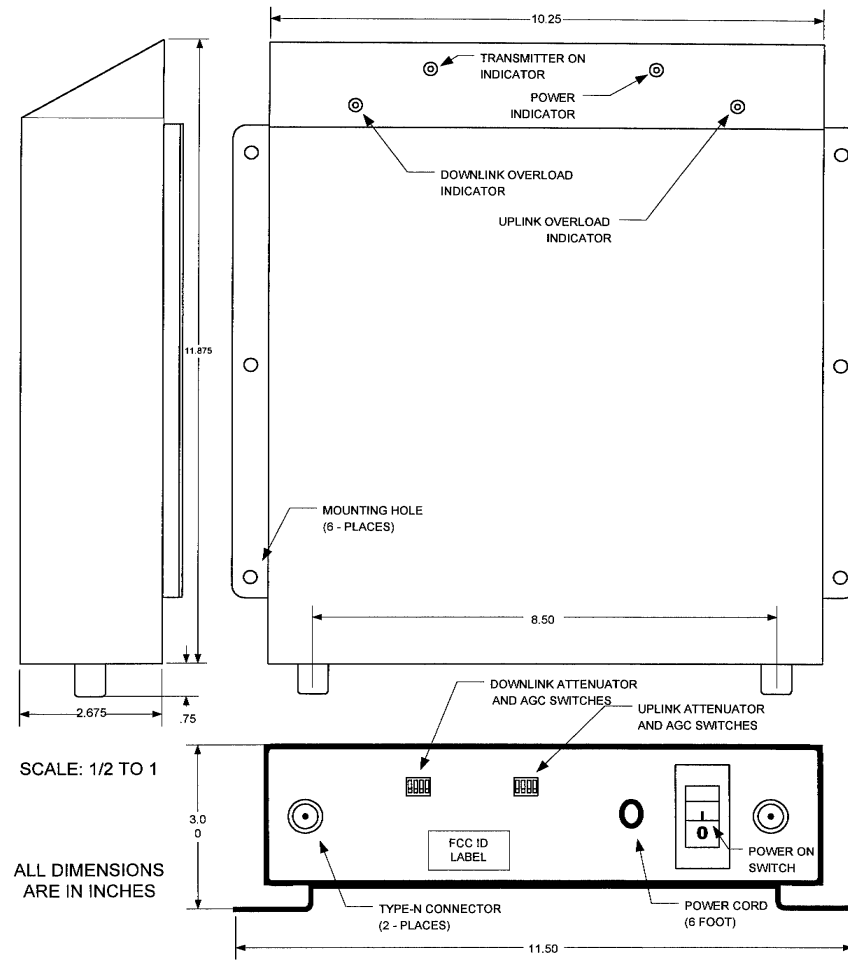


FIGURE 2.2 Model 310 Mechanical Outline Drawing

MANUAL310AMPS REV -

3.0

GENERAL SPECIFICATIONS

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

	Uplink (Phone to Tower)	Downlink (Tower to Phone)
Frequency	824-849MHz	869-894MHz
Pass Band Ripple	±1.5dB	±1.5dB
Gain @ Zero Attenuation	+57dB+3dB	+57dB+3dB
Gain Adjustment Range	-28dB	-28dB
Power Output, (max).		
1dB Compression	+27 dBm	+27 dBm
Linear	+25 dBm	+25 dBm
Noise Figure, Typ.	+6dB	+6dB
3rd Order Intercept Point, IP3	+43dBm	+43dBm
Maximum Input Power	-10dBm	-10dBm
VSWR	2.0:1 Max	
Propagation Delay	<1.0 microsecond	
Impedance	50 Ohms	
Connectors	'N' Female	
Power Requirements	120 VAC @ 500mA	
Size	12" x 10" x 3"	
Weight	6½ Lbs., 3 kg	
Operating Temperature	-22 to +118°F, -30 to +48°C	
Indicator LEDs	Power, Transmitter On, Uplink Overload, Downlink Overload	
Controls	Power switch with circuit breaker, AGC override switch, switches for Uplink and Downlink attenuation from 0-28dB in four dB steps.	

MANUAL310AMPS REV -

4.0**INSTALLATION****Pre-installation Survey****Note:**

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

A pre-installation survey should 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 rooftop 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. (E.g. -85dBm) Successful installations may be made with lower readings in some cases.

**WARNING!**

AMPLIFIER DAMAGE **WILL** OCCUR IF A HANDSET IS CONNECTED DIRECTLY TO THE IBA OR THE COAX THAT LEADS TO THE IBA.

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.

If GPS coordinates are not available there is an alternative method of locating the dominant site: connect a handset via SMA female to N male adapter to the directional donor antenna. Rotate the antenna until maximum RSSI and SQE readings are obtained and secure it.

The location of the IBA and the interior antennas should be determined through the use of floor plans of the building in which the system 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 150 feet is suggested although longer runs might be accommodated. This assumes that a coax with loss at

MANUAL310AMPS REV -

800 MHz of approximately 3.5 dB per 100 feet is used. The coax used should be a nominal RG-8 type with a flame retardant rating except when installed in space where moving air (heating and/or cooling) exists. In which case the coax must be "plenum" rated. For long runs that exceed 150 feet, the use of low loss 1/2" coax is desirable. 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 could, 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 window mounts or other non-rooftop mountings should be avoided.

SAFETY PRECAUTIONS



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.

MANUAL310AMPS REV -



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.

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 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.

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.

MANUAL310AMPS REV -

5.0**AMPLIFIER ADJUSTMENT**

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.

Both the uplink and downlink overload indicators should remain off. If either indicator is illuminated, the gain of the appropriate link should be reduced.

If the gain of the amplifier needs adjustment the uplink and the downlink may be adjusted by means of the step attenuators on the rear of the unit. Attenuation from 0 dB to 28 dB in steps of 4 dB may be inserted by proper selection of the 4, 8 and 16 dB attenuators. If satisfactory cell (or two-way) phone performance is not obtained when the phone is in close proximity to the interior antenna it may be necessary to decrease the gain of one or both of the links.

6.0**TROUBLESHOOTING**

All external cables should be carefully checked for “shorts” and “opens”.

The rooftop antenna, if directional, should be checked for proper alignment along the calculated compass heading. Typically, the directional antenna should be aimed at the same sight that your handset uses in the area where the outside antenna is to be placed.

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. Automatic Gain Control (AGC) may be switched on by moving the leftmost dip switch to the on (down) position. In some instances the directional outside antenna can be reoriented, horizontally to place the interfering source in an antenna pattern “null”. There also 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.

**Evaluation of the CSI Model 310_{amps} BDA
For
Compliance with FCC Guidelines
For Human Exposure to Radio Frequency
Electromagnetic Fields**

5 January 2000

General

The CSI Model 310_{amps} Bi-directional amplifier is considered to be a “mobile” device operating in the Specialized Mobile Radio Service authorized under subpart H of part 22 and part 90. As such, the equipment is required to be evaluated for RF exposure if operated below 1.5 GHz with an effective radiated power (ERP) of 1.5 watts or more, as defined in 2.1091 of FCC rules.

Downlink

For the downlink portion of the Model 310_{amps} BDA, the maximum rated output power is +27dBm (500 mW). As stated in the Model 310_{amps} Manual, the maximum authorized antenna gain is 3 dBi, corresponding to a typical Omni-Directional antenna. Neglecting cable losses, the worst-case EIRP will be 1.00 watts or an ERP of 0.61 watts, (ERP=EIRP/1.64). This is well below the 1.5 watts and therefore excludes the downlink from routine evaluation. The Cautions in the Model 310_{amps} manual clearly define the antenna selection and installation criteria in order to maintain a minimum 20-centimeter separation.

Uplink

For the uplink portion of the BDA the maximum rated output power is +27 dBm (500 mW). With an authorized maximum antenna gain of 11 dBd, the worst-case ERP is 6.3 watts, neglecting cable losses between the antenna and BDA. Under these conditions the unit must be evaluated for minimum separation distances in order to comply with the Exposure limits of 1.1310 of the FCC rules.

Using the guidelines in FCC OET Bulletin 65 and Supplement C, the power density at a reasonable distance from the maximum gain antenna was calculated. The minimum safe distance was also determined based on the uncontrolled exposure limits defined in Table 1B of FCC rules 1.1311. The following assumptions are made concerning these calculations:

- Po = 500 mW average
- Cable Loss = 0 dB
- Ant Gain = 11 dBd (13.2 dBi)
- Frequency = 815 MHz ± 10 MHz
- Main Beam (worst-case)
- Rooftop 100% reflection
- Reasonable Distance = 4 feet (120 cm)

Therefore, from OET Bulletin 65,

$$S = (PG)/4\pi R^2 \quad \text{or} \quad S = \text{EIRP}/4\pi R^2$$

For 100% reflection, a doubling of the field strength can be expected. The above equation can be modified to,

$$S = (2)^2 PG/4\pi R^2 = \text{EIRP}/\pi R^2$$

Solving for S at a distance of 4 feet (120 cm) gives,

$$S = (500) (20.9) / \pi (120)^2 = \boxed{0.23 \text{ mw/cm}^2}$$

From FCC rules 1.1311, Table 1B, the allowable limit for uncontrolled exposure is $f(\text{MHz}) / 1500$. At 815 MHz this corresponds to a level of 0.54 mw/cm^2 .

The calculated value of 0.23 is below the limit of 0.54 thereby showing compliance under worst-case operating conditions.

When the above equation is solved for minimum separation at the exposure limit,

$$R = \sqrt{(500) (20.9) / \pi (0.54)} = 78 \text{ cm (2.6 feet)}.$$

As in the case of the downlink, the Cautions in the Model 310_{amps} manual clearly define the antenna selection and installation criteria in order to maintain a conservative 4-foot separation.

Model 310_{amps} Functional Description

The Model 310 In-Building Amplifier is intended for use in enclosed structures where sufficient signal from local cell sites to operate cell phones is unavailable within the building. The amplifier 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 one or more cell sites. 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

There are four amplification stages on the downlink and four on the uplink for a total +55 dB gain for each link. Both links have manual gain control settings accessed through DIP switches on the back panel plus an AGC control for both the uplink and downlink. There are LED indicators on the front panel for power on, transmitter on, uplink overload and downlink overload.

An automatic amplifier safety shutdown circuit is also present, which will disable the transmitters for ten seconds should the uplink and downlink overloads be reached simultaneously, to prevent excessive intermodulation and oscillation.

MODEL 310 BDA POWER PER CHANNEL

Channels	UpLink dBm	DownLink dBm
1	25.0	25.0
2	21.0	21.0
3	18.7	18.7
4	17.0	17.0
5	15.7	15.7
6	14.7	14.7
7	13.8	13.8
8	13.0	13.0
9	12.3	12.3
10	11.7	11.7
11	11.2	11.2
12	10.7	10.7
13	10.2	10.2
14	9.8	9.8
15	9.4	9.4
16	9.0	9.0
17	8.6	8.6
18	8.3	8.3
19	8.0	8.0
20	7.7	7.7

Power per Channel-rev A

1/7/00