

Ku-Band Redundant LNB Systems

Introduction

Redundant LNB systems minimize system downtime due to LNB failure by providing a spare LNB and an automatic means of switching to the spare upon failure of a primary LNB. A 1:1 system provides one spare LNB for one primary LNB. A 1:2 system provides one spare LNB for either of two primary LNBs. The systems consist of an outdoor plate assembly which mounts at the antenna hub and an indoor control panel.

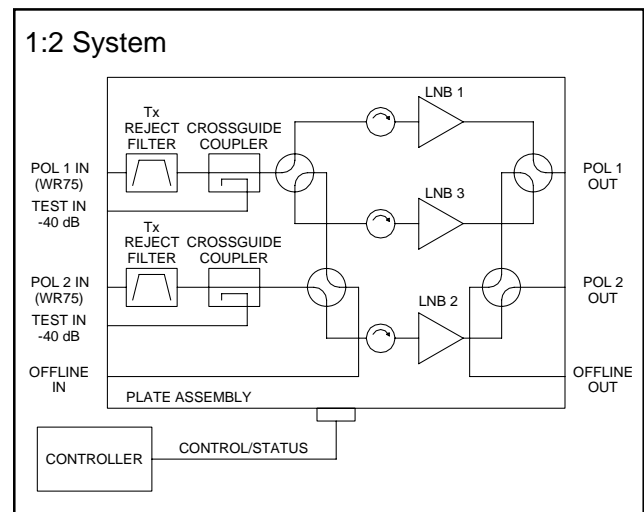
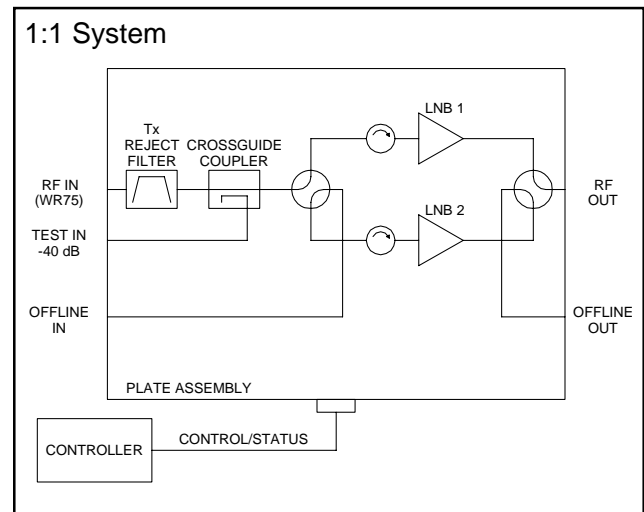
Plate Assembly Features

- Norsat PLL LNBs
- High quality dual waveguide/coaxial switches
- Manual override
- Waveguide input flanges
- Tx reject filter(s), coupler(s), offline I/O, and input isolator 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 LNB bias currents to detect faults
- Automatically switches to standby LNB when fault occurs
- RS-232/-422/-485 and parallel I/O M&C interfaces
- Audible alarm

System Block Diagrams



System Specifications * BRK-1000 Systems

Parameter	Notes	Min	Nom/Typt	Max	Units
Input Frequency Range	Band A	11.70		12.20	GHz
	Band B	12.25		12.75	GHz
	Band C	10.95		11.70	GHz
Output Frequency Range	Bands A, B	950		1450	MHz
	Band C	950		1700	MHz
Noise Temperature, System	At +23 °C Versus temperature		See Table 1 See Table 2		
Gain	Standard LNB	55	60		dB
Gain Flatness	Per 27 MHz			±0.50	dB
Gain Stability	Per day, constant temp Versus temperature			±0.25	dB
			-0.06		dB/°C
VSWR	Input, no isolator(s)		2.00		:1
	Input, with isolator(s)		1.25	1.30	:1
	Input with isolator(s) and Tx reject filter(s)		1.30	1.35	:1
		Output (75 ohm)		1.80	2.00
Power Output	At 1 dB compression	+2	+5		dBm
Third Order Intercept	Output (OIP ₃)	+12	+15		dBm
Local Oscillator Frequency	Band A		10.75		GHz
	Band B		10.00		GHz
	Band D		11.30		GHz
Frequency Stability	-40 to +60 °C		±10		kHz
Phase Noise	100 Hz Offset		-65		dBc/Hz
	1 kHz Offset		-75		dBc/Hz
	10 kHz Offset		-80		dBc/Hz
	100 kHz Offset		-90		dBc/Hz
Maximum Input Power	Without damage			0	dBm
Desensitization Threshold for 13.75-14.5 GHz in	No Tx filter(s)			-20	dBm
	With Tx filter(s)			+30	dBm
Connectors	RF Input	WR75F Waveguide Flange			
	RF Output	Type F Female			
	Offline In, Coupler In	Type N Female			
	Offline Out	Type F Female			
Temperature Range	Switch Plate Assy	-40		+60	°C

† 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.

* System specifications depend on choice of LNB and various options. Specifications shown are for a typical system using commercially available LNBs. Order LNBs separately by model number or frequency range.

Part Number/Ordering Information

(Copy and FAX this page to General Dynamics.)

BRK-

Standard system includes:*

	LNBs*	Controller	Plate Assy	O&M Manuals	Test Data
<input type="checkbox"/> 1100 = 1:1 System	2	1	1	1	X
<input type="checkbox"/> 1200 = 1:2 System	3	1	1	1	X

* LNB Model number: _____ (Order separately).

Options Available:

- | | |
|---|--|
| <input type="checkbox"/> Cable length _____ ft or _____ m
(Up to 500 ft [150 m] in 50 ft increments) | <input type="checkbox"/> Remote Control Panel (RCP) |
| <input type="checkbox"/> Waveguide Input Isolator(s) | <input type="checkbox"/> Cable for Remote Panel
_____ ft or _____ m (Up to
4000 ft [1200 m] in 50 ft increments) |
| <input type="checkbox"/> Transmit Reject Filter(s) | <input type="checkbox"/> Additional O&M Manuals, Qty.: _____ |
| <input type="checkbox"/> Input Crossguide Coupler(s)
<input type="checkbox"/> 40 dB (std), <input type="checkbox"/> _____ dB | <input type="checkbox"/> ±48 Vdc Power Option |
| <input type="checkbox"/> Offline LNB Input/Output Ports | |

Table 1 — Typical System Noise Temperature with Various Options (Add to T_{LNB})**

System Configuration	1:1		1:2		
			Pol. 1	Pol. 2	Standby
Standard Configuration (Add to T _{LNB})		10 K	10 K	14 K	19 K
With 40 dB Crossguide Coupler(s)	Add 2 K to Standard Configuration				
With Transmit Reject Filter(s)	Add 13 K to Standard Configuration				
With Waveguide Isolator(s)	Add 10 K to Standard Configuration				

Example: For a 1:1 system with 75 K LNBs, waveguide isolator and Tx reject filter, the system noise temperature at +23 °C is given by: T_{sys} = 75 K (LNB) + 10 K (Standard configuration) + 10 K (isolator) + 13 K (filter) = 108 K

** General Dynamics has found that commercial Ku-band LNBs may measure up to 15K higher than stated noise temperature. Consequently, General Dynamics cannot guarantee system noise performance.

Table 2 — Noise Temperature vs. Ambient Temperature

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

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

NT₂ = Noise Temperature at T₂
 NT₁ = Noise Temperature at T₁
 T₂ = Temperature 2 in K
 T₁ = Temperature 1 in K
 n = 1.8 for LNB, 1.0 for passive losses

For the case where T₁ = 296 K (+23 °C), the ratio NT₂/NT₁ is shown in the table at right for both LNBs (n = 1.8) and for passive losses (n = 1.0):

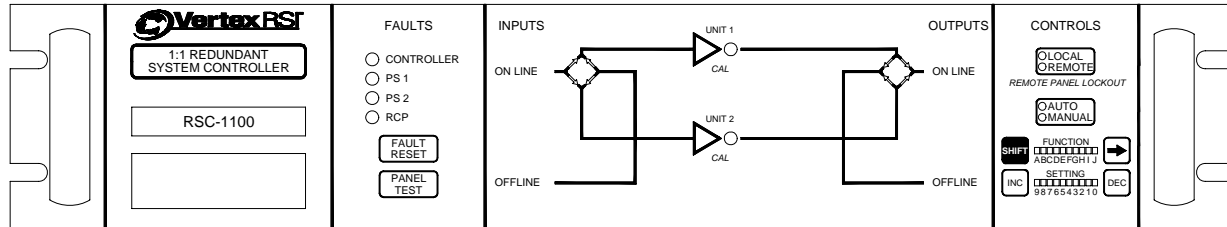
Ambient Temperature T ₂ (°C)	n = 1.8 NT ₂ /NT ₁	n = 1.0 NT ₂ /NT ₁
0	0.86	0.92
+23	1.00	1.00
+40	1.11	1.06
+50	1.17	1.09
+60	1.24	1.13

Example: 1:1 system with Tx filter and 80 K LNB. T_{LNB} = 80 K at +23 °C, passive losses = 23 K at +23 °C; thus T_{sys} = 103 K at +23 °C. What is T_{sys} at +50 °C?

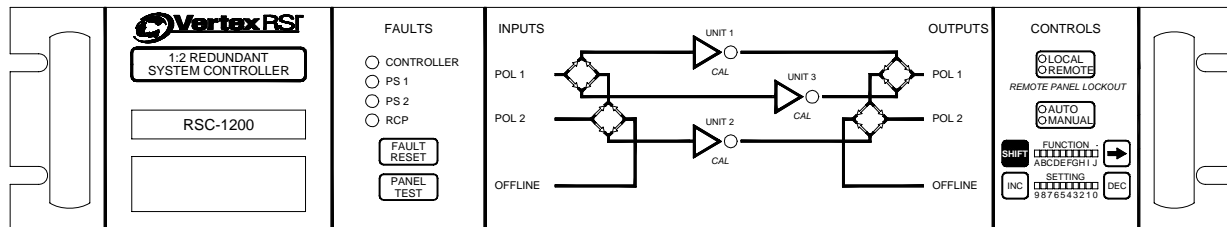
From the table, NT₂/NT₁ at 50 °C = 1.17 for the LNB and 1.09 for the passive losses.

$$NT_2 = 1.17 \times (80 \text{ K}) + 1.09 \times (23 \text{ K}) = 93.6 \text{ K} + 25.1 \text{ K} = 118.7 \text{ K at } +50 \text{ }^\circ\text{C}.$$

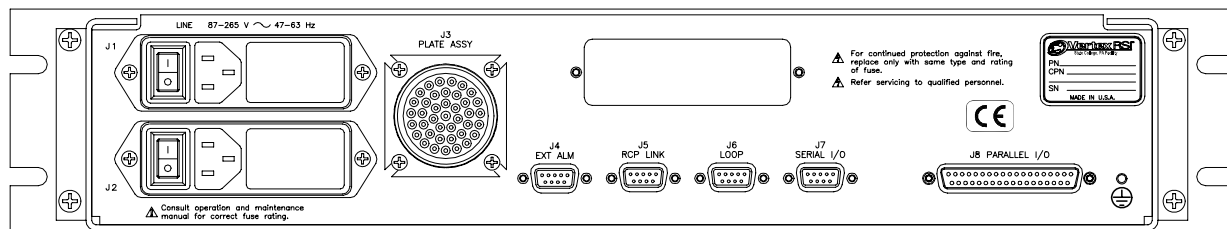
Controller Front Panel (1:1 System):



Controller Front Panel (1:2 System):



Controller Rear Panel (All models):



Specifications

Controller

LNB Status Monitor Method	Control panel monitors LNB 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 Connector	RS-232/RS-422/RS-485 2- or 4-wire 9-Pin D, female
Parallel I/O: Status outputs Control inputs Connector	Form 'C' dry contacts; 100 Vdc, 0.5 A, 3 W max (resistive load) Contact closures to ground; withstand 15 V, sink 20 mA 37-pin D, male
Controller 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	Order cable separately. 100 ft (30 m) to 500 ft (150 m) lengths in 50 ft (15 m) increments are standard; other lengths are available by special order.
AC Input	87-265 Vac, 47-63 Hz, 100 W. Dual AC inputs and dual redundant power supplies.
Operating Temperature Range	0 to +50 °C

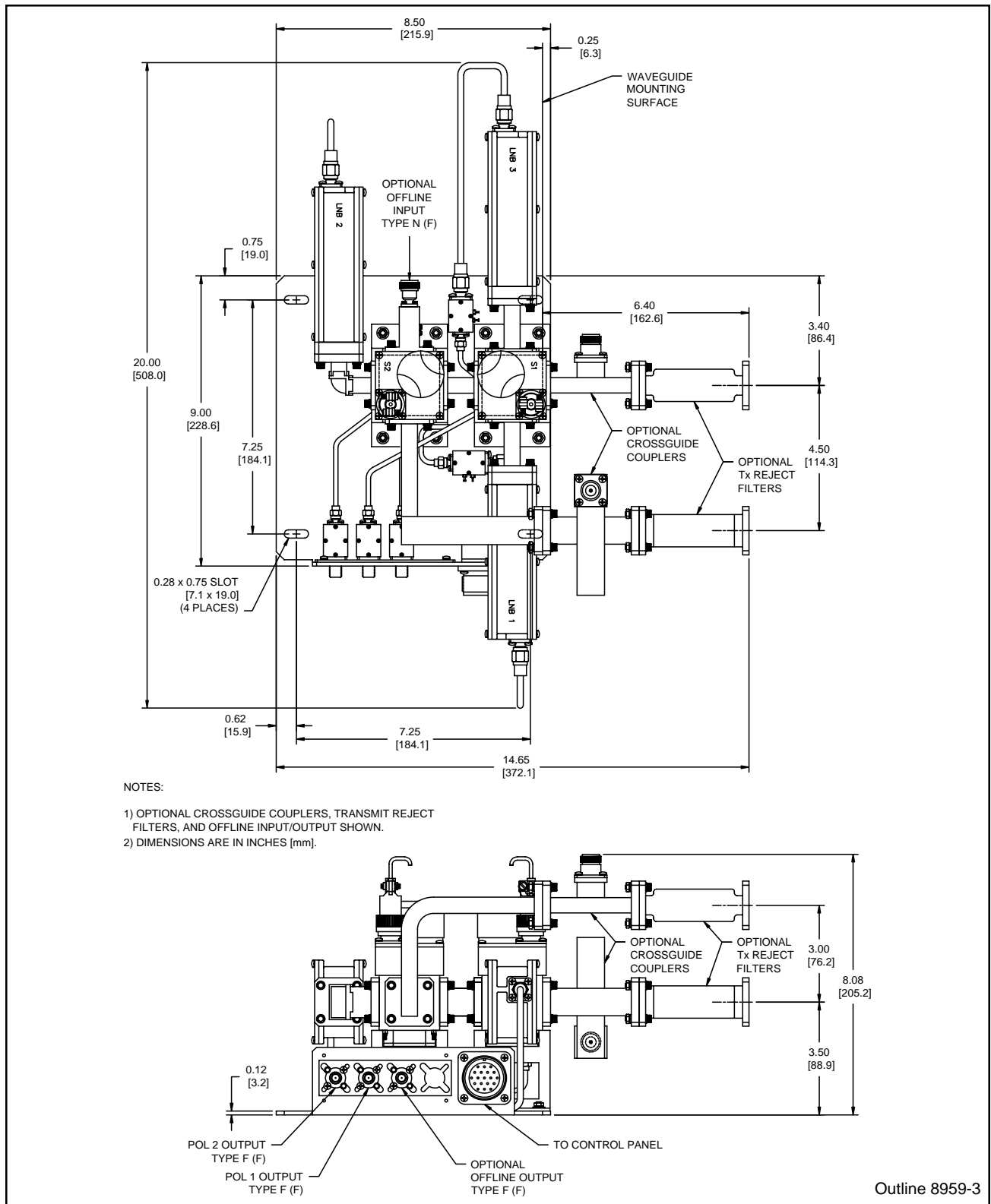
Front Panel Controls and Indicators

LNB Status Alarms	LED Indicators glow green when OK, red when an LNB 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 LNBs. Arrow indicators show which LNBs are switched on-line. Unit indicators light red to show faulted LNBs. In 1:1 systems, LNB1 is normally the primary LNB and LNB2 is on standby. In 1:2 systems, LNB1 and LNB2 are the primary LNBs for Polarization 1 and Polarization 2, respectively. LNB3 is the standby LNB and can be selected for either polarization.
Auto/Manual Switch and Indicators	In Auto mode, an LNB failure initiates automatic switchover to the standby LNB. In manual mode, the on-line LNB can be selected from the front panel.
Remote/Local Switch and Indicators	Selects either local control, or remote control from serial I/O, parallel I/O, or 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 LNB power and switch drive signals. Order cable separately. Standard lengths are from 100' (30 m) to 500' (150 m) in 50' (15 m) increments; other lengths are special order.
Parallel I/O - J8	<p>Parallel I/O connection for customer control or monitoring. Capable of controlling all features of the system except remote/local switch.</p> <p>Form 'C' relay contact outputs (1:1 systems):</p> <ul style="list-style-type: none"> • LNB1 status • LNB2 status • Switch position • PS1 status • PS2 status • Auto/Manual mode • Local/Remote mode <p>Control inputs—contact closure to ground (1:1 systems):</p> <ul style="list-style-type: none"> • LNB1 select • LNB2 select • Auto/Manual select <p>Form 'C' relay contact outputs (1:2 systems):</p> <ul style="list-style-type: none"> • LNB1 status • LNB2 status • LNB3 status • PS1 status • PS2 status • Local/Remote mode • Auto/Manual mode • Pol. 1: LNB1 or LNB3 • Pol. 2: LNB2 or LNB3 <p>Control inputs—contact closure to ground (1:2 systems):</p> <ul style="list-style-type: none"> • Pol. 1: LNB1 select • Pol. 1: LNB3 select • Pol. 2: LNB2 select • Pol. 2: LNB3 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 LNB current monitor alarms. Allows an external signal to indicate LNB failure. Unused inputs can be used as status inputs to M&C system.

1:2 Plate Assembly Outline Drawing, with Various Options Installed



Outline 8959-3

OTHER VertexRSI PRODUCTS

- **Low Noise Amplifiers and LNA Systems**
- **Solid-State Power Amplifiers and SSPA Systems**
- **General Purpose Converters**
- **Satellite Communications Equipment**
- **Custom Subsystems**



11673 Rev. H ECR 9806 12/21/09 MSI
Specifications are subject to change at GD SATCOM's discretion.