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

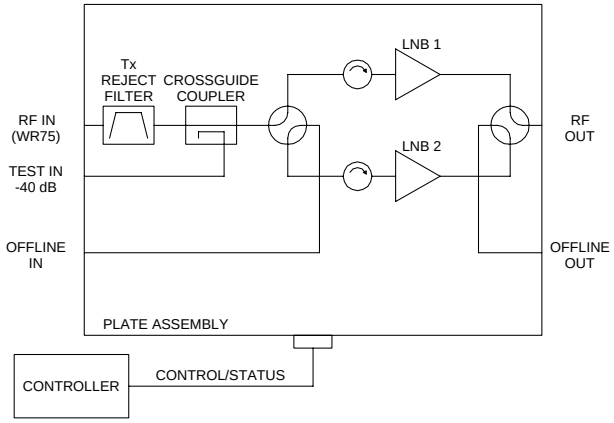
- Norsat PLL LNBs
- High quality dual waveguide/coaxial switches
- Manual override
- Waveguide input flanges
- Tx reject filter(s), coupler(s), offline I/O, and input isolator options available

Control Panel Features

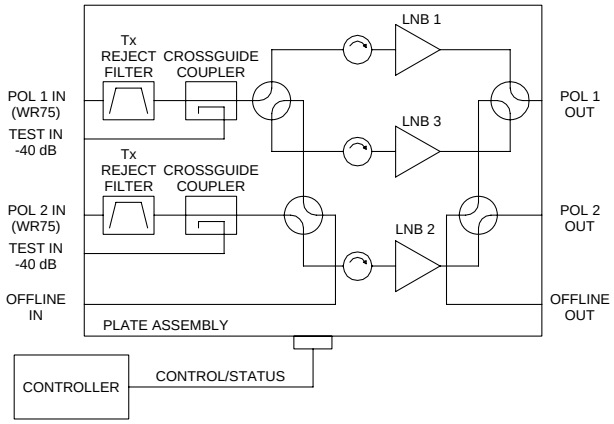
- Standard 19" rack panel, 3½" high
- Dual, redundant power supplies
- Worldwide universal AC input capability
- Manual or automatic operation
- Monitors LNB bias currents to detect faults
- Automatically switches to standby LNB when fault occurs
- RS-232/-422/-485 and parallel I/O M&C interfaces
- Audible alarm

System Block Diagrams

1:1 System



1:2 System



CE

2120 Old Gatesburg Road, State College, PA 16803 USA
Telephone 814-238-2700 • FAX 814-238-6589 • *www.tripointglobal.com*

Vertex RSI

System Specifications * BRK-1000 Systems

Parameter	Notes	Min	Nom/Typ†	Max	Units
Input Frequency Range	Band A Band B Band D	11.70 10.95 12.25		12.20 11.70 12.75	GHz GHz GHz
Output Frequency Range	Bands A, D Band B	950 950		1450 1700	MHz 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		 -0.06	±0.25	dB dB/°C
VSWR	Input, no isolator(s) Input, with isolator(s) Input with isolator(s) and Tx reject filter(s) Output (75 ohm)		2.00 1.25 1.30 1.80	 1.30 1.35 2.00	:1 :1 :1 :1
Power Output	At 1 dB compression	+2	+5		dBm
Third Order Intercept	Output (OIP_3)	+12	+15		dBm
Local Oscillator Frequency	Band A Band B Band D		10.75 10.00 11.30		GHz GHz GHz
Frequency Stability	-40 to +60 °C		±10		kHz
Phase Noise	100 Hz Offset 1 kHz Offset 10 kHz Offset 100 kHz Offset		-65 -75 -80 -90		dBc/Hz dBc/Hz dBc/Hz dBc/Hz
Maximum Input Power	Without damage			0	dBm
Desensitization Threshold for 13.75-14.5 GHz in	No Tx filter(s) With Tx filter(s)			-20 +30	dBm dBm
Connectors	RF Input RF Output Offline In, Coupler In Offline Out		WR75F Waveguide Flange Type F Female Type N Female 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.

Part Number/Ordering Information

(Copy and FAX this page to VertexRSI.)

BRK-[ ]

	Standard system includes:					
	LNBs	Controller	Plate Assy	Cable Assy	O&M Manuals	Test Data
❑ 1100 = 1:1 System	2	1	1	100 ft	1	x
❑ 1200 = 1:2 System	3	1	1	100 ft	1	x

LNB Model number: _____

Options Available:

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

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

	1:1	1:2		
System Configuration		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

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

Table 2 — Noise Temperature vs. Ambient Temperature

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

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

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 = 1.8 for LNB, 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 at right for both LNBs (n = 1.8) and for passive losses (n = 1.0):

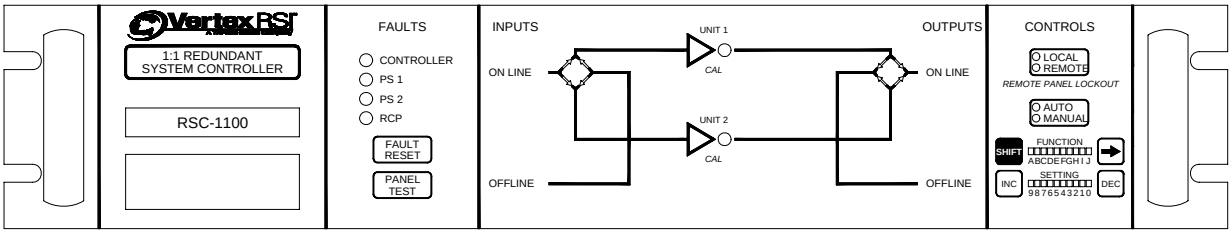
Ambient Temperature T_2 (°C)	n = 1.8 NT_2/NT_1	n = 1.0 NT_2/NT_1
0	0.86	0.92
+23	1.00	1.00
+40	1.11	1.06
+50	1.17	1.09
+60	1.24	1.13

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?

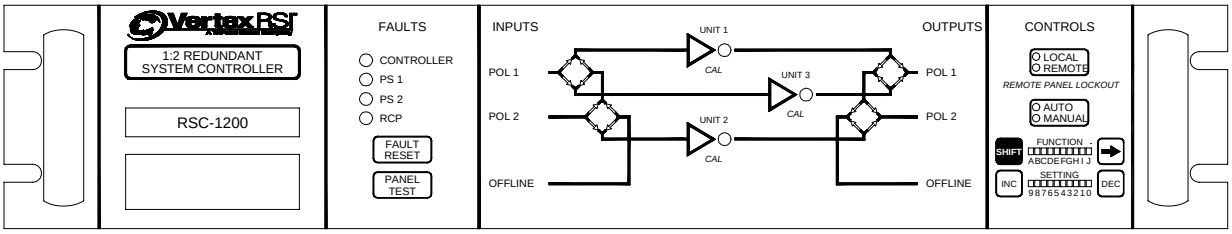
From the table, NT_2/NT_1 at 50 °C = 1.17 for the LNB and 1.09 for the passive losses.

NT_2 = 1.17 x (80 K) + 1.09 x (23 K)
= 93.6 K + 25.1 K = 118.7 K at +50 °C.

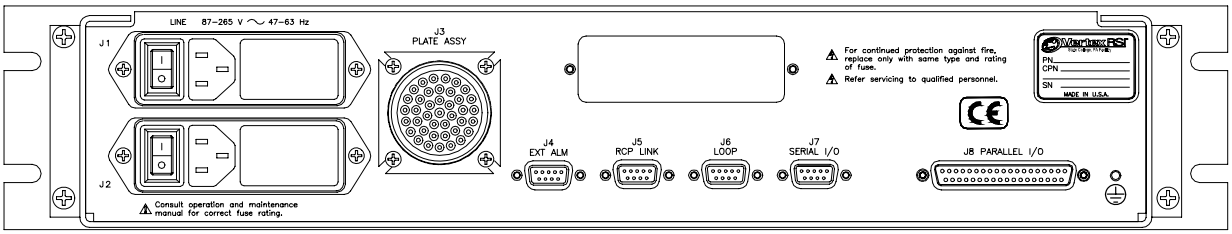
Controller Front Panel (1:1 System):



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	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
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	100 ft (30 m) to 250 ft (75 m) available
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

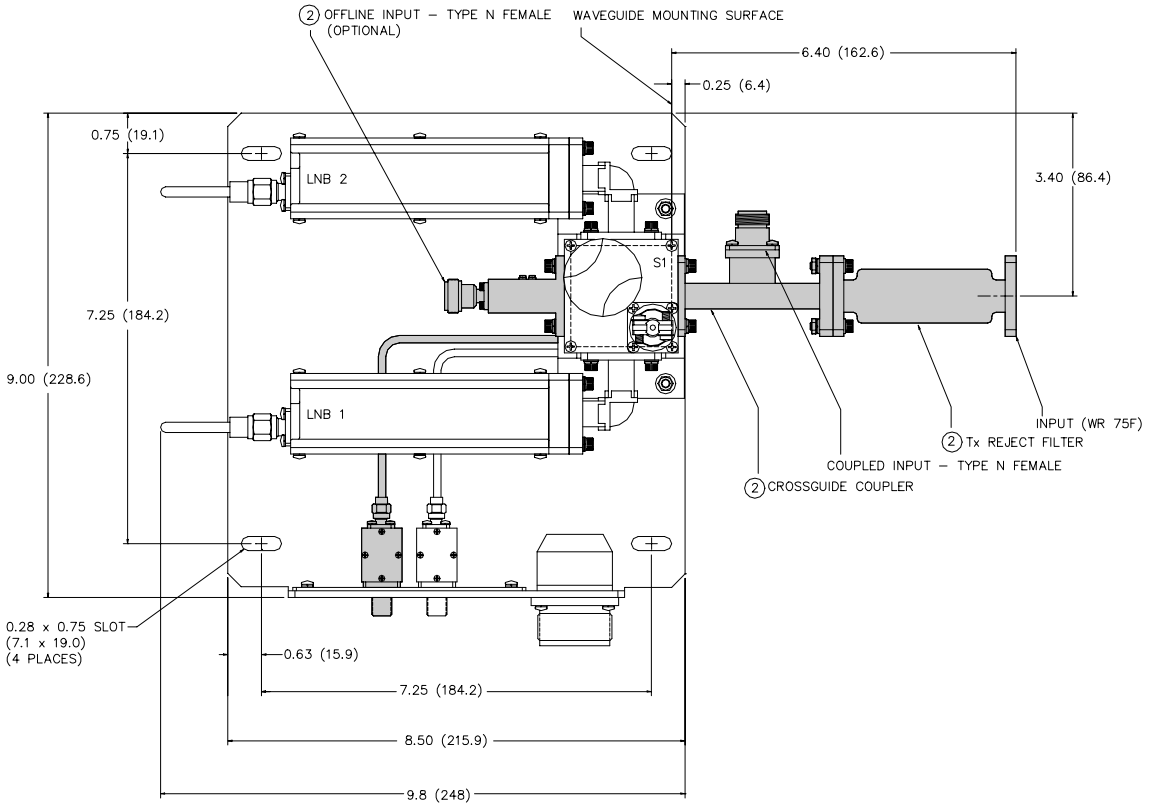
Front Panel Controls and Indicators

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. 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 (1:1 systems): • LNB1 status • PS1 status • Auto/Manual mode • LNB2 status • PS2 status • Local/Remote mode • Switch position Control inputs—contact closure to ground (1:1 systems): • LNB1 select • LNB2 select • Auto/Manual select Form 'C' relay contact outputs (1:2 systems): • LNB1 status • PS1 status • Auto/Manual mode • LNB2 status • PS2 status • Pol. 1: LNB1 or LNB3 • LNB3 status • Local/Remote mode • Pol. 2: LNB2 or LNB3 Control inputs—contact closure to ground (1:2 systems): • Pol. 1: LNB1 select • Pol. 2: LNB2 select • Auto/Manual select • Pol. 1: LNB3 select • Pol. 2: LNB3 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.

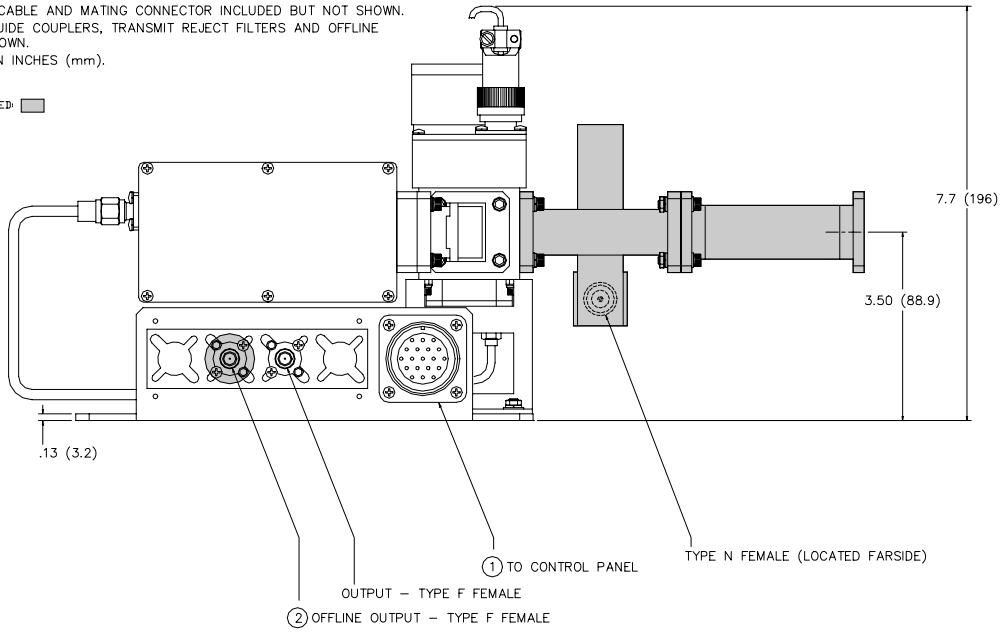
1:1 Plate Assembly Outline Drawing, with Various Options Installed



NOTES:

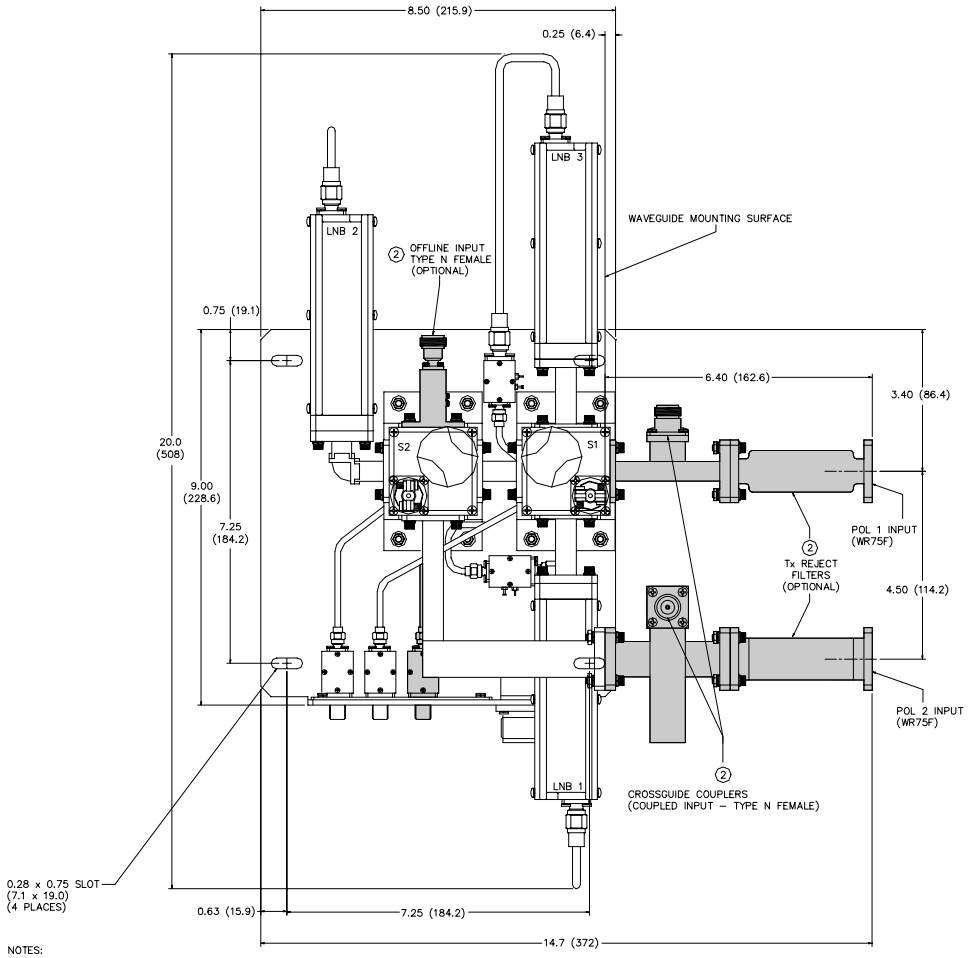
1) INTERCONNECTING CABLE AND MATING CONNECTOR INCLUDED BUT NOT SHOWN.
2) OPTIONAL CROSSGUIDE COUPLERS, TRANSMIT REJECT FILTERS AND OFFLINE INPUT/OUTPUT SHOWN.
3) DIMENSIONS ARE IN INCHES (mm).

OPTIONAL ITEMS ARE SHADED:



Outline 8960-3

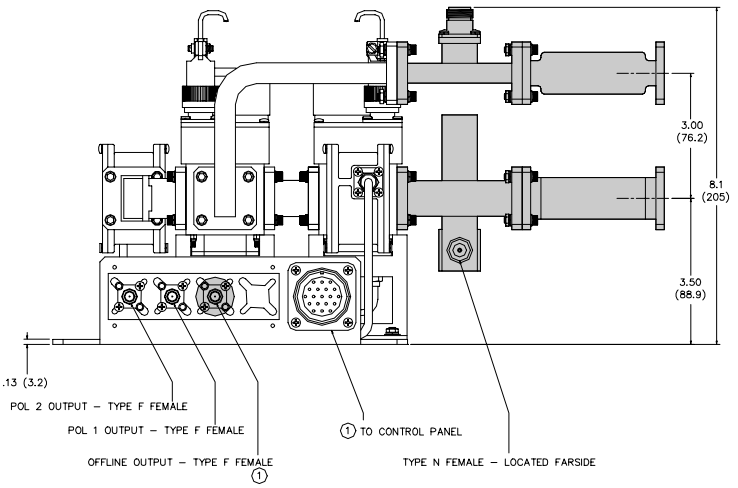
1:2 Plate Assembly Outline Drawing, with Various Options Installed



NOTES:

1) INTERCONNECTING CABLE AND MATING CONNECTOR INCLUDED BUT NOT SHOWN.
2) OPTIONAL CROSSGUIDE COUPLERS, TRANSMIT REJECT FILTERS AND OFFLINE INPUT/OUTPUT SHOWN.
3) DIMENSIONS ARE IN INCHES [mm].

OPTIONAL ITEMS ARE SHADED:



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. E ECR 6740 9/20/05 GLK

2120 Old Gatesburg Road, State College, PA 16803 USA • Telephone 814-238-2700 • FAX 814-238-6589
www.tripointglobal.com