

## **THEORY OF OPERATION**

The BDA-1819-60 is a bi-directional amplifier. It is designed to exchange radio communications in buildings, basements, tunnels and other RF shielded environments. The BDA improves the sensitivity of base stations in indoor locations where there is a significant amount of cable loss in RF distribution systems. BDA-1819-60 operates in designated PCS bands.

It contains two amplifiers providing amplification of RF signals in Up-link and Down-link frequency bands. They are connected to the external cables via frequency selective duplexers in order to attenuate all signals that are not in the designated bands.

## TECHNICAL DESCRIPTION

The BDA-1819-60 bi-directional amplifier provides signal amplification in two separated frequency bands in both directions between two coaxial connector terminals. It is achieved by utilization of two frequency selective duplexers, which direct signals at two frequency bands present at the common port in two outputs. These duplexers provide sufficiently high isolation between two paths to prevent self-oscillation of the system. Detailed block-diagram is shown in Figure 1.

The amplifier consists from several gain stages with the low noise stage at the input and medium power stage at the output. All amplifier stages operate at class A linear regime in order to provide the lowest possible intermodulation products.

The duplexer serves two purposes: it splits the signal from the common port to two different ports, and it provides frequency selectivity and isolation between two paths. The common port of the first duplexer is called “**BASE STATION**”. The common port of the other duplexer is called “**SERVICE AREA**”.

Only signals within the frequency range of PCS corresponding Down-link of A-D, B, or C band will be amplified coming from the **BASE STATION** port and only signals within the corresponding Up-link band will be amplified from the **SERVICE AREA** port.

In this configuration the BDA amplifies signals in the Up-link band in one direction and signals in the Down-link band in the other direction.

Physically the BDA block consists of a single compact unit with two RF connectors. It is rugged and can be easily connected during cable installation. It has a moisture proof NEMA 4X enclosure suitable for indoor and outdoor installation with two low noise medium power amplifiers, optional independently controlled Up-link and Down-link attenuators, two duplexers, and optional bias tee's and AGC circuits.

The BDA can be powered by a conventional 110/220 VAC source using an external power supply or alternatively DC voltage can be supplied to the BDA via an external DC input or via center conductor of the RF coax cable.

# Line Bi-Directional Amplifier

## BLOCK DIAGRAM

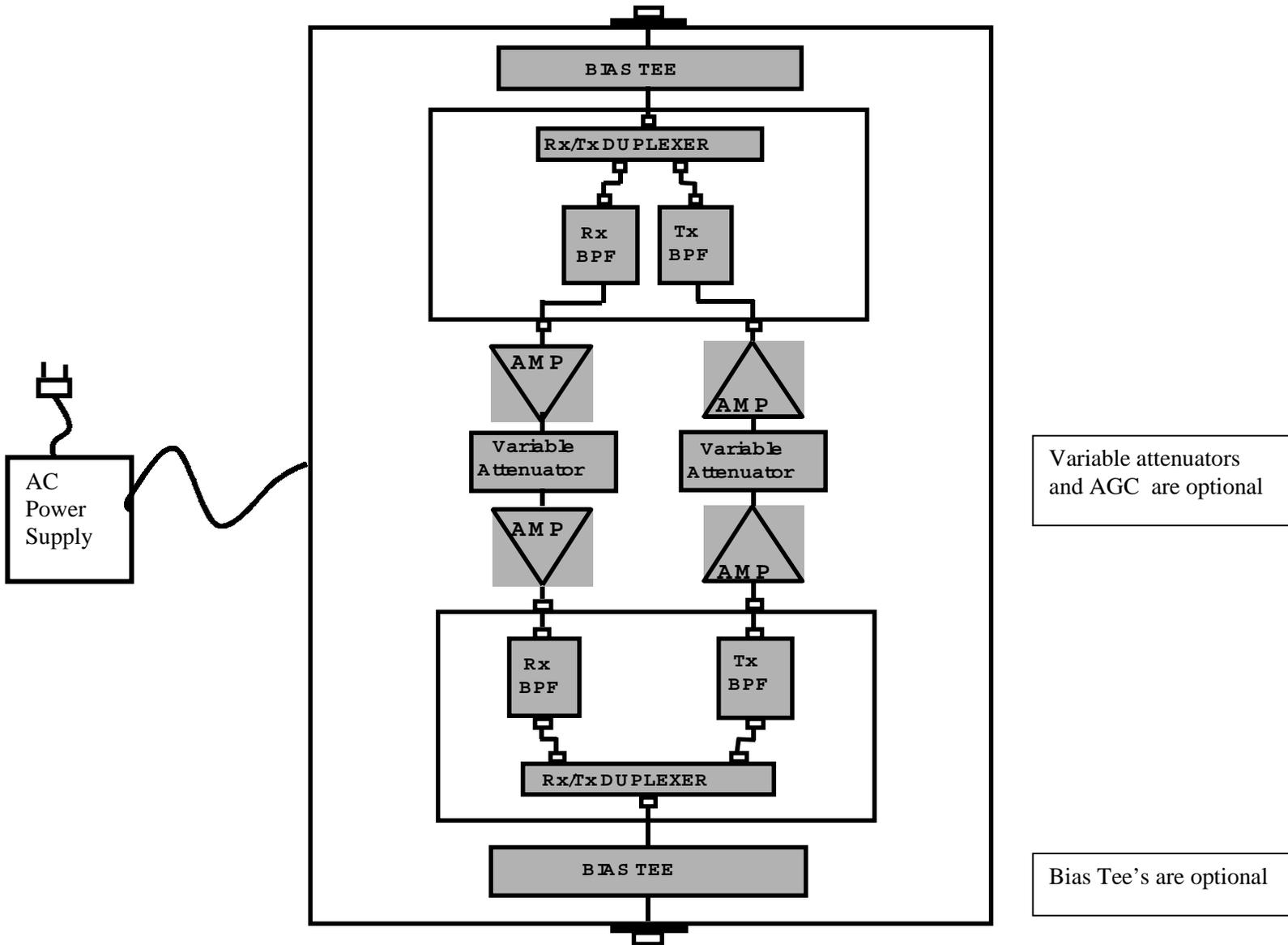


Figure 1



INSTALLATION MANUAL

for

BI-DIRECTIONAL AMPLIFIERS

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## 1. **THEORY OF OPERATION**

The BDA-1819-60 is a bi-directional amplifier. It is designed to exchange radio communications in buildings, basements, tunnels and other RF shielded environments. The BDA improves the sensitivity of base stations in indoor locations where there is a significant amount of cable loss in RF distribution systems.

It contains two amplifiers providing amplification of RF signals in Up-link and Down-link frequency bands. They are connected to the external cables via frequency selective duplexers in order to attenuate all signals that are not in the designated bands.

## 2. TECHNICAL DESCRIPTION

The BDA-1819-60 bi-directional amplifier provides signal amplification in two separate frequency bands in both directions between two coaxial connector terminals. It is achieved by utilization of two frequency selective duplexers, which direct signals at two frequency bands present at the common port in two outputs. These duplexers provide sufficiently high isolation between two paths to prevent self-oscillation of the system. Detailed block-diagram is shown in Figure 1.

The amplifier consists from several gain stages with the low noise stage at the input and medium power stage at the output. All amplifier stages operate at class A linear regime in order to provide the lowest possible intermodulation products.

The duplexer serves two purposes: it splits the signal from the common port to two different ports, and it provides frequency selectivity and isolation between two paths. The common port of the first duplexer is called “**BASE STATION**”. The common port of the other duplexer is called “**SERVICE AREA**”.

Only signals within the frequency range of 851-866 MHz band will be amplified coming from the **BASE STATION** port and only signals within the frequency range of 806-821 MHz band will be amplified from the **SERVICE AREA** port.

In this configuration the BDA amplifies signals in the Up-link band in one direction and signals in the Down-link band in the other direction.

Physically the BDA block consists of a single compact unit with two RF connectors. It is rugged and can be easily connected during cable installation. It has a moisture proof NEMA 4X enclosure suitable for indoor and outdoor installation with two low noise medium power amplifiers, optional independently controlled Up-link and Down-link attenuators, two duplexers, and optional bias tee's.

The BDA can be powered by a conventional 110/220 VAC source using a built-in power supply or alternatively DC voltage can be supplied to the BDA via an external DC input or via center conductor of the RF coax cable.

# Line Bi-Directional Amplifier

## BLOCK DIAGRAM

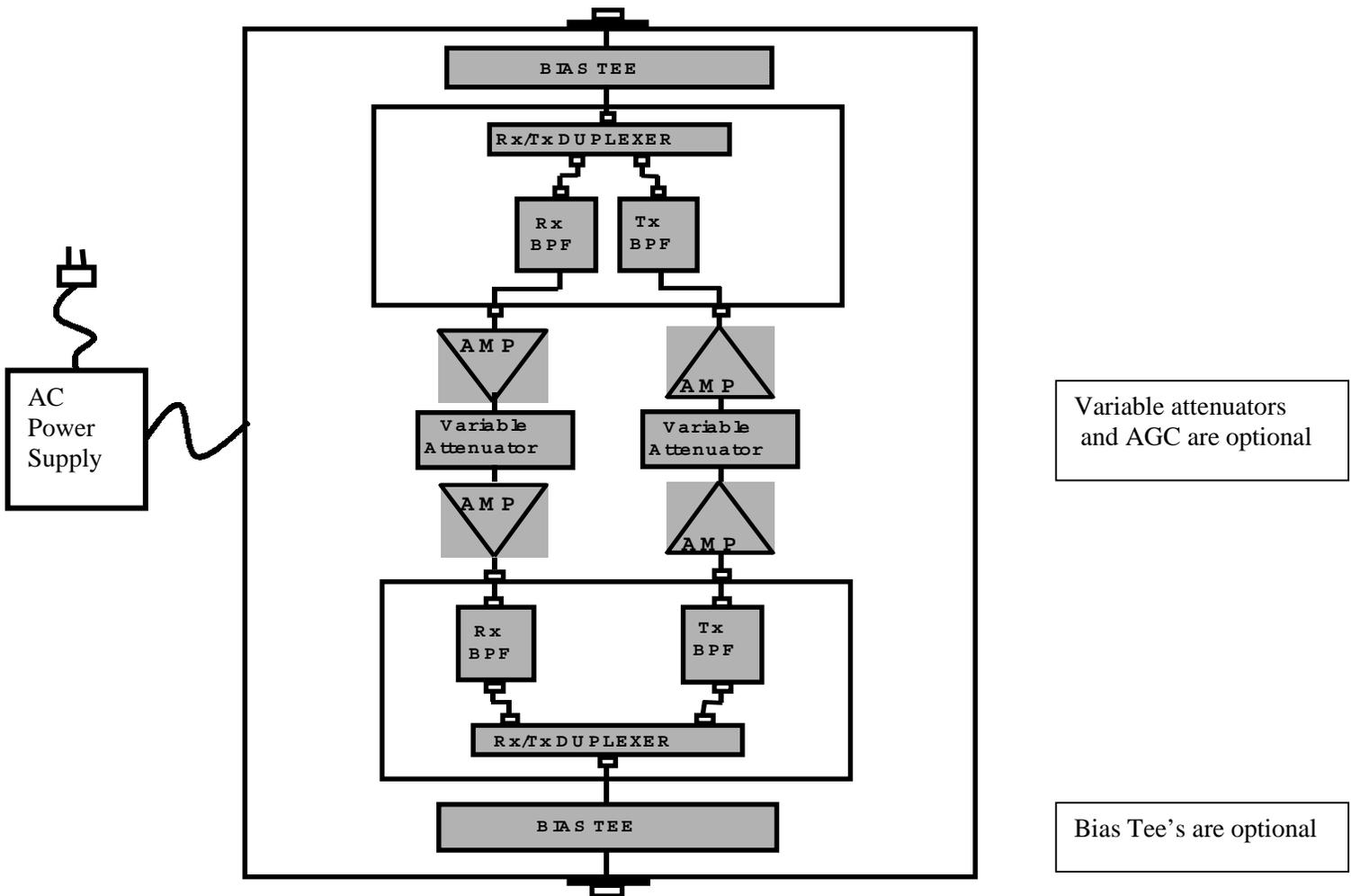


Figure 1

## 3. INSTALLATION PROCEDURE

### 3.1 INSPECTION

**CAUTION**

**Use caution working with the bi-directional amplifier.  
Disconnect the 115 VAC from the amplifier prior to  
inspection.**

Open the enclosure of the bi-directional amplifier (BDA) and carefully inspect the inside assembly of the unit.

Verify that all components are properly secured to the base of enclosure, there are no loose parts, and all interconnections are reliable.

### 3.2 SITE INSTALLATION

3.2.1 The bi-directional amplifier can be installed as a freestanding unit lying on the shelf of the cabinet or any other adequately strong support. It can also be secured by screws to the wall or rack using four holes in the tabs located at the back plate of the enclosure. It is recommended that the environmental temperature will not exceed 65 C and the area will be adequately ventilated.

3.2.2 Once amplifier is installed in place, open the front door and verify that all internal parts are securely mounted.

3.2.3 Connect the ground wire to ground stud on the enclosure.

3.2.4 Plug in the AC cable into the AC socket to turn on the amplifier. The green light on the enclosure must be lit on.

3.2.5 Connect spectrum analyzer to the input (donor antenna) cable. Measure the signal level in the cable coming into the Down-link port of the amplifier. If the signal level is above  $-36$  dBm, add attenuator with the corresponding value or use internal attenuator, if the BDA option is so equipped.

3.2.6 Repeat the same for the cable that will be connected to the Up-link port of the amplifier.

3.2.7 Connect the spectrum analyzer via 20 dB pad to the Down-link port of the BDA.

Connect the “donor” side cable to the Up-link port of the BDA. Observe the level of the amplified signals on the spectrum analyzer. Adjust the gain (if the BDA option is so equipped) or external (internal, if so equipped) attenuator value to limit the power of the signals to +28 dBm.

3.2.8 Repeat the same measurements connecting the spectrum analyzer to the Up-link port and cable to the Down-link port. Adjust the level of amplified signals at the Up-link port to +28 dBm.

3.2.9 Record the settings of attenuators.

3.2.10 Connect the Up-link cable to the amplifier. Check the security of the installation and presence of the AC power. Amplifier is ready for operation.

### 3.3 REMOVE BI-DIRECTIONAL AMPLIFIER

3.3.1 Unplug the AC cord from the socket. AC light on the amplifier must be off. Disconnect all coaxial cables.

3.3.2 Dismount amplifier from the wall or remove it from the shelf.

### 3.4 SHIPMENT AND STORAGE OF THE BDA

3.4.1 Use common technical shop practices to ensure equipment protection during shipment or storage.

### 3.5 TROUBLESHOOTING AND FAULT DETECTION

**WARNING!**  
**110 VAC CAN BE LETHAL!**  
**ALWAYS UNPLUG THE AMPLIFIER**  
**BEFORE SERVICING THE INTERIOR.**

3.5.1 Check the presence of the AC power. The AC light must be on.

3.5.2 Check the continuity of all connecting cables.

3.5.3 If the fault was not located, remove the amplifier and send it to the manufacturer for repair.

3.5.4 RF testing of the amplifier is possible in the specially equipped laboratory.

### **3.6.0 INFORMATION TO USER**

**Any changes or modifications to this product as well as usage outside of specified electrical parameters, which are not expressly approved by manufacturer, could void the user's authority to operate the equipment.**

## Drawing for FCC ID Label

