



1:1 and 1:2 REDUNDANT LOW NOISE AMPLIFIER SYSTEMS

RACK MOUNT CONTROLLER -



HUB/WALL MOUNT CONTROLLER-



HUB MOUNTED AMPLIFIER/SWITCH(S) PLATE ASSEMBLY
1:1 or 1:2 CONTROL UNIT – SHELTER OR HUB MOUNTED
INTERCONNECT CABLE – CONTROLLER TO PLATE ASSEMBLY

The 1:1 and 1:2 Redundant Low Noise Amplifier (LNA) Systems are designed to ensure continuous operation with minimum disruption of signal transmission.

FEATURES

- Low noise temperature
- Fault tolerant design
- Fully redundant power supplies
- Remote control via RS485/RS422 (user selectable) and Ethernet
- Automatic/manual control from both local and remote mode
- Remote status reporting
- Offline input/output access
- Amplifier current fault detection
- Weather resistant amplifier/switch plate assembly
- Time-stamped alarm and system event history
- Front panel LNA bias display

A fault condition in the online LNA, or an operator generated command, will switch the standby LNA to the online position and remove the online LNA from the signal path.

The Redundant LNA system consists of an outdoor amplifier/switch assembly which mounts at the antenna hub, an indoor rack mount controller or hub/wall mounted controller and an interconnection cable.

OPTIONS

- Transmit reject filter
- Input/output signal monitors
- Higher gain
- Increased output power

Frequency (GHz)	Band Abbreviation	Available Amplifier Noise Temperature at +25°C (Maximum)	Interface Input/Output
1-2	100200	60*	SMA/SMA
1.5-1.6	150160	33	SMA/SMA
2.2-2.3	220230	33	SMA/SMA
3.4-4.2	340420	30	CPR-229G/N
3.4-4.8	340480	35*	CPR-229G/N
4.5-4.8	450480	35	CPR-229G/N
7.1-8.4	710840	50*	CPR-112G/SMA
7.25-7.75	725775	45	CPR-112G/SMA
8-8.4	800840	50	CPR-112G/SMA
10.7-12.75	107128	65	WR-75/SMA
10.95-12.75	109128	65	WR-75/SMA
17-22	170220	140*	WR-42/2.92 mm
17.7-21.2	177212	101*	WR-42/2.92 mm
19.8-20.65	198206	101*	WR-42/2.92 mm
17.7-22.0	177220	130*	WR-42/2.92 mm

* References 14 dB minimum input return loss specification.

Low Noise Amplifier System Model Numbers -

A (Controller Code)-(Frequency Band Abbreviation)-(Amplifier Noise Temperature):

Controller Code: 1R = 1:1 Rack Mount Controller, 1E = 1:1 Hub Mounted Controller
2R = 1:2 Rack Mount Controller, 2E = 1:2 Hub Mounted Controller

Please note that each Low Noise Amplifier System is supplied with:

- One (1) Redundant Amplifier/Switch Assembly (Prefix A1RP or A2RP)
- One (1) Local Control and Monitoring Unit (Prefix A1RC/A2RC or A1EC/A2EC)
- One (1) interconnection control cable (other lengths optional)

Examples:

1:1 System, 10.95-12.75 GHz with 65°K amplifier noise temperature: A1R-109128-65
Supplied with:

A1RC-109128-65 Rack Mounted Local Control and Monitoring Unit
A1RP-109128-65 Outdoor Mounted Amplifier Plate Assembly
100 foot (30M) interconnection cable (length optional).

1:2 System, 3.4-4.2 GHz with 30°K amplifier noise temperature: AR2E-340420-30
Supplied with:

A2EC-34042-30 HUB Mounted Local Control and Monitoring Unit
A2RP-34042-30 Outdoor Mounted Amplifier Plate Assembly
10 foot (3M) interconnection cable (length optional).

RF SPECIFICATIONS

Gain	50 dB minimum (higher gain optional)
Gain Flatness	0.4 dB/40 MHz, 1.0 dB peak-to-peak/RF bands up to 500 MHz, 1.5 dB peak-to-peak/RF bands up to 800 MHz, 2.0 dB peak-to-peak/RF bands greater than 800 MHz
Gain Slope	0.2 dB/10 MHz maximum
Gain Stability	±0.2 dB/24 hours (constant temperature) 5 dB maximum/-40 to +60°C (higher stability optional)
Power Output (1 dB Compression).....	+10 dBm minimum (higher output power optional)
AM/PM Conversion.....	0.5°/dB maximum to 0 dBm output
Group Delay (±18 MHz) -	
Linear	0.02 ns/MHz maximum
Parabolic	0.001 ns/MHz ² maximum
Ripple	0.1 ns peak-to-peak maximum
Spurious Outputs	Below thermal noise
Isolation	50 dB minimum
Input Return Loss (amplifier).....	19 dB minimum *14 dB minimum (refer to table)
Output Return Loss	20 dB minimum
Input/Output Impedance	50 ohms
Switchover Time	100 ms maximum
Non-damage Input Power.....	+10 dBm maximum
Typical Transmit Densensitivity Threshold -	
C-band	-20 dBm (-30 dBm with Option 11-5)
X-band	-50 dBm (-60 dBm with Option 11-5)
Ku-band	-20 dBm (-30 dBm with Option 11-5)
Ka-band	-50 dBm (-60 dBm with Option 11-5)

LOCAL CONTROL UNIT PRIMARY POWER REQUIREMENTS

Voltage.....	90-250 VAC
Frequency.....	47-63 Hz
Power Consumption	20 W typical, 50 W peak during switchover

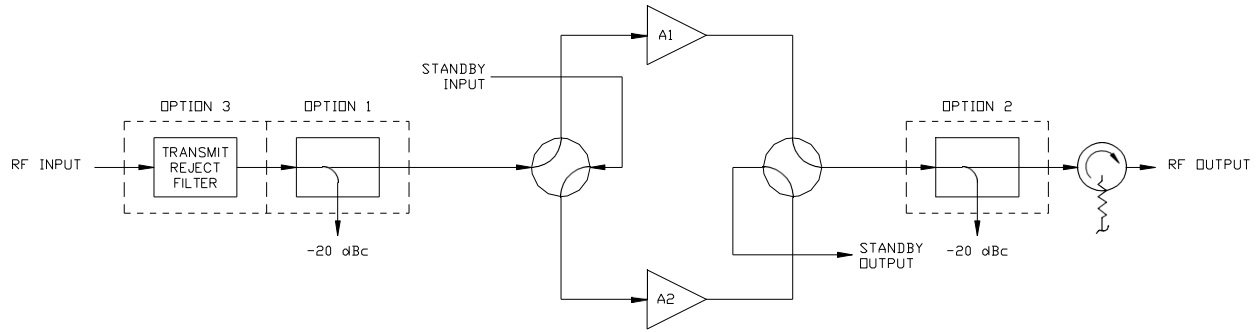
SUMMARY ALARM

Contact closure/open for DC voltage and/or amplifier alarm.
Status alarm readout on remote control bus.

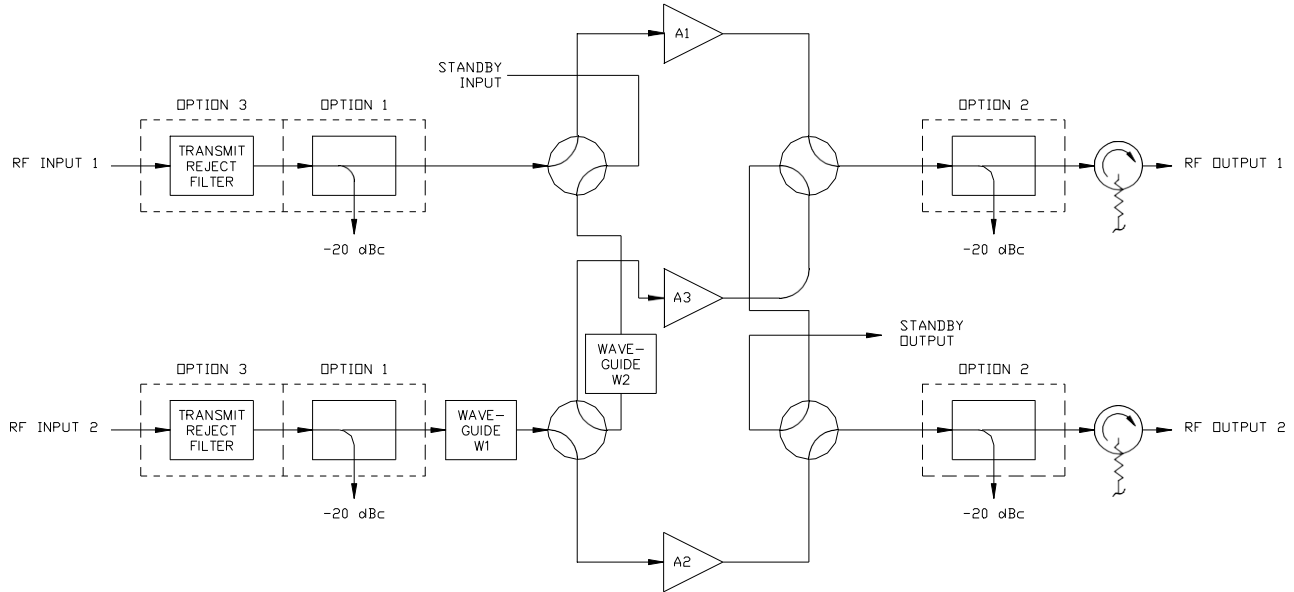
PHYSICAL

Primary Power Input	IEC-320 (indoor controller)
Summary Alarm Interface Mating Connector.....	DEM-9P
Remote Interface Connector	DEM-9S for RS485 and RS422, RJ4 female for Ethernet
Switch/Amplifier Weight -	
1:1 Units	Below 10 GHz, 15 lbs, Above 10 GHz, 10 lbs nominal
1:2 Units	Below 10 GHz, 25 lbs, Above 10 GHz, 20 lbs nominal
Chassis Dimensions (Rackmount Controller).....	19" x 1.75" panel height x 20" maximum

1:1 REDUNDANT LNA SYSTEM BLOCK DIAGRAM



1:2 REDUNDANT LNA SYSTEM BLOCK DIAGRAM



Typical system noise temperature calculation

1:1 Redundant System

$$T_{\text{system}} = T_{\text{LNA}} + T_{\text{SWITCH}} + T_{\text{OPTION3}} + T_{\text{OPTION1}}$$

1:2 Redundant LNA System

RF input 1: LNA 1 Online signal path

$$T_{\text{system}} = T_{\text{LNA}} + T_{\text{SWITCH}} + T_{\text{OPTION3}} + T_{\text{OPTION1}}$$

RF input 1: LNA 3 Online signal path (LNA 1 standby)

$$T_{\text{system}} = T_{\text{LNA}} + 2 * T_{\text{SWITCH}} + T_{\text{W2}} + T_{\text{OPTION3}} + T_{\text{OPTION1}}$$

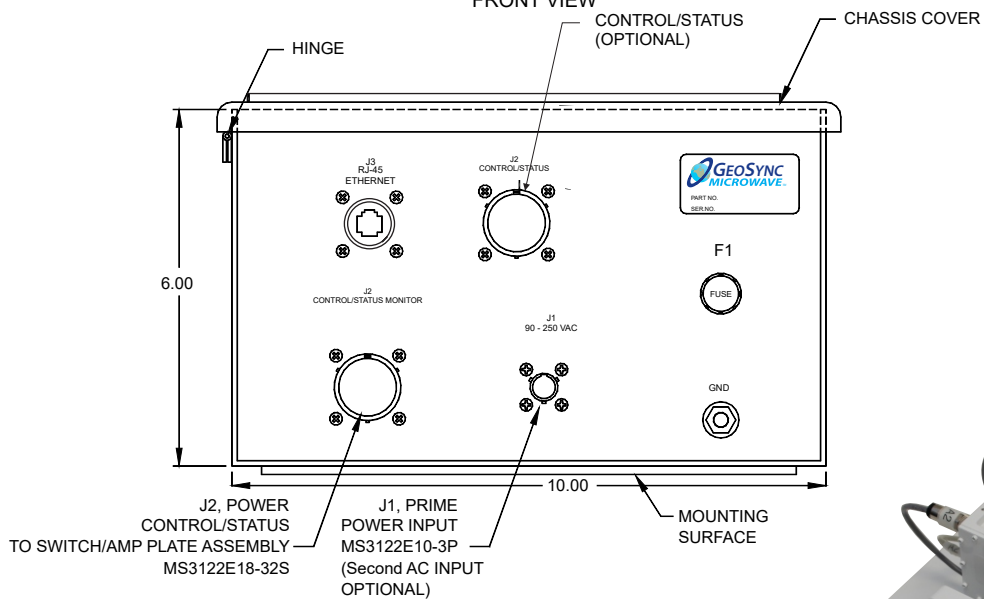
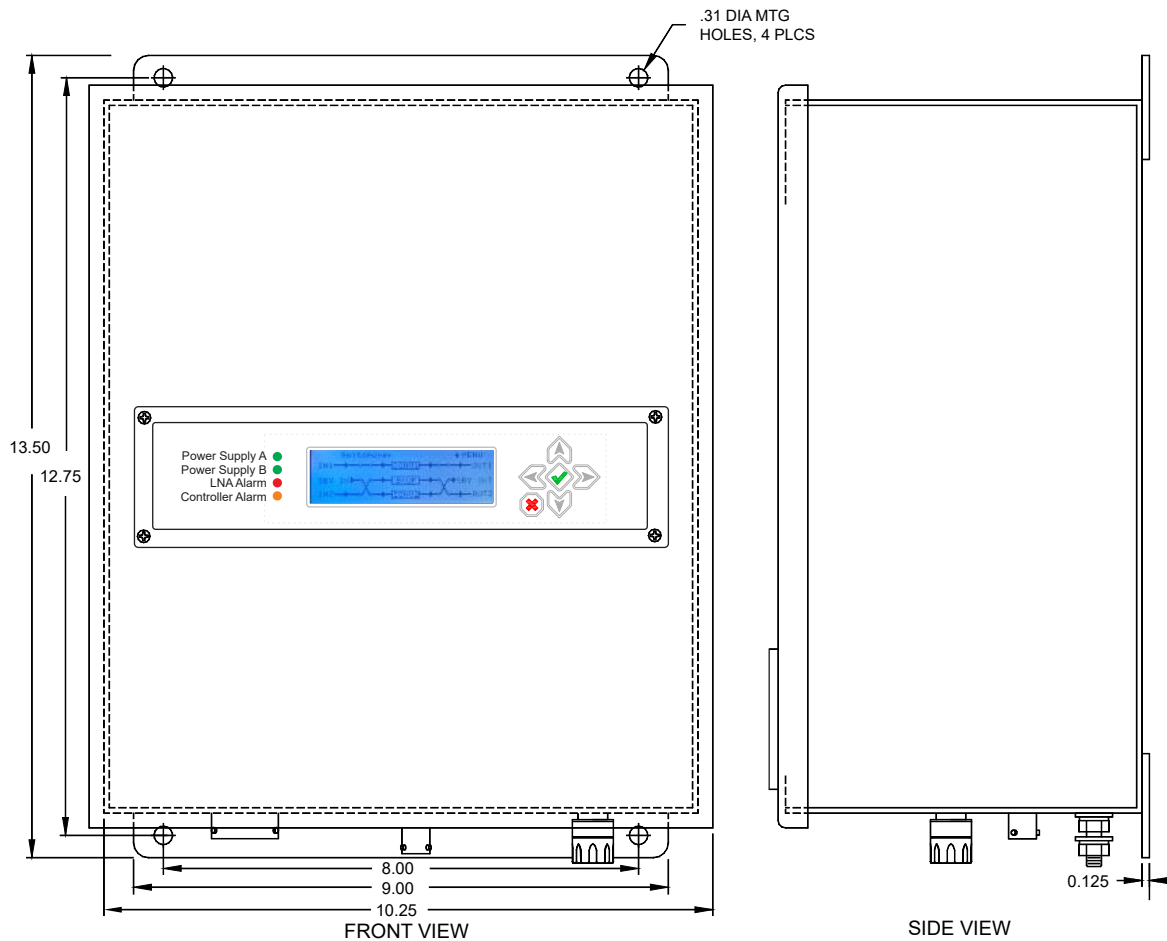
RF input 2: LNA 2 Online signal path

$$T_{\text{system}} = T_{\text{LNA}} + T_{\text{W1}} + T_{\text{SWITCH}} + T_{\text{OPTION3}} + T_{\text{OPTION1}}$$

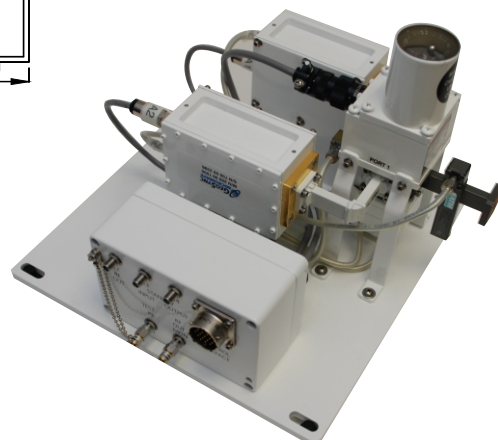
RF input 1: LNA 3 Online signal path (LNA 2 standby)

Typical Noise Temperature in Kelvin at 23°C								
Band (GHz)	0-0.95	0.95-2	C-Band	3.4-4.2 and 4.5-4.8	X-Band	Ku-band	Ka -Band Rx	Ka Band Tx
	(coaxial)		WR-229	WR-229	WR-112	WR-75	WR-42	WR-28
T _{SWITCH}	7.0°	13.5°	1.5°	1.5°	3°	5°	12°	20°
T _{W1}	N/A	N/A	1.5°	1.5°	4°	4°	7°	10°
T _{W2}	14°	14°	1.5°	1.5°	9°	9°	11°	15°
T _{OPTION1}	25°	25°	0.5°	0.5°	2°	2°	3°	4°
T _{OPTION3}	N/A	N/A	2.5°	7.5°	28°	18°	N/A	N/A

TYPICAL OUTLINE HUB/WALL MOUNT UNIT -



HOFFMAN TYPE ENCLOSURE
MODEL A12106CHAL



TYPICAL Ka BAND 1:1 ASSEMBLY
(Shown with options 73-1, 2)

ENVIRONMENTAL

Operating -

Ambient Temperature (Rack Controller).....0 to 50°C
Ambient Temperature (Hub Controller).....-20 to +60°C
Ambient Temperature (Amplifier Assembly)-40 to +60°C (For other ranges, consult factory)
Atmospheric PressureUp to 10,000 feet

Non-operating -

Ambient Temperature-50 to +70°C
Atmospheric PressureUp to 40,000 feet
Shock and VibrationNormal handling by commercial carriers

OPTIONS

Note: System noise temperature will increase and return loss will degrade for any additional component located before the amplifier. This applies to Options 11-1 and 11-3.

11-1. Test Input Inject Couplers -

Below 3.4 GHzCoaxial coupler 40 dB nominal coupling level
Above 3.4 GHzCrossguide coupler 40 dB nominal coupling level

11-2. Output Test Coupler20 dB nominal coupling level

11-3. Transmit Reject Filter -

Receive Band Frequency (GHz)	Receive Band Insertion Loss (dB)	Transmit Band Frequency (GHz)	Transmit Band Rejection (dB)
3.4-4.2	0.04	5.825-6.725	60
4.5-4.8	0.15	6.70-7.05	55
7.25-7.75	0.50	7.9-8.4	64
10.7-12.75	0.15	13.75-14.5	60
17.7-21.2	0.25	27.0-31.0	70

11-4 (x). Local control unit to amplifier/switch assembly cable length, where (x) is the length of the cable in feet. Available from 10 to 400 feet in 10 foot increments. 100 foot (30M) cable supplied as standard with rack mount controller. 10 foot (3M) cable supplied as standard with hub mounted controller.

11-5. Increased Gain60 dB minimum gain

11-6. Increased Output Power+20 dBm output power at 1 dB compression

11-7. Increased Gain Stability3 dB peak-to-peak maximum/-40 to +60°C

11-8. Remote ControlRS422/RS485 (supplied as standard)