INSTALLATION
AND
OPERATING MANUAL

FOR

BDA-PCS/X-1/1W-XX-B

BI-DIRECTIONAL AMPLIFIER

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BDA OVERVIEW:

The BDA assembly extends the coverage area of radio communications in buildings and RF shielded environments.
The unit features low noise figure and wide dynamic range. It is based on a duplexed path configuration with sharp out of band attenuation allowing improved isolation between the receiving and transmitting paths.

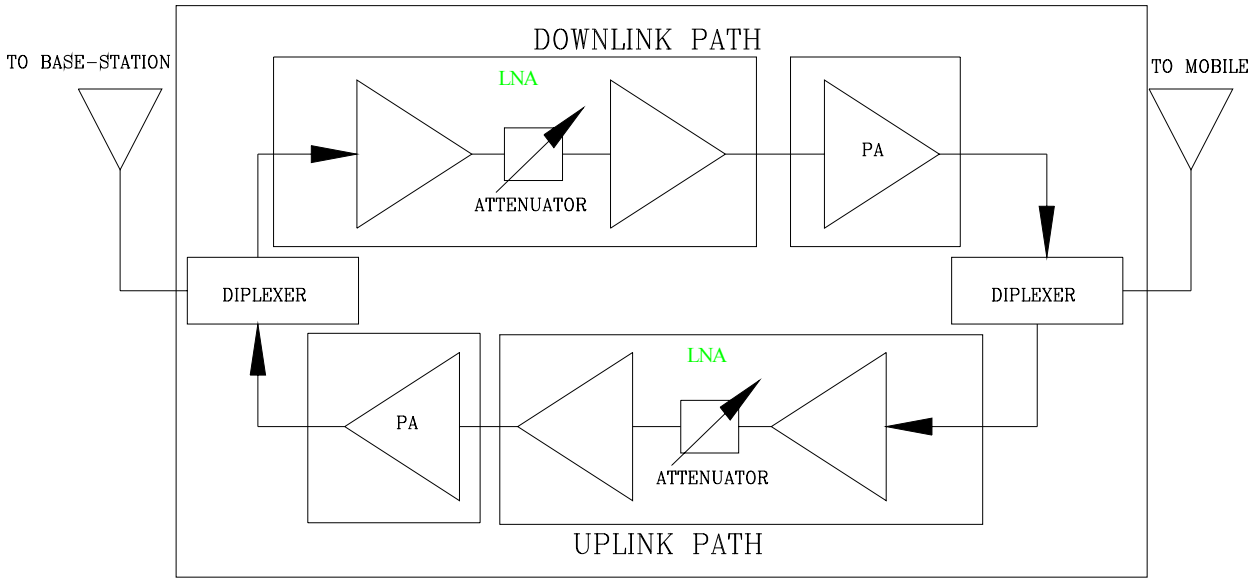
BDA BLOCK DIAGRAM DESCRIPTION:

Refer to figure 1 for the following discussion.

The BDA Downlink path receives RF signals from the base station and amplifies and transmits them to the subscriber. The BDA Uplink path receives RF signals from the subscriber and amplifies and transmits them to the base station. The Uplink and Downlink occupy two distinct frequency bands. For example, the PCS A frequency bands are as follows: *1850-1865 MHz for the Uplink and 1930-1945 MHz for the Downlink.* Two diplexers isolate the paths and route each signal to the proper amplifying channel.

A selectable Automatic Level Control (ALC) allows for output power limiting. A variable step attenuator provides 30 dB of attenuation in 2 dB steps. The use of these controls is covered in the “OPERATION” section, later in this document.

Figure 1



BLOCK DIAGRAM

ELECTRICAL SPECIFICATIONS:

Frequency Range	: See Table 1
Pass band Gain @ min attenuation	: 65 dB or 80 dB minimum
Variable Step Attenuator Range (2-dB steps)	: 0-30 dB
Pass band Ripple	: ±1.5 dB typical
Noise Figure @+25°C at max gain	: 5.0 dB max
3rd Order Intercept point	
Uplink	: +45 dBm typical
Downlink	: +45 dBm typical
Output Power @ 1dB Compression	
Uplink	: +32 dBm (typ)
Downlink	: +32 dBm (typ)
Isolation between Up/Down Link	: 80 dB min
Input/ Output Impedance	: 50 Ohms
VSWR (Input/Output)	: 1.5: 1 max
Power Supply	: 110VAC/0.67Amp : 240VAC/0.34 Amp : 50 to 60 Hz

Table 1

Frequency Band	Downlink Frequency Ranges	Uplink Frequency Ranges
PCS A	1930-1945 MHz	1850-1865 MHz
PCS B	1950-1965 MHz	1870-1885 MHz
PCS C	1975-1990 MHz	1895-1910 MHz
PCS C-1	1982.5-1990 MHz	1902.5-1910 MHz
PCS C-2	1975-1982.5 MHz	1895-1902.5 MHz
PCS C-3	1975-1980 MHz	1895-1900 MHz
PCS C-4	1980-1985 MHz	1900-1905 MHz
PCS C-5	1985-1990 MHz	1905-1910 MHZ
PCS D	1945-1950 MHz	1865-1870 MHz
PCS E	1965-1970 MHz	1885-1890 MHz
PCS F	1970-1975 MHz	1890-1895 MHz

MECHANICAL SPECIFICATIONS:

Size	: 11.2 x 9.7 x 6.0 inch : (284.5 x 246.4 x 152.4 mm)
RF Connectors	: N-type Female
Weight	: 13.5 Lbs. (6.2kg.) approx.

ENVIRONMENTAL CONDITIONS:

The unit is designed for indoor applications:

Operating temperature: - 20°C to + 50°C

Storage temperature: - 50°C to + 90°C

BDA CONNECTIONS

The BDA AC power is accepted through a standard 3-wire male plug (IEC-320) with phase, neutral and ground leads. The AC power is wired to a high efficiency DC switching power supply which is CE and UL approved. The power supply runs the amplifiers and the Power On lamp. The metal enclosure of the BDA is connected to ground.

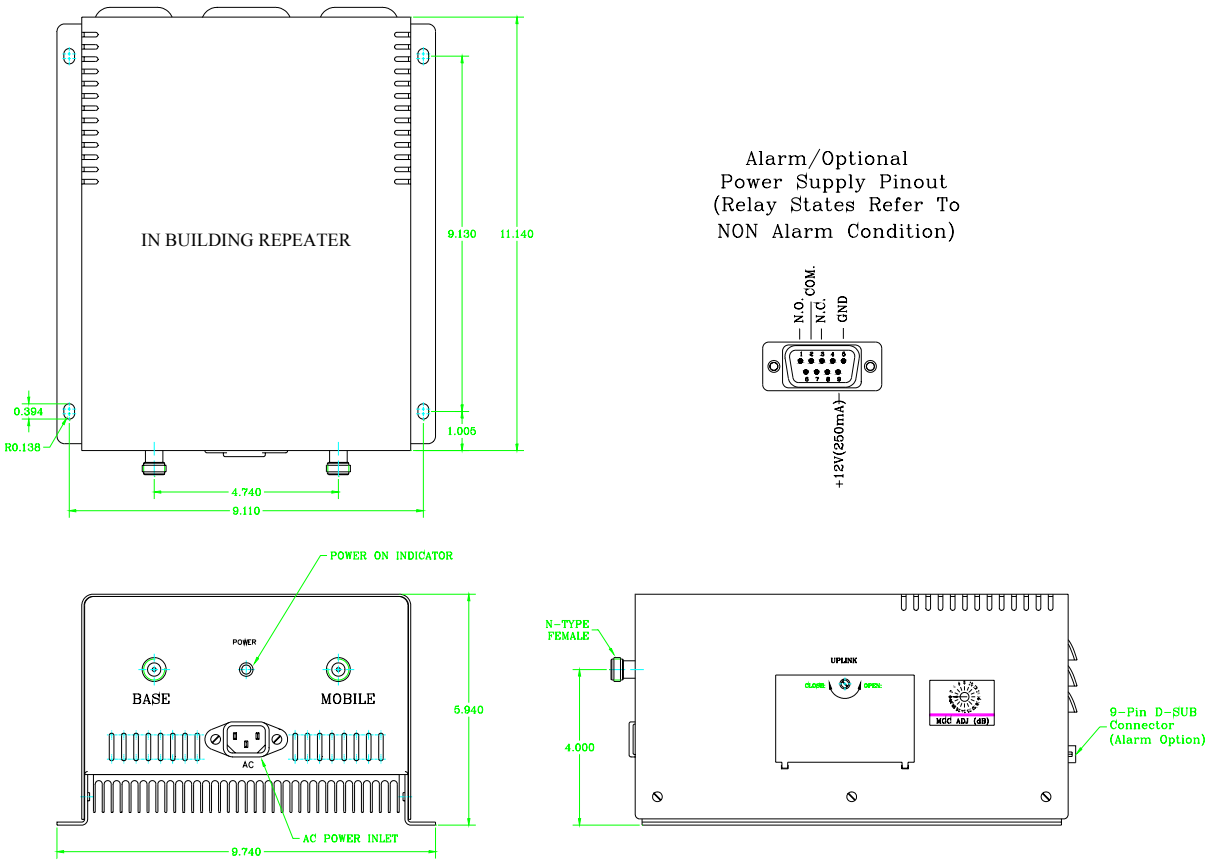
A 9-pin D-Sub connector provides failure alarm output contacts (see diagram next page) as well as an optional 12 VDC (250mA) auxiliary output.

The RF connections are made via two type “N” female connectors. The RF connector labeled “BASE” must be connected to the antenna pointing towards the base station. The RF connection labeled “MOBILE” must be connected to the antenna facing the area to be covered by the BDA.

The RF connections must be made through cables with characteristic impedance of 50 ohms.

The isolation between the base station antenna and the mobile antenna should be at least 12 dB higher than the BDA gain. Isolation less than this value can cause gain ripple across the band. Isolation equal to or less than the BDA gain will give rise to oscillations which will saturate the amplifiers and possibly cause damage to the BDA.

Figure 2



BDA Mechanical Outline

RF EXPOSURE WARNING

In order to satisfy the FCC RF exposure requirements, the BDA/antenna installation must comply with the following:

The outdoor antenna (Yagi type or similar directional antenna) must be installed so as to provide a minimum separation distance of 0.3 meters (30 cm) between the antenna and persons within the area. (This assumes a typical antenna with gain of [10.1 dBi, VSWR ≤ 1.5:1, Zo= 50 ohms, and a cable attenuation of between 1-10 dB).

The indoor antenna (omni directional) must be installed so as to provide a minimum separation distance of 0.2 meters (20 cm) between the antenna and persons within the area. (This assumes a typical wide-beam type antenna with gain of 0-2 dBi, VSWR ≤ 2:1, Zo= 50 ohms, and a cable attenuation of between 1-10 dB).

BDA INSTALLATION

DO NOT APPLY A.C. POWER TO THE BDA UNTIL CABLES ARE CONNECTED TO BOTH PORTS OF THE BDA AND THE ANTENNAS.

1. Mount the BDA on the wall with the RF connectors pointing DOWN. Using appropriate screws and anchors, attach the BDA to the wall at the four mounting holes on the side flanges.

2. Ensure that the isolation between the donor antenna and the service antenna is at least 12 dB greater than the BDA gain. (Use the higher of the Uplink and Downlink gains reported on the BDA test data sheet).

3. Connect the cable from the donor antenna to the BDA connector labeled “BASE” and the cable from the service antennas to the BDA connector labeled “MOBILE”.

4. Open the adjustment access panels on the sides of the BDA and verify that both of the ALC switches are in their factory preset “ON” positions. Close the panels.

5. Connect the AC power cord to the BDA and then to the power source. Verify that the “Power ON” lamp is illuminated.

Installation of the BDA is now complete. To adjust the gain controls to suit the specific signal environment, refer to the next section of the manual.

BDA OPERATION

Refer to figure 3 for adjustment access location and label.

Variable Step Attenuator

BDA gain can be reduced by up to 30 dB in 2 dB steps using the variable step attenuator (Figure 3). Gain adjustment is made with rotary switches accessible via the access door on the BDA enclosure. Arrows on the shafts of these switches point to the value of attenuation selected. BDA gain can be determined by subtracting the attenuation value from the gain reported on the BDA Test Data Sheet for that side of the unit. The attenuators are labeled for Uplink and Downlink.

ALC (Automatic Level Control)

To minimize intermodulation products, each amplifier in the BDA contains an ALC feedback loop. The ALC circuit senses the output power and limits it to the factory preset level of +25 dBm.

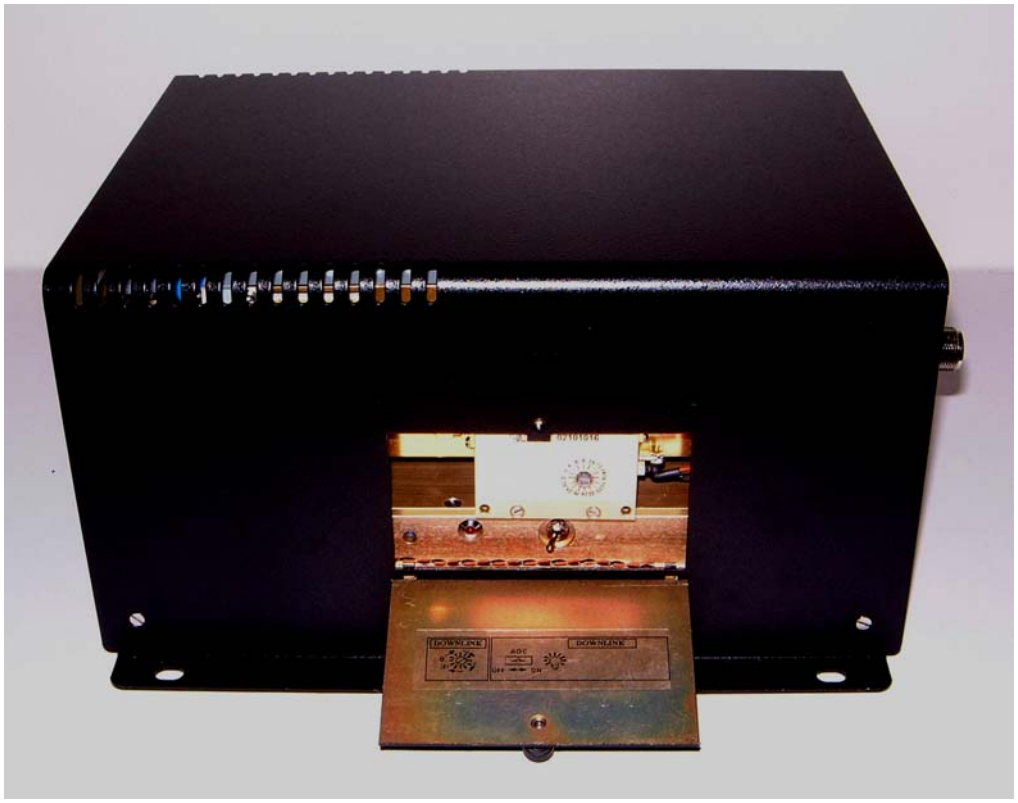
ALC function is selected with an on/off toggle switch located on each amplifier and accessible via the adjustment access panels located on the sides of the BDA enclosure (Left, or “BASE” side is Downlink, right, or “MOBILE” side is Uplink). A red indicator lamp located on each amplifier illuminates when output power exceeds the ALC set point. The indicator is functional regardless of the position of the ALC switch.

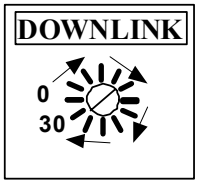
Units are shipped with the ALC switch in the “ON” position.

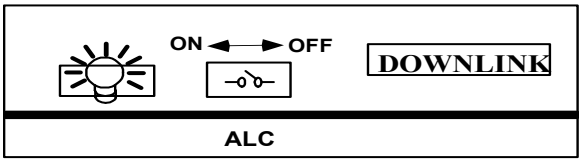
If operation below the 25 dBm ALC set point is desired, BDA gain can be reduced by adjusting the variable step attenuator until the light goes off.

Operation of BDA-PCS/X-1/1W-XX-A at minimum attenuation with greater than -35 dBm average power incident for 65dB gain units and -50 dBm average power incident for 80dB gain units on either BASE or MOBILE port can cause damage to the BDA.

Figure 3







Adjustment Access Panel and Label

DIAGNOSTICS GUIDE

The BDA provides long term, care-free operation and requires no periodic maintenance. There are no user-serviceable components inside the BDA.

This section covers possible problems that may be related to the installation or operating environment.

a. Gain Reduction

Possible causes: Bad RF cables and RF connections to antennas, Damaged antennas.

b. Excessive Intermodulation or Spurious

Possible causes:
Amplifier oscillation caused by insufficient isolation. The isolation between two antennas is given by the equation:
Isolation = 92.5 + 20 Log (F x D) – Gt – Gr
Where:
F = frequency (GHz)
D = separation (Km)
Gt = transmit antenna gain (in the direction of the receive antenna).
Gr = receive antenna gain (in the direction of the transmit antenna).

For example, at the SMR frequencies, the antenna isolation at 100 m separation is about 71 dB for omni-directional antennas (0 dB gain). To increase isolation, the antennas should have higher directivity and must be pointed away from each other.

c. Occasional Drop-out of some Channels

Possible causes: One channel with very strong power dominates the RF output of the amplifier.