

10 GHz Low Noise Pre-Amplifier

User's Manual



310-010152-002

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PRAXSYM warrants that all items will be free from defects in material and workmanship under use as specified in this guide for a period of one year from date of delivery. PRAXSYM further agrees to repair or replace, at its discretion, any failure which upon PRAXSYM's inspection appears to be a result of workmanship or material defect. In no case, shall PRAXSYM's liability for breach of warranty exceed the purchase price of the items in question. PRAXSYM's liability on any claim of any kind, for any loss connected with, or resulting from the use of, performance or breach thereof, installation, inspection, operation or use of any equipment furnished by PRAXSYM, shall in no case exceed the purchase price of the goods which give rise to the claim.

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1.0 System Description

The 310-010152-002 Low Noise Pre-Amplifier and companion external low noise amplifier (LNA) are used to amplify low level microwave signals. The Pre-Amplifier contains an AC/DC power supply, internal low noise amplifier, and a bias tee to source a DC bias voltage on the RF input connector.

1.1 Low Noise Internal Amplifier

The RF input connector is connected through the bias tee to the internal low noise amplifier with 24dB gain. The output of the amplifier is connected to the Pre-Amplifier RF output connector.

The Pre-Amplifier amplifies the small signal from the test antenna and masks the high noise figure of a test receiver or spectrum analyzer. The Pre-Amplifier, when used with an industrial grade spectrum analyzer, will ensure that the system noise figure will be less than 4.5 dB at 10 GHz.

The maximum safe input level to the Pre-Amplifier is +20dBm.

1.2 External Low Noise Amplifier

To overcome cable loss between the test antenna and the Pre-Amplifier assembly, a remote low noise amplifier (LNA) is mounted directly onto the 10 GHz antenna.

A bias tee inside the Pre-Amplifier chassis powers the remote LNA through the coax cable interconnecting the pre-amplifier and the 10 GHz test antenna.

The 10 GHz signal is amplified, travels through the coax cable and then is applied to the Pre-Amplifier at the RF input connector. Using this configuration, the Pre-Amplifier 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 amplifiers are available with N-type female connectors (820-020005-001) or SMA jacks (310-010091-001).

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.

2.0 Operating the Low Noise Pre-Amplifier

Plug the Pre-Amplifier into 110/220 VAC 50/60 Hz power source. The Pre-Amplifier 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 Coaxial Bias

The front panel of the Pre-Amplifier contains a push-button switch to turn the bias voltage on the center conductor of the 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 amplifier.

The 500mA bias supply fuse is located to the right of the bias switch.

The 310-010152-002 contains a current limited bias supply voltage regulator. This feature was added to prevent momentary shorts between the inner and outer conductors of the RF input connector from blowing the fuse. When the inner conductor is shorted to ground, or a load that pulls more than the rated current is attached to the RF input connector, the bias voltage will be pulled low and the red LED will go out.

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 Pre-Amplifier.

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 Pre-Amplifier 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

310-010152-002 Pre-Amplifier

Frequency Range:	9.5–10.5 GHz
Gain:	23–28 dB 24 dB typical
Input and Output VSWR:	2.5:1 max
Noise Figure:	3.0 dB typical 3.8 dB max
Output P1dB	+10 dBm
Bias Supply:	11.4V at 200mA max
Bias Fuse:	500mA (5x20mm, fast acting)
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
Supply Fuse:	1A (5x20mm, slo-blo, 250V)
Size:	8.37" x 1.75" x 10.75" (Width x Height x Depth)
Weight:	2.5 pounds nominal
RF Connectors:	N-Type Female

820-020005-001 Low Noise Amplifier

Frequency Range:	9.5–10.5 GHz
Gain:	25–30 dB 27 dB typical
Input VSWR:	2.2:1 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

310-010091-001 Low Noise Amplifier

Frequency Range:	9.5–10.5 GHz
Gain:	24–29 dB 26 dB typical
Input VSWR:	2.2:1 max
Noise Figure:	2.0 dB max
Output P1dB:	+8 dBm
Supply Power:	10.0 - 15.0V at 80mA Powered through RF output connector
RF Connectors:	SMA Female (jack)



820-020005-001 Low Noise Amplifier

**10GHZ LOW NOISE
PRE-AMPLIFIER**

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900-000012-001 Rev C