

PR1000A Low Noise Amplifier

User's Manual



310-010083-001

PRAXSYM
DISTINCTIVE SOLUTIONS

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1.0 System Description

The PR1000A Low Noise Amplifier was designed to amplify received signals from a test antenna to overcome the high noise figure of the companion test receiver or spectrum analyzer so that very low level signals can be detected. The PR1000A, when used with a spectrum analyzer will ensure that the system noise figure will be less than 4.5 dB at all test frequencies from 1 kHz to 1 GHz and 9.8 GHz to 10.2 GHz. When used with a laboratory grade spectrum analyzer at a measurement bandwidth of 100 Hz, the system exhibits a sensitivity of -150 dBm at the test antenna output.

1.1 PR1000A

A block diagram of the PR1000A is shown in Figure 1. At frequencies from 1 kHz to 1 GHz, the test antenna is connected to the low band preamplifier. The preamp output is switched by an SP2T electro-mechanical coaxial switch to the test receiver.

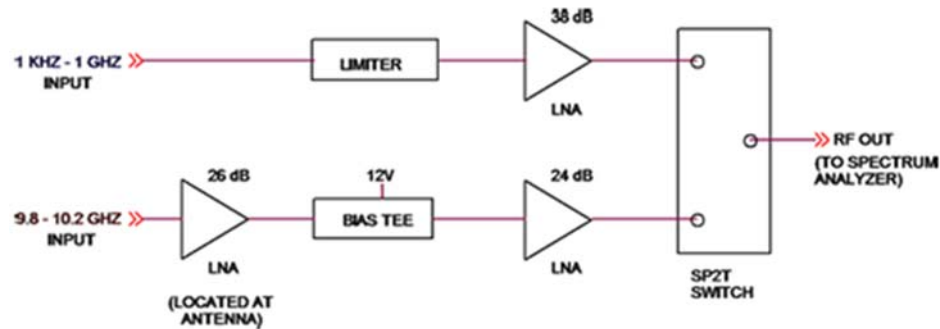


Figure 1
PR1000A Conceptual Block Diagram

At Frequencies from 9.8 to 10.2 GHz, the test antenna is connected to the high band preamplifier thru a bias tee. A rocker switch on the front panel controls the power to the correct preamplifier and controls the coaxial switch.

1.2 External Low Noise Preamplifier

To overcome high cable loss between the test antenna and the PR1000A assembly at 10 GHz, a remote low noise pre-amplifier is mounted directly onto the 10 GHz antenna. A bias tee inside the PR1000A chassis powers the remote preamp through the coax cable interconnecting the PR1000A and the RF OUT/DC connector on the preamplifier. Additional gain at 10 GHz is provided by a second amplifier in the PR1000A chassis. The 10 GHz amplified signal is routed to the test receiver through the SPDT coaxial switch. Using this configuration, the PR1000A can be interfaced to the 10 GHz test antenna with cables having insertion loss as high as 20 dB without significantly degrading the overall system sensitivity.

Low noise preamplifiers are available with N-type female connectors (820-020005-001) or SMA jacks (310-000091-001).

1.3 System Noise Figure

Several factors need to be considered when calculating the system noise figure of the receiver. The noise figure of a spectrum analyzer is the difference (in dB) between the theoretical value of noise power density in a 1 Hz bandwidth given by KTB (Boltzman's constant, temperature in degrees Kelvin, and bandwidth) which is -174 dBm/Hz at room temperature and the spectrum analyzer's displayed average noise level normalized to 1 Hz. For example if the spectrum analyzer has a specified noise level of -145 dBm in a 1 Hz bandwidth at a specified frequency, the difference between this and -174 dBm/Hz is 29 dB and is the noise figure of the spectrum analyzer at that frequency. The displayed average noise level specification requires that the input RF attenuator be set to 0 dB. Every dB that the input attenuator setting is increased from a setting of zero will add as many dB to the noise figure of the spectrum analyzer calculated above.

To achieve a 4.5 dB system noise figure at 10 GHz using a spectrum analyzer with a noise figure of 29 dB, the external LNA provides 27 dB of gain with a noise figure of less than 2.0 dB, followed by a transmission line with up to 20 dB of loss, followed by the Pre-Amplifier with 24 dB of gain with a noise figure of 3.0 dB.



PR1000A

2.0 Operating the PR1000A

Plug the PR1000A into 110/220 VAC 50/60 Hz power source. The PR1000A contains a universal power supply that automatically adjusts to any power source in this range.

2.1 Power-On State

Toggle the power switch. The embedded green light will illuminate.

2.2 High Band/Low Band Selection

The SELECT rocker switch on the front panel enables operation at either the low band (1 KHz to 1 GHz) or the high band (10 GHz). The selected input is indicated by an illuminated red LED next to the corresponding selected female N-Connector.

2.3 High Band Coaxial Bias

The front panel of the PR1000A contains a push-button switch to turn the bias voltage on the center conductor of the high band RF input connector 'on' or 'off'. The switch is located to the right of the RF input connector. When the switch is depressed, the red LED in the switch will illuminate.

The bias voltage is used to power an external low noise preamplifier.

The 500mA bias supply fuse is located to the right of the bias switch. If the red LED on the BIAS switch does not illuminate when depressed, the fuse may be blown.

3.0 Additional Information

3.1 Calibration and Repair

The Pre-Amplifier has been tested at the factory to meet the specifications detailed in Section 4.0. No calibration cycle is recommended for the PR1000A

Should equipment verification or repair be required, the equipment can be returned to Praxsym for evaluation. Please contact Praxsym to obtain a return material authorization.

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3.2 Proper Care and Use

The PR1000A normally operates in a dry environment. The Pre-Amplifier must be protected from sources of moisture. Adequate ventilation is imperative for proper function.



4.0 Specifications

310-010083-001 PR1000A

Frequency:	1 kHz to 1 GHz (low frequency input) 9.8 to 10.2 GHz (high frequency input)
Gain:	Low frequency input – 38 dB minimum High frequency input – 22 dB minimum
Noise Figure:	3.5 dB maximum (1 kHz to 500 MHz) 4.0 dB maximum (500 MHz to 1 GHz) 3.2 dB maximum (9.8 to 10.2 GHz)
Output Level:	+ 6 dBm minimum at 1 dB gain compression (output to spectrum analyzer)
Input VSWR:	2.8:1 Maximum 1 KHz to 1 GHz 2.0:1 Maximum 9.2 to 10.2 GHz
Output VSWR:	2.0:1 Maximum
Maximum Safe Input Level:	Low frequency input: +20dBm High frequency input: +20dBm
Internal Bias Tee:	Provides +12 VDC via high frequency input connector to the remote 10 GHz Preamp. (0.5 Ampere fast blow fuse)
Operating Temperature:	0 to +40 degrees Centigrade
Operating Humidity:	95% relative humidity, non-condensing
Power Supply:	110/220 VAC (auto-adjusting), 48–63 Hz, 15 watts (1.0 Ampere fast blow fuse)
Size:	19" x 1.75" x 10" (Width x Height x Depth)
Weight:	6 pounds nominal

820-020005-001 Low Noise Amplifier

Frequency Range:	9.8–10.2 GHz
Gain:	25–30 dB 27 dB typical
Input VSWR:	2.0:1 max
Noise Figure:	2.0 dB max
Output P1dB	+10 dBm
Supply Power:	11.0 - 16.0V at 80mA Powered through RF output connector
RF Connectors:	N-Type Female

310-000091-001 Low Noise Amplifier

Frequency Range:	9.8–10.2 GHz
Gain:	24–29 dB 27 dB typical
Input VSWR:	2.0:1 max
Noise Figure:	2.0 dB max
Output P1dB	+8 dBm
Supply Power:	10.0 - 15.0V at 90mA Powered through RF output connector
RF Connectors:	SMA Female (jack)

310-010091-001 Low Noise preamplifier

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900-00018-001 Rev A