

## Application

Our Low-Noise Amplifier (LNA) series includes LNAs and redundant LNA/LNB systems (C-, X-, Ku-, or Ka-Band). They meet or exceed system requirements for commercial geosynchronous satellites worldwide. Their compact design and rugged construction make them ideal for transportable applications and severe environments. The LNAs have a comprehensive set of options to accommodate systems ranging from Very Small Amplifier Terminal (VSATs) to major earth stations. The redundant LNA/LNB systems include primary and backup LNA(B)s and an automatic switching controller. In case of primary LNA/LNB failure, fast automatic switchover to the backup LNA/LNB minimizes downtime.



## Technology

The amplifiers incorporate both HEMT devices for low-noise temperature performance and GaAs FET devices for low intermodulation. The units use surface mounted components for robotic manufacturing techniques, thereby insuring maximum product consistency and enhanced reliability. XLNA includes integrated filtering to address adjacent power issues peculiar to demanding X-Band terminals.

## Reliability

The amplifier series utilizes proprietary circuitry and high-quality components to achieve an MTBF in excess of 160,000 hours. Each unit is temperature cycled from -40 to 140°F (-40 to +60°C).

## System Controller

The RC-11/1270 1:1/1:2 system controller (0 to 50 C operation, standard 19" 1RU chassis, nominally 16" deep) monitors the outdoor LNA/B system and provides the necessary 48V DC nominal redundant switch drive as well as selectable(13/18V) unit bias to operate multi-band LNBs. It has two independent internal power supplies allowing the customer to supply independent power sources (AC or optional 48V DC) for utmost reliability. It offers an easy-to-use front panel keyboard/display as well as full Ethernet capabilities (SNMP, Telnet, HTML, serial EIA-232/485) for integration with a customer network.



## Subsystems

1+1 (one backup for one primary) and 1+2 (one backup for two primary) redundant LNA and LNB systems are available complete with mounting plate, brackets, and indoor Redundancy Controller/Power Supply (transmit reject filters, cables and other integration materials are offered as required).

## LNA Specifications

Frequency	
CLNA & REDCLNA	3.4 to 4.2 GHz 3.625 to 4.2 GHz 3.625 to 4.8 GHz (45K only) 4.5 to 4.8 GHz
XLNA & REDXLNA	7.25 to 7.75 GHz
KLNA & REDKLNA	10.95 to 12.75 GHz 10.70 to 12.75 GHz
KaLNA & REDKLNA	19.7 to 21.2 GHz 19.2 to 20.2 GHz 17.8 to 19.3 GHz 20.2 to 21.2 GHz
Noise Temperature	
CLNA	30, 35, 40, 45 K
XLNA	40, 45 K
KLNA	65, 70, 80, 85 K
KaLNA	120, 130, 150 K
Gain(nominal)	50 dB or 60 dB All Bands, 70dB X-Band Only
Gain Flatness (fixed temp)	
CLNA	1.5 dB p-p from 3.625 to 4.2 GHz 2.0 dB p-p from 3.4 to 4.2 GHz 3.0 dB p-p from 3.4 to 4.8 GHz 0.40 dB p-p over 40 MHz
REDCLNA (Std. Band)	3.0 dB p-p over Full Band typical 0.50 dB p-p over 40 MHz typical
XLNA	3.0 dB p-p over Full Band typical 0.50 dB p-p over 40 MHz typical
REDXLNA	4.0 dB p-p over Full Band typical 1 dB p-p over 40 MHz typical
KLNA	3.0 dB p-p over Full Band 0.75 dB p-p over 40 MHz

REDKLNA	4.0 dB p-p over Full Band typical 1 dB p-p over 40 MHz typical
KaLNA	4.0 dB p-p over Full Band 1 dB p-p over 40 MHz
REDKaLNA	5.0 dB p-p over Full Band typical 1.5 dB p-p over 40 MHz typical

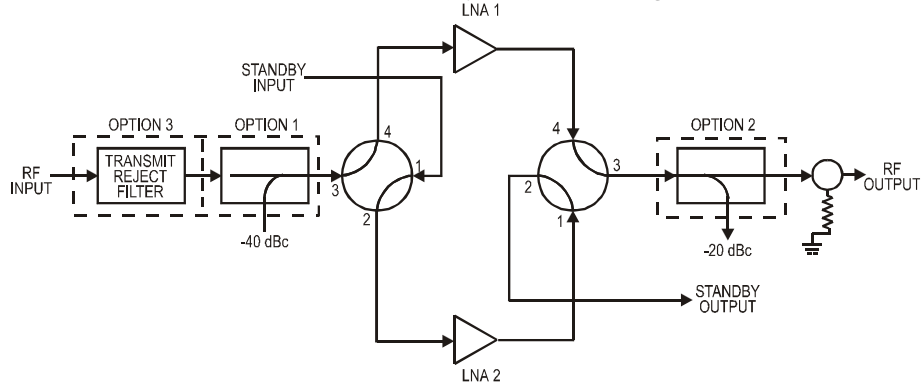
<b>Third Order Intercept</b>	+20 dBm (+30 dBm opt. for XLNA)
<b>Output Power</b>	+12 dBm typ, +10 dBm guaranteed across band and temp
<b>AM-PM Conversion</b>	0.05°/dB @ -5 dBm (@ -10 dBm for KaLNA)
<b>Linear Group Delay</b>	0.01 ns/MHz (XLNA - ± .05 ns/MHz)
<b>Parabolic Group Delay</b>	0.001 ns/MHz <sup>2</sup> (XLNA - ± .005 ns/MHz <sup>2</sup> )
<b>Ripple</b>	0.1 ns p-p (XLNA - ± 1 ns p-p)
<b>Input/Output VSWR</b>	1.33:1 Maximum Input VSWR (all) 1.33:1 Output VSWR for C/X/Ku Red. Sys. 1.5:1 Max Output VSWR for KaLNA

Input Waveguide	
CLNA & REDCLNA	CPR229
XLNA & REDXLNA	CPR112
KLNA & REDKLNA	WR75
KaLNA & REDKaLNA	WR42

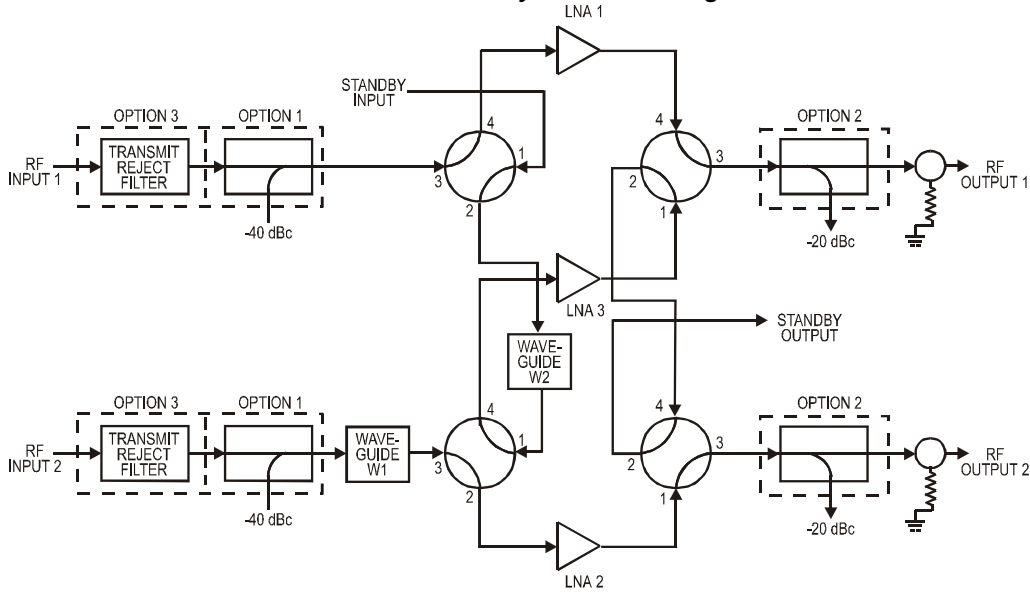
<b>Output Connector (C, X, Ku)</b>	Type N Standard, Optional SMA
<b>Output Connector (Ka)</b>	SMA
Operating Temp.	-40 to 140°F (-40 to +60°C)
Input Power	+12 to +24 VDC @ 120 mA
Power Connector	Coaxial or PT06E-8-4S

# System Diagrams

**1:1 Redundant LNA System Block Diagram**



**1:2 Redundant LNA System Block Diagram**



**Typical System Noise Temperature Calculation**

**1:1 Redundant LNA System**

$$T_{system} = T_{LNA} + T_{SWITCH} + T_{OPTION 3} + T_{OPTION 1}$$

**1:2 Redundant LNA System**

RF Input 1:LNA online signal path

$$T_{system} = T_{LNA} + T_{SWITCH} + T_{OPTION 3} + T_{OPTION 1}$$

RF Input 1:LNA 3 online signal path (LNA 1 Standby)

$$T_{system} = T_{LNA} + 2 * T_{SWITCH} + T_{W2} + T_{OPTION 3} + T_{OPTION 1}$$

RF Input 2:LNA 2 online signal path

$$T_{system} = T_{LNA} = T_{W1} + T_{SWITCH} + T_{OPTION 3} + T_{OPTION 1}$$

RF Input 1:LNA 3 online signal path (LNA 2 Standby)

$$T_{system} = T_{LNA} + 2 * T_{SWITCH} + T_{W1} + T_{W2} + T_{OPTION 3} + T_{OPTION 1}$$

**Typical Noise Temperature in Kelvin at 23°C**

Band (GHz)	3.62 – 4.205	3.4 – 4.2	7.9 – 8.4	10.7 – 12.75	Ka-Band
	WR-229	WR-229	WR-112	WR-75	WR-42
T <sub>SWITCH</sub>	1.50	1.50	3.00	5.00	12.00
T <sub>W1</sub>	1.50	1.50	4.00	4.00	7.00
T <sub>W2</sub>	1.50	1.50	2.5	4.00	7.00
T <sub>OPTION1</sub>	0.50	0.50	2.00	2.00	5.00
T <sub>OPTION3</sub>	2.40	7.00	28.0	15.00	NA



2114 West 7<sup>th</sup> Street  
 Tempe, AZ 85281 USA  
 Phone +1.480.333.2200  
 Email cefdsales@comtech.com

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