



Technical Description
DA4000SBR Variable Gain RF Amplifier/Repeater

Purpose:

The purpose of the DA4000SBR Variable Gain bi-directional RF Amplifier/Repeater is to boost the output power of a .6 watt handheld cellular phone to a maximum legal limit of 3 watts for the 800 MHz cellular band and 2 watts for the 1800-1900 MHz PCS band. Digital Antenna, Inc. manufactures a line of 9dBi gain cellular antennas to be used with the DA4000SBR amplifier/Repeater. The 9dBi antennas are different in outside housing only. The same dual band, tri mode element is used for all Digital Antenna, Inc. cellular antennas.

Construction:

The DA4000SBR circuit board has been designed with exceptional RF shielding. RF signal path construction, trace thickness, width and turning radii, complies with widely accepted high frequency specifications.

The extruded aluminum case is designed with top fins that provide appropriate surface area for heat dissipation. End plates close the assembly providing RFI shielding and a means to house connectors, switch and a power indicator. The function of the connectors, switch and power indicator is silk screened on the end plates for clarity.

Functional Description:

The DA4000SBR is a bi-directional variable gain RF amplifier/Repeater. The direction of signal flow is described as Uplink (transmit to the antenna) and Downlink (receive from the antenna) for both 800 MHz cellular band and 1800-1900 PCS bands. Uplink operating frequency is 824-849 MHz for cellular at 3 watts maximum output power and 1850-1910 MHz for PCS at 2 watts maximum output power. Uplink maximum gain for the cellular band is 55 dB and the PCS band is 55 dB. Downlink operating frequency is 869-894 MHz for cellular with a maximum gain of 60 dB and 1930-1990 MHz for PCS with a maximum gain of 60 dB. Signal protocol is TDMA, CDMA, GSM850, GSM1900, AMPS, GPRS and PCS. Use of the DA4000SBR is accomplished by connecting an outside antenna to the connector labeled "outside antenna". The phone communicates with the DA4000SBR by way of the inside antenna thru the air.

A tri-color LED provides a visual activity indication. Green indicates that power is on and the unit is ready. Blinking amber indicates RF phone activity. Red indicates either heavy RF phone activity or a malfunction. Continued red requires system shutdown. An output power control circuit is incorporated to prevent stray power from being produced in case of a malfunction.

Circuit operation:

Uplink operation starts at the connector labeled J2 entering a diplexer with an input frequency range of 824-894 MHz for cellular and 1850-1990 MHz for PCS. Two duplexers separate uplink and downlink signal directions. One duplexer is used for cellular with a frequency range of 810-960 MHz and the other duplexer is used for PCS with a frequency response of 1710-1990 MHz.

An RF band pass filter network with a center frequency of 836 MHz is used on the input to the 3 watt amplifier. Another duplexer is used to separate cellular uplink frequencies from cellular downlink frequencies. Next is a diplexer that is used to separate the cellular band from the PCS band of frequencies.

An RF band pass filter network with a center frequency of 1880 MHz is used on the input to the 2 watt amplifier. Another duplexer is used to separate PCS uplink frequencies from PCS downlink frequencies. Next is a diplexer that is used to separate the Cellular band from the PCS band of frequencies.

Downlink operation starts at the connector entering a diplexer with an input frequency range of 824-894 MHz for cellular and 1850-1990 MHz for PCS. Two duplexers separate uplink and downlink signal directions. One duplexer is used for cellular with a frequency range of 810-960 MHz and the other duplexer is used for PCS with a frequency response of 1710-1990 MHz.

A band Pass filters network with a center frequency of 1960 MHz and band pass filter network with a center frequency of 881 MHz, provide frequency isolation to the input of a low noise amplifiers. The LNA's then drives into duplexers with a frequency range of 1710-1990 MHz and a duplexer for cellular with a frequency range of 810-960 MHz. As mentioned before, these duplexers separate uplink from downlink signal paths. Next a set of duplexers interface to a Diplexer (dip 2) which finally feeds the phone thru the inside antenna connected to a mini-UHF connector. This completes the downlink path to the cell phone.

DC Power source:

The DA4000SBR is designed to accept 5 VDC as an input. The normal maximum input current is 1 A. Switch SW1 enables power .

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