S-Band Redundant LNA System

Redundant LNA systems minimize system downtime due to LNA failure by providing a spare LNA and an automatic means of switching to the spare upon failure of the primary LNA. The system consists of an outdoor plate assembly which mounts at the antenna hub and an indoor control panel.

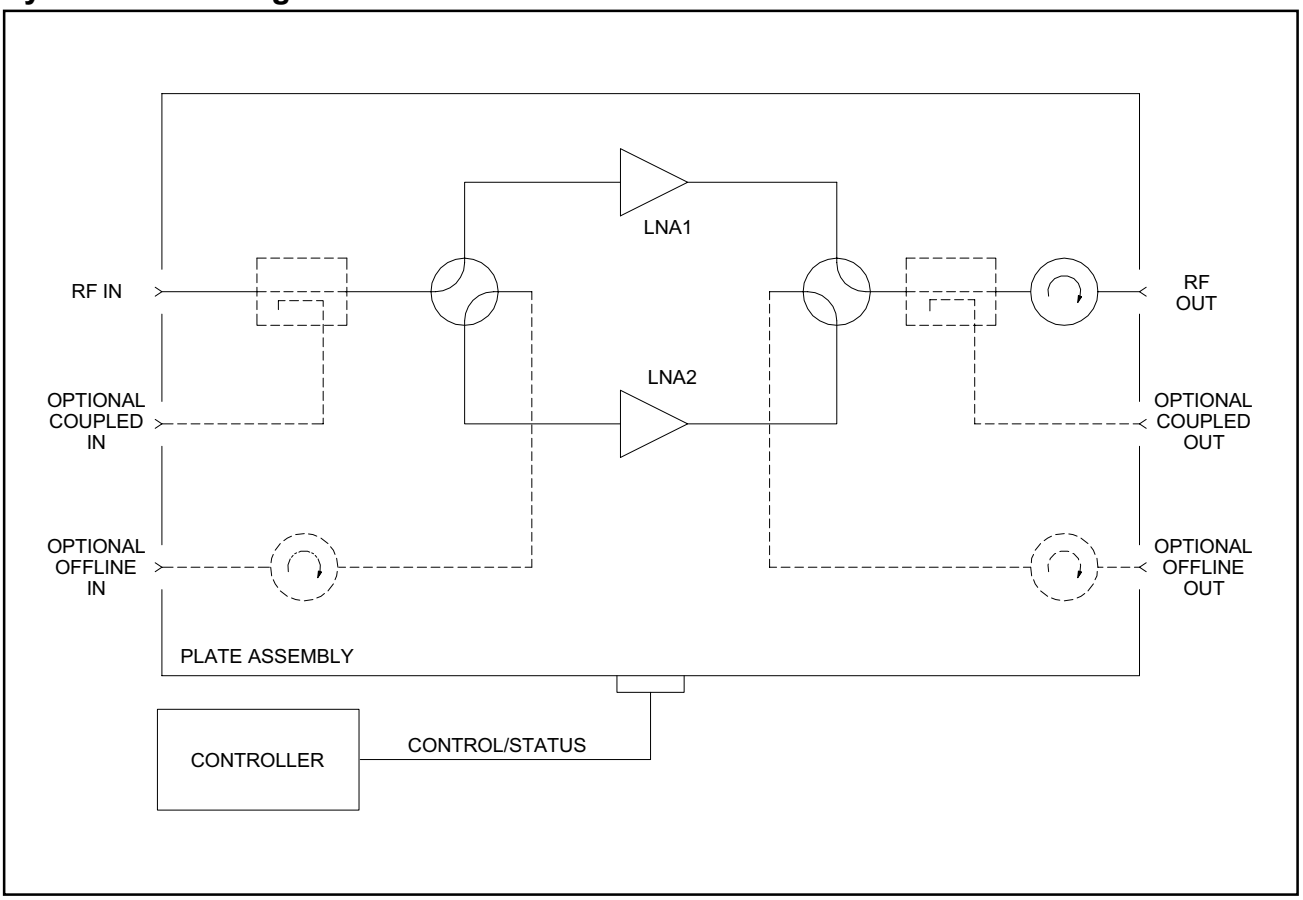
Plate Assembly Features

- VertexRSI Low Noise Amplifiers
- High quality dual coaxial switches
- Manual override
- Output coaxial isolator standard
- Input coupler, output coupler, and offline I/O options available

Control Panel Features

- Standard 19" rack panel, 3½" high
- Dual, redundant power supplies
- Worldwide universal AC input capability
- Manual or automatic operation
- Monitors LNA bias currents to detect faults
- Automatically switches to standby LNA when fault occurs
- RS232/422/485 serial I/O M&C interface
- Parallel I/O M&C interface
- Audible alarm

System Block Diagram



Specifications * LRS-1100 System

Parameter	Notes	Min	Nom/Typ†	Max	Units
Frequency Range	Band “A”	2.20		2.30	GHz
	Band “B”	2.30		2.40	GHz
	Band “C”	2.20		2.40	GHz
Noise Temperature, System	At +23 °C, standard			T_{LNA} + 10	K
	With input coupler			T_{LNA} + 25	K
	Versus temperature		See Table 1		
Gain		50	53		dB
Gain Match	Between LNAs			1	dB
Gain Flatness	Full band			±0.5	dB
	Per 10 MHz			±0.25	dB
Gain Stability	Per day, constant temp			±0.2	dB
	Versus temperature		-0.04		dB/°C
VSWR	Input, standard		1.25	1.30	:1
	Input, with coupler		1.30	1.40	:1
	Output		1.20	1.25	:1
Power Output	At 1 dB compression	+10	+13		dBm
Third Order Intercept	Output, OIP_3	+20	+23		dBm
AM/PM Conversion	At -5 dBm out			0.05	°/dB
Group Delay per 36 MHz	Linear			0.05	ns/MHz
	Parabolic			0.005	ns/MHz^2
	Ripple			1.0	ns p-p
Maximum Input Power	Without damage			+10	dBm
	Desens. threshold			-50	dBm
Connectors	RF Input, standard		SMA Female		
	RF Input, with coupler		Type N Female		
	RF Output		Type N Female		
	Offline In/Out (Optional)		Type N Female		
	Coupler In/Out (Optional)		Type N Female		
Temperature Range	Switch Plate Assy	-40		+60	°C

* System specifications depend on choice of LNA and various options. Specifications shown are for VertexRSI LS-2200 Series LNAs.

† When there is only one value on a line, this column is a nominal value. Otherwise it is a typical value. Typical values are intended to illustrate typical performance, but are not guaranteed.

Part Number/Ordering Information

(Copy and FAX this page to VertexRSI.)

LRS-1100 — Standard 1:1 LNA system includes a plate assembly with two LS-2200 Series LNAs, a 1:1 redundant LNA system controller, an interface cable (100 ft standard), one copy of the system O&M manual, and a set of system test data.

Specify LNA Model number: _____
(See LS-2200 Series specification sheet.)

Options Available:

❏ A. Cable length _____ ft or _____ m
(Up to 1000 ft [300 m] in 25 ft increments)

❏ B. Input Coupler:
❏ 30 dB (standard), or ❏ _____ dB

❏ C. Output Coupler:
❏ 20 dB (standard), or ❏ _____ dB

❏ D. Offline LNA Input/Output Ports:
❏ No isolators, or ❏ with isolators

❏ Remote Control Panel (RCP)

❏ Cable for Remote Panel:
_____ ft or _____ m
(Up to 4000 ft [1200 m] in 25 ft increments)

❏ Additional O&M Manuals, Qty. _____

Table 1 — Noise Temperature vs. Ambient Temperature

Noise temperature vs. ambient temperature can be found from the equation:

$$\frac{NT_2}{NT_1} = \left(\frac{T_2}{T_1}\right)^n$$

where
NT_2 = Noise Temperature at T_2
NT_1 = Noise Temperature at T_1
T_2 = Temperature 2 in K
T_1 = Temperature 1 in K
n = 1.5 for LNA, 1.0 for passive losses

For the case where T_1 = 296 K (+23 °C), the ratio NT_2/NT_1 is shown in the table below for both LNAs (n = 1.5) and for passive losses (n = 1.0):

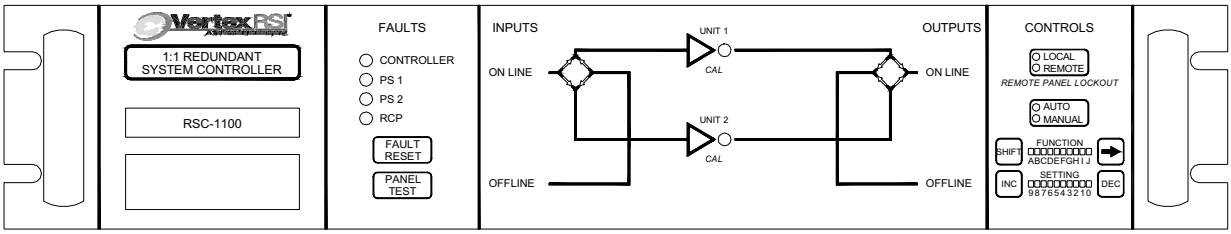
Ambient Temperature T_2 (°C)	n = 1.5 NT_2/NT_1	n = 1.0 NT_2/NT_1
0	0.89	0.92
+23	1.00	1.00
+40	1.09	1.06
+50	1.14	1.09
+60	1.19	1.13

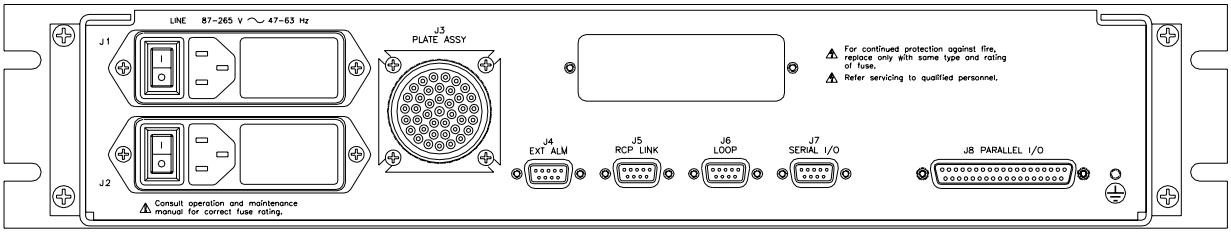
Example: 1:1 system with input coupler option and 50 K LNAs, model LSA-2250. T_{LNA} = 50 K at +23 °C, passive losses = 25 K at +23 °C; thus T_{SYS} = 75 K at +23 °C. What is T_{SYS} at +50 °C?

From the table, NT_2/NT_1 at 50 °C = 1.14 for the LNA and 1.09 for the passive losses. Thus,

NT_2 = 1.14 x (50 K) + 1.09 x (25 K)
= 57.0 K + 27.3 K
= 84.3 K at 50 °C.

1:1 Controller Front and Rear Panels





Specifications Controller

LNA Status Monitor Method	Control panel monitors LNA bias current. Alarm is generated if current goes outside of allowed tolerance window.
Window Width	±5% to ±25% of nominal; software selectable in 5% steps
Switchover Time	100 ms
Serial I/O:	
Interface	RS-232/RS-422 /RS-485 2- or 4-wire
Connector	9-Pin D, female
Parallel I/O:	
Status outputs	Form ‘C’ dry contacts; 100 Vdc / 0.5 A / 3 W max (resistive load)
Control inputs	Contact closures to ground; withstand 15 V, sink 20 mA
Connector	37-pin D, male
Control Panel Dimensions	19" (483 mm) W x 3.47" (88.1 mm) H x 17.5" (445 mm) D; 25 lb (11.4 kg)
Chassis Slides	Standard
Cable Length to Plate Assy	100 ft (30 m) standard, up to 1000 ft (300 m) optionally available
AC Input	87-265 Vac, 47–63 Hz, 100 W. Dual AC inputs and dual redundant power supplies.
Operating Temp. Range	0 to +50 °C

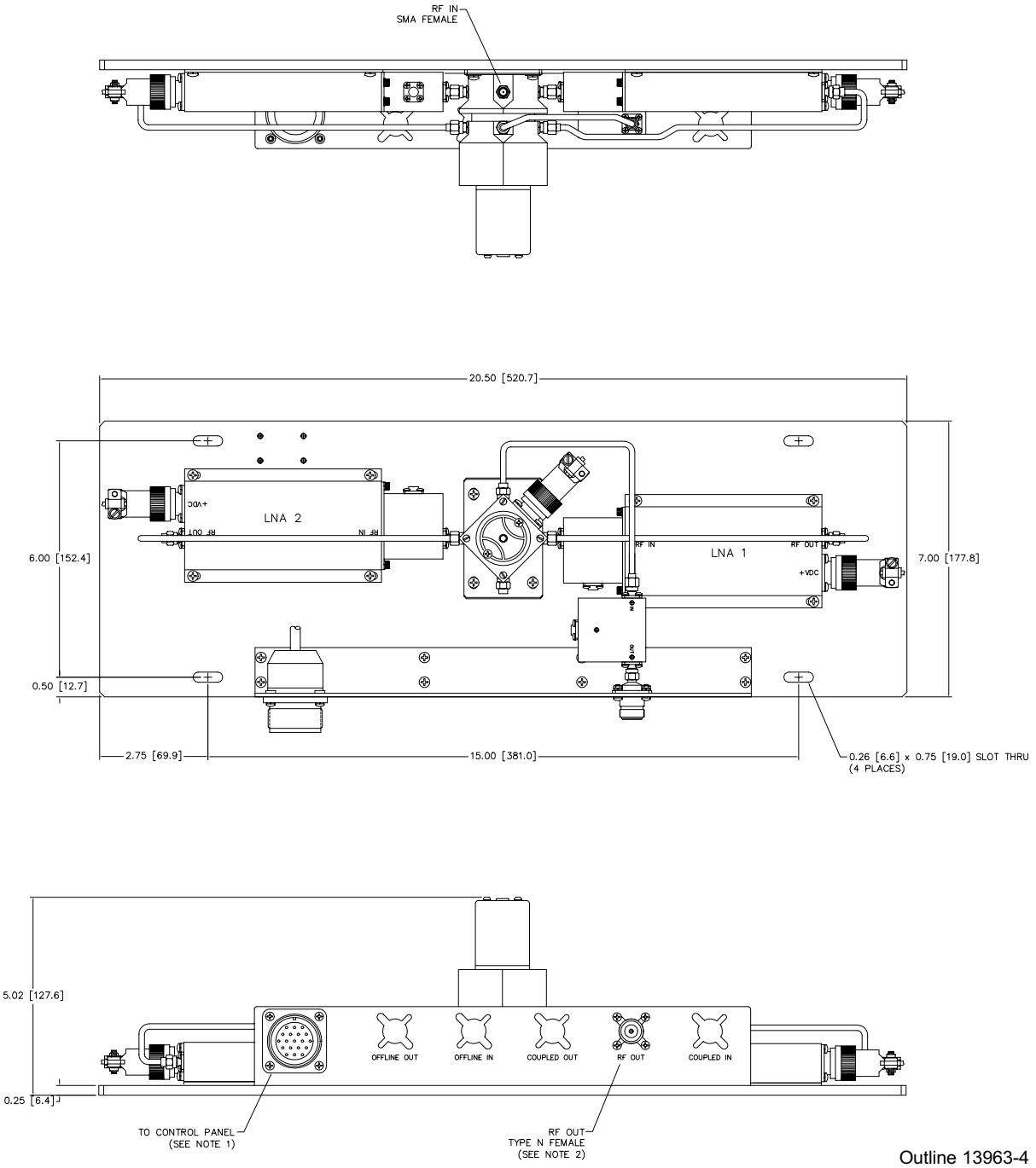
Front Panel Controls and Indicators	
LNA Status Alarms	LED Indicators glow green when OK, red when an LNA fault is detected.
PS1, PS2 Indicators	Glow red to show fault with dual redundant power supplies.
Panel Test Pushbutton	Lights all indicators & test audible alarm.
Unit Pushbuttons and Indicators	Pushbuttons are used to manually switch the LNAs. Arrow indicators show which LNAs are switched on-line. Unit indicators light red to show faulted LNAs. In 1:1 systems, LNA1 is normally the primary LNA and LNA2 is on standby.
Auto/Manual Switch and Indicators	In Auto mode, an LNA failure initiates automatic switchover to the standby LNA. In manual mode, the on-line LNA can be selected from the front panel.
Remote/Local Switch and Indicators	Selects local control or remote control from serial I/O or parallel I/O or optional remote panel.

Rear Panel I/O Interface	
LINE 1 - J1, LINE 2 - J2	Dual power entry modules contain the AC line input connector, fuses, and power switch. System can be powered from separate AC lines if desired. Either or both power supplies are capable of operating the system.
TO PLATE ASSEMBLY - J3	Cable to antenna plate assembly carries LNA power and switch drive signals. System normally supplied with 100 feet of control cable; other lengths are optional.
Parallel I/O - J8	Parallel I/O connection for customer control or monitoring. Capable of controlling all features of the system except remote/local switch. Form ‘C’ relay contact outputs: • LNA1 status • PS1 status • Auto/Manual mode • LNA2 status • PS2 status • Local/Remote mode • Switch position Control inputs—contact closure to ground: • LNA1 select • LNA2 select • Auto/Manual select
Serial I/O and Loop - J6 & J7	RS-232/RS-422/RS-485 connectors for user M&C System. Commands provide monitoring, controlling, and configuration.
RCP Link - J5	For optional Remote Control panel, which duplicates all front panel functions.
External Alarm - J4	External Alarm inputs. Substitute for or combine with internal LNA current monitor alarms. Allows an external signal to indicate LNA failure. Unused inputs can be used as status inputs to M&C system.

1:1 Plate Assembly Outline (Standard Configuration):

NOTES:

1. INTERCONNECTING CABLE AND MATING CONNECTOR INCLUDED BUT NOT SHOWN.
2. OUTPUT ISOLATOR INCLUDED WITH STANDARD SYSTEM.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. TOLERANCE – ±0.02 [0.5].

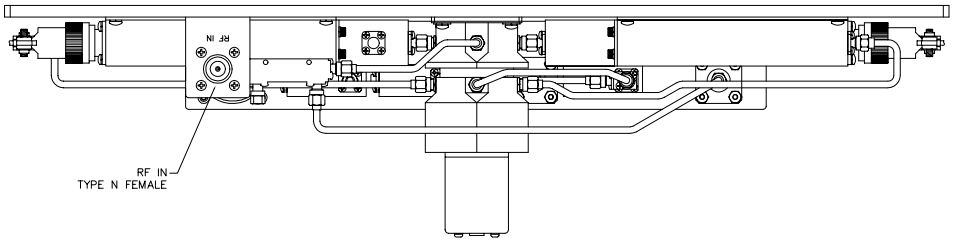


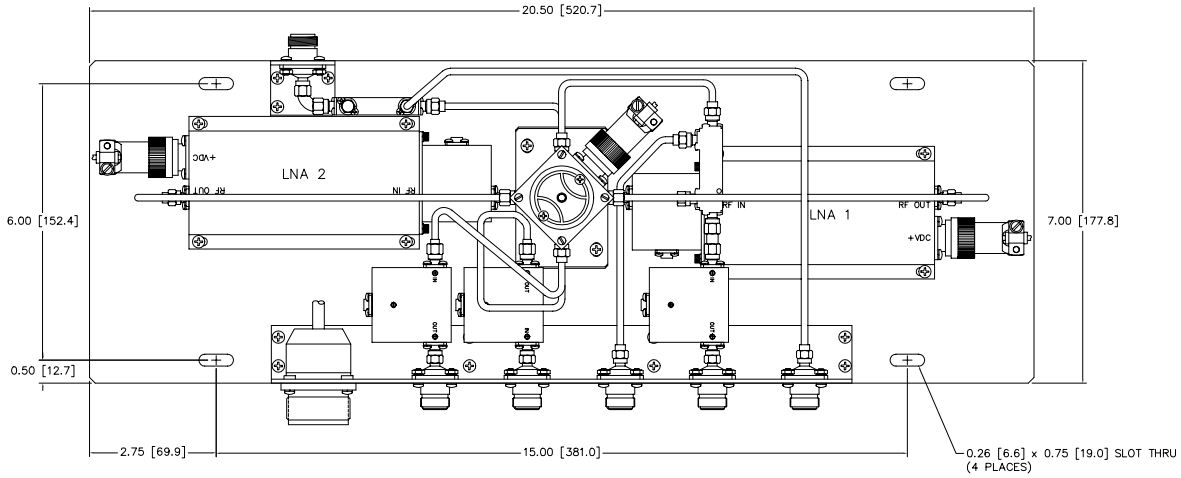
Outline 13963-4

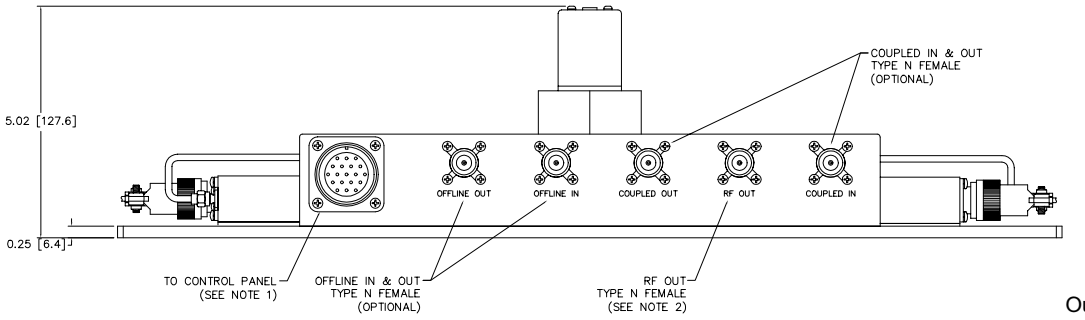
1:1 Plate Assembly Outline (With Options):

NOTES:

1. INTERCONNECTING CABLE AND MATING CONNECTOR INCLUDED BUT NOT SHOWN.
2. OUTPUT ISOLATOR INCLUDED WITH STANDARD SYSTEM.
3. OFFLINE OUTPUT ISOLATOR IS SHOWN (OPTIONAL).
4. COUPLED INPUT/OUTPUT OPTION IS SHOWN.
5. DIMENSIONS ARE IN INCHES [MILLIMETERS].
6. TOLERANCE – ±0.02 [0.5].







Outline 13963-5

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- **Satellite Communications Equipment**
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Specifications are subject to change at VertexRSI's discretion.

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