Carina Splitter/Combiner Manual

Carina Splitter/Combiner Manual

Revision History

Style Sheet is: X:\Company\SmartMasters\Orion

Filenames are:
X:\Company\Manuals\ReferenceManual\Components\CarinaSplitterCombiner\RevB\CarinaSplitterCombinerManual.lwp
X:\Company\Manuals\ReferenceManual\Components\CarinaSplitterCombiner\RevB\CarinaSplitterCombinerTitlePage

Rev	Date	Author	Description
A;	23 April 99	Brad Tavner	Initial release.
B	23 May 01	Brad Tavner	Design updates.

Approval: _____

Table of Contents

This page intentionally left blank.

1. Introduction

Congratulations on your choice of Carina Splitter/Combiner, a part of the Nanometrics Libra Satellite Seismograph System. As you use your new Carina Splitter/Combiner we know you will appreciate the many features that provide excellent performance.

It is very important to understand how the Carina Splitter/Combiner operates before you use it. On the following pages you will find a wealth of information regarding all aspects of Carina Splitter/Combiner. Please read the instructions carefully.

If you have problems or need technical support, please submit requests for technical support by e-mail or fax. This permits you to fully explain your problem and include "evidence" as it allows us to submit your problem to the most knowledgeable person for reply.

by e-mail: **support@nanometrics.ca**

by fax: **To: Support at fax (613) 592-5929**

by phone: **Please ask for Support at (613) 592-6776**

Nanometrics Inc.
250 Herzberg Road
Kanata, Ontario Canada
K2K 2A1

This page intentionally left blank.

2. Organization of this Manual

This manual is organized in ten major sections:

Chapter 1	**Introduction** Introductory notes to this manual.
Chapter 2	**Organization of this Manual** Notes on how to use this manual.
Chapter 3	**Unpacking and Post Delivery Inspection** Identification of the components you have purchased. It also references an "as-shipped" section.
Chapter 4	**Technical Description** Description of features and technical specifications of the Carina Splitter/Combiner
Chapter 5	**Installation** How to install Carina Splitter/Combiner
Chapter 6	**Servicing** Recommended maintenance and repair procedures.
Appendix A	Connector Pinouts
Appendix B	Specifications

This page intentionally left blank.

3. Unpacking & Post Delivery Inspection

Open and inspect the shipment for possible damage. Carefully check each item for damage or defects. Carina Splitter/Combiner is usually shipped built into the Carina Hub, which is a standard 19" rack and a part of the Libra System Central Site. Carina Hubs may have various configurations. To find out the exact list of items included in your shipment refer to the shipping documents.

Checking the As-Shipped Sheets

As written, this manual covers the Carina Splitter/Combiner. Please study the as-shipped data sheet to determine the exact configuration of the Splitter/Combiner. The as-shipped sheet lists the serial numbers of the parts shipped, the exact hardware configuration and calibration constants associated with your hardware. It also includes a hard copy of the as-shipped sheet of the Carina Splitter/Combiner. This will determine how your Carina Splitter/Combiner operates when first turned on.

Calibration

The Carina Splitter/Combiner insertion loss must be calibrated at the assigned transmit frequency. This calibration is typically performed during installation. The calibration procedure is described in the Libra central station installation procedure tutorial.

This page intentionally left blank.

4. Technical Description

Overview of the Hardware

The Carina Splitter/Combiner allows up to 4 Carina transceivers to share a single antenna at a Libra satellite network hub station.

The Carina Splitter/Combiner integrates all the necessary hardware to power the LNB and SSPB. It also splits the receive (LNB) signal four ways and combines 4 transmit inputs into one output for the SSPB. Lastly, it distributes the SSPB temperature signal to four Carina transceivers.

The Carina Splitter/Combiner enables the Carina transceivers to operate independently from one another. If one Carina transceiver stops working, the remaining Carina transceivers can continue to operate without interruption. Note that two Carina transceivers cannot transmit at the same time. This is a limitation of the SSPB not the Carina Splitter/Combiner.

Carina Splitter/Combiner is packaged in a 19" Rackmount box which is 2U high. All the connectors are mounted on the rear face of the box as shown in the Figure 1.

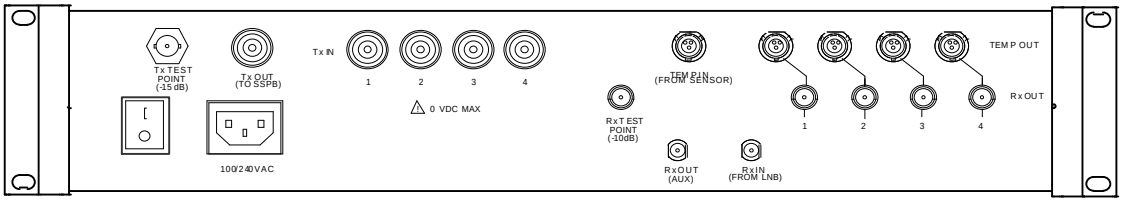

Figure 1: Rear view of Splitter/combiner

DC Power

The 24 Volt power supply input is an autoranging 110/220 VAC, 50/60 Hz type.

DC Power for the SSPB and LNB is supplied by Carina Splitter/Combiner 24 Volt power supply. This generates sufficient voltage to compensate for resistive voltage losses of the transmit RF cable, which is typically 30m in length.

The DC power is fed to the SSPB by the Bias Tee, which outputs +24 VDC on the coax cable center conductor. The Tx IN ports should not be subjected to DC currents. For this reason, the Carina Hub's TRANSMIT port must be DC-isolated from the Splitter/Combiner with a coaxial DC block. This differs from remote sites where the transmit RF port provides 15VDC to power the SSPB.

Caution Do not subject the Tx IN ports to DC current - equipment damage can result. A DC block must be installed between the Carina Hub's Tx OUT ports and the Splitter/Combiner's Tx IN ports.

Power is fed to the LNB by a voltage regulator inside its Bias Tee, which outputs +17 VDC on the coax cable center conductor. The Splitter/Combiner Rx OUT ports are not affected by DC current. DC blocks are not required on these ports.

Transmit Path

The transmit section of the Carina Splitter/Combiner contains a four-way RF combiner, filtering, amplification and a bias tee. See Figure 2 for details.

The DC power for the SSPB is inserted by the bias tee. A bias tee capacitively couples the Combiner/Filter/Amplifier network to the SSPB, allowing RF carriers and 10 MHz reference signals to flow, but isolating the Combiner network from any DC current. The Carina Transceivers generate modulated carriers in the 950 - 1450 MHz L-Band. These are passed through the combiner and bias tee.

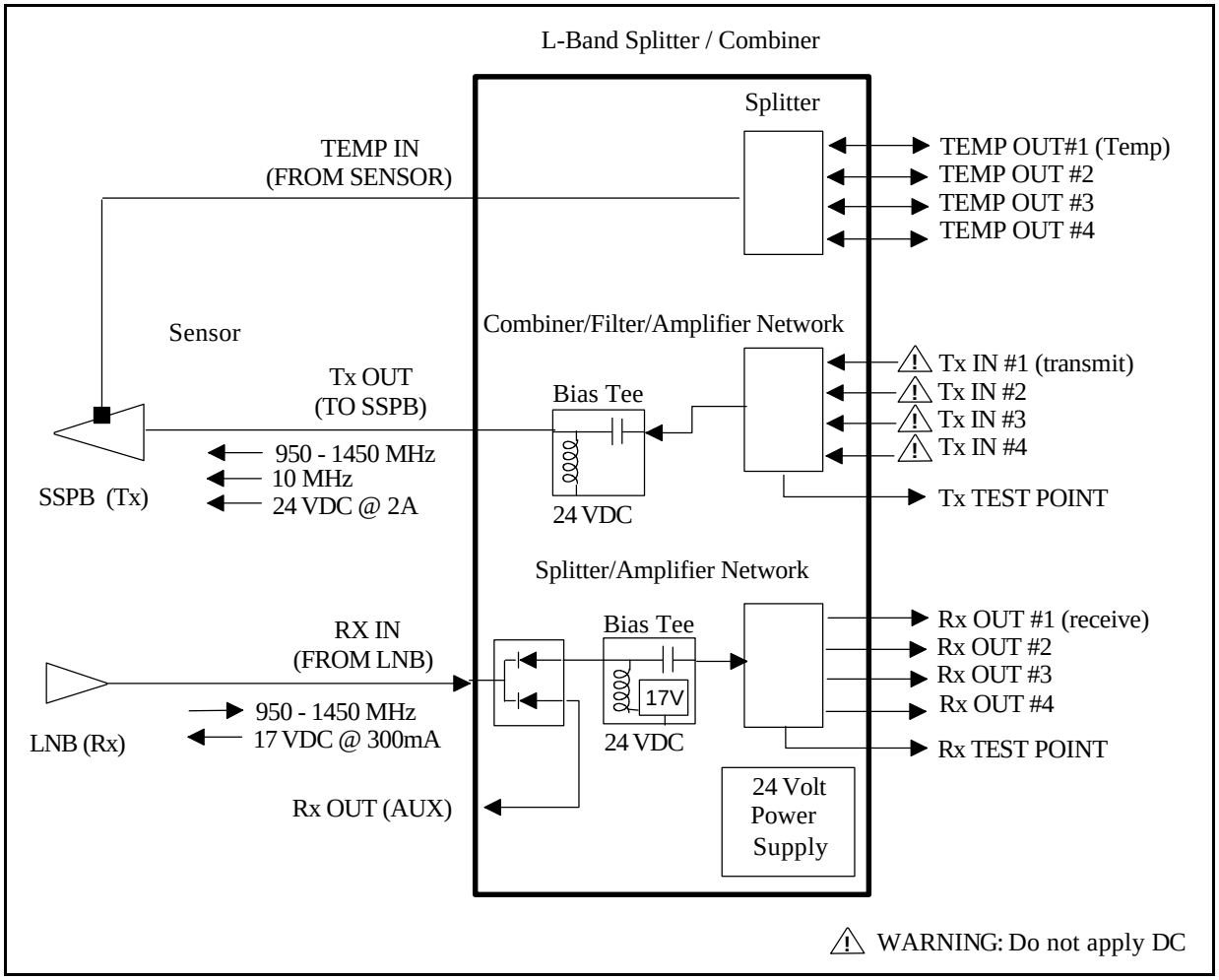

Figure 2: Block Diagram of the Carina Splitter/Combiner

Receive Signal Path

The receive section of the Carina Splitter/Combiner contains a four way RF splitter, amplification and bias tee. The 17 VDC power for the LNB is inserted by a voltage regulator in the bias tee. The

receive splitter capacitively couples to the Carina Transceivers, so it is not necessary to disable the DC on the Carina receive RF port.

SSPB Temperature Sensor Path

A temperature sensor measures the SSPB (transmit amplifier) temperature. As the SSPB temperature varies, the Carina Hubs adjust transmit power to compensate for SSPB gain variation. The temperature probe requires +5 VDC which is provided by any of the Carina Hubs.

This page intentionally left blank.

5. Installation

Hardware Installation

The Carina Splitter/Combiner is mounted in a standard 19" rack. All the connectors are located on the rear of the panel.

Please take the following precautions before powering the Carina Splitter/combiner

1. Ensure the Carina Transceivers do not output DC voltage to the Tx IN ports.
2. Terminate all unused transmit and receive RF ports.
3. The Carina Transceivers must adjust their transmit carrier level to compensate for losses of the transmit path. This is required to ensure 1dB accuracy of the uplink transmissions. The Carina Splitter/Combiner's gain must be calibrated during installation. The calibration procedure is included in the Libra hub site installation procedures.

   Caution: Failure to calibrate correctly may result in uncontrolled uplink power levels which can violate the terms of your satellite lease.

The power input is a standard IEC connector. The unit has a universal power input, and can be connected to any mains supply. There is a power switch on the rear of the unit. Do not turn it on until all the cabling is connected.

The Transmit RF connections are female N connectors, and Receive RF connections are female F connectors. Connect the transmit cable to the Tx OUT (TO SSPB) connection and the receive cable to the Rx IN (FROM LNB) connection. These cables should be supplied with the system.

The SSPB Temperature Sensor must be bolted to the SSPB case.

Once all the connections are made, ensure the rest of the equipment in the rack is connected and ready for power.

Caution: Do not begin satellite transmissions until the Carina Hub TDMA configurations are coordinated. Uncoordinated Carina Hub TDMA may result in noisy transmissions which can violate the terms of your satellite lease. TDMA coordination is explained in the Software Configuration section below.

When the Splitter/Combiner is switched on, the front panel LED will light.

Receive Test Point

The Rx TEST POINT allows the the entire satellite spectrum to be monitored with a spectrum analyzer. The uplink power levels of each station can be compared, the receive signal-to-noise level can be monitored, and traffic from other networks can be observed.

The connector is a female F type, and is AC coupled. Signal and noise levels will be approximately 4dB weaker than levels at the Rx OUT ports. Carrier-to-noise ratio (C/N) will be identical at the Rx TEST POINT and Rx OUT ports.

Caution: Always terminate the Receive Test Point when it is not in use.

Transmit Test Point

The Tx TEST POINT allows the Carina Hub transmissions and 10 MHz references to be monitored with a spectrum analyzer. Note that the transmissions appear in L-Band (950-1450 Mhz) and will be offset from eachother due to Carina frequency compensation.

Caution: Always terminate the Transmit Test Point when it is not in use.

The connector is a female BNC and is AC coupled. Signal levels will be approximately 15 dB weaker than levels at the Tx OUT (TO SSPB) port.

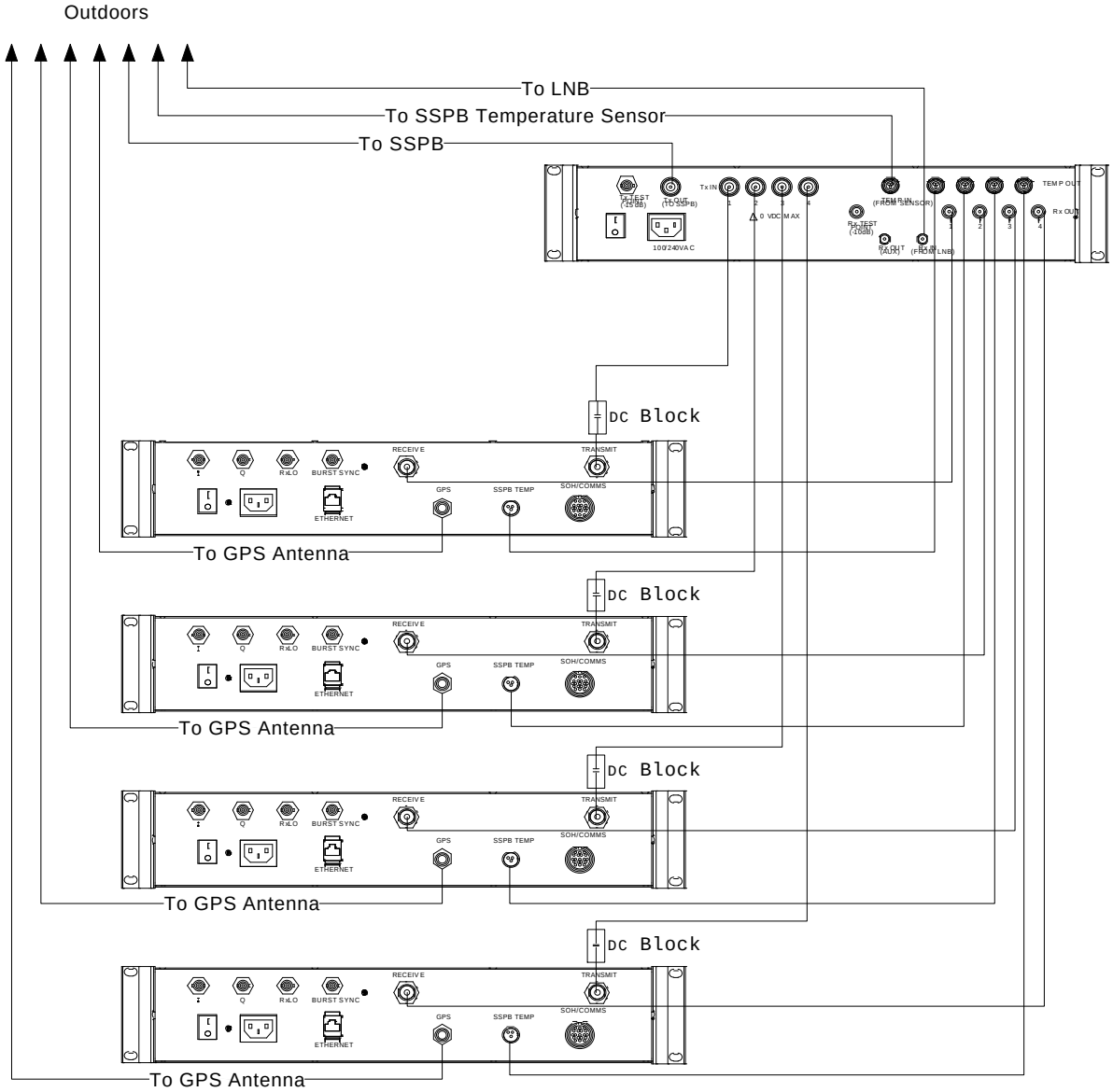

Figure 3: Connections for 1 - 4 Carina Hubs

Software Configuration - TDMA Coordination

The SSPB transmit amplifier can only transmit one Carina Hub carrier at any time. If two (or more) hubs transmit simultaneously through 1 SSPB the transmissions will interfere with eachother and cause noise to be transmitted to the satellite. Such noise can interfere with other satellite networks and violate the terms of your satellite lease agreement.

TDMA coordination involves the following rules:

1. All Carina Hubs sharing a SSPB must use the same TDMA Frame duration.
2. All transmissions passing through one SSPB must be separated by 500mS. The time between the end of any transmission and the beginning of the next transmission must be greater than or equal to 500mS.
3. These restrictions only apply to Carina Hubs sharing one SSPB. If 2 or more SSPB's are mounted on one antenna, the Carina Hubs sharing one SSPB do not require coordination with the Carina Hubs sharing the second SSPB.

4. TDMA restrictions only apply to transmission, not reception.

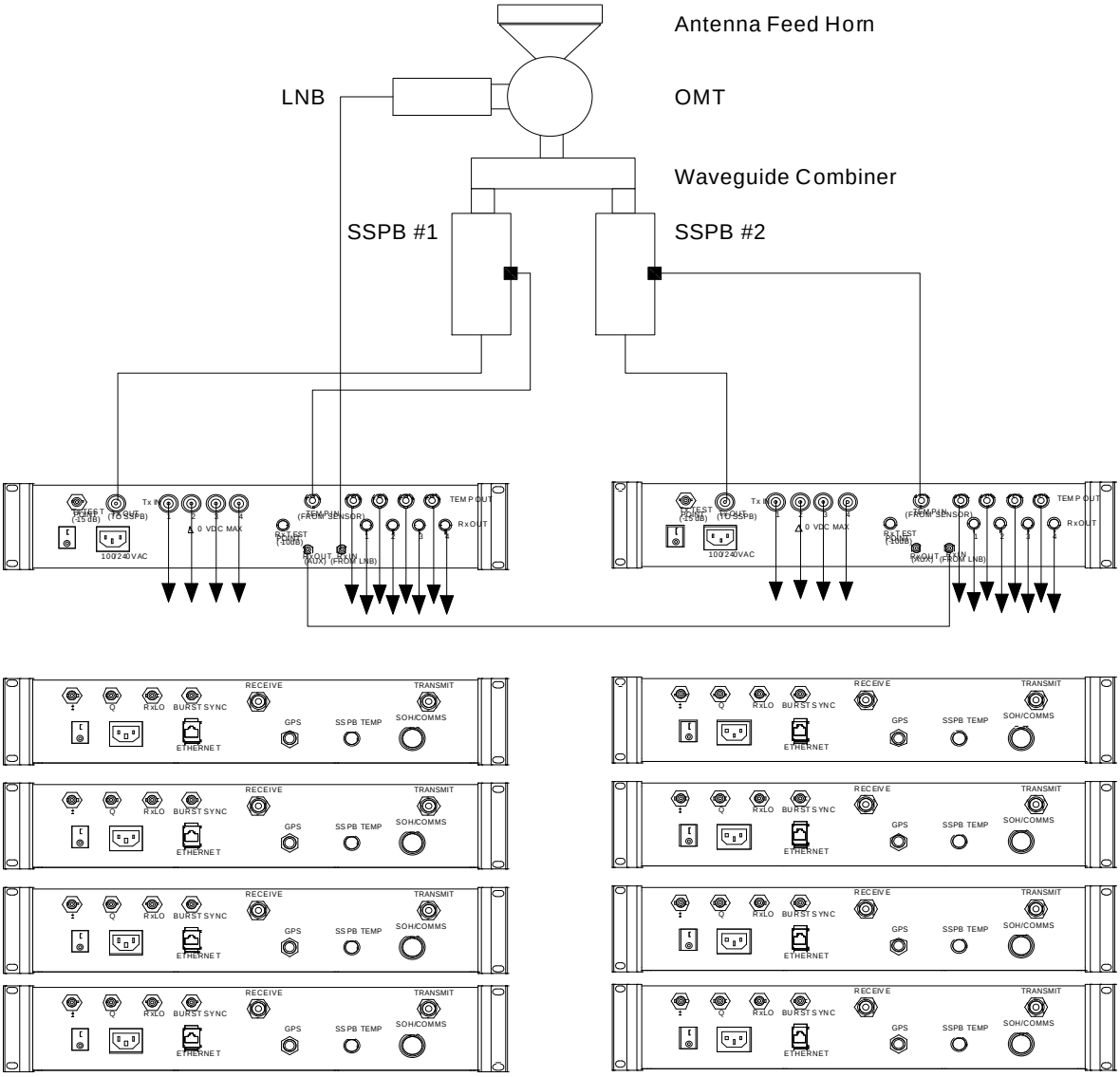

Figure 4: Connections for 5 - 8 Carinas

6. Servicing

Maintenance

Repair philosophy

Object is to troubleshoot to the component level and replace the component.

Disassembly Instructions

The following tools are required:

1. Phillips screwdriver for #4 and #8 screws.

Instructions:

1. Remove all power from the Carina Splitter/Combiner.
2. Remove the Carina Splitter/Combiner from the 19” rack.
3. Remove all the screws for the top cover and lift off the top cover.
4. The components inside the Splitter/Combiner can be disconnected and tested individually. They may be unscrewed and removed.

Assembly Instructions

The assembly instructions are the reverse of the disassembly instructions.

This page intentionally left blank.

Appendix A - Connector Pinouts

Transmit Output	50 Ohm N female
Transmit Inputs(4)	50 Ohm N female
Receive Input	75 Ohm F female
Receive Output(4)	75 Ohm F female
Power Input	standard IEC Socket
Temperature	Souriau 851-07A-8-3AS-50
A	+5V
B	Temperature
C	GND

This page intentionally left blank.

Appendix B - Specifications

Mains Power Input	
Input Voltage Range	85 - 264 VAC
Input Frequency Range	47 - 63 Hz
Input Fuse	3.15 Amps
PSU approvals	EN60950, VDE0805, IEC950, EN41003 (BABT)
	UL1950, CSA C22.2 No. 950, CE
Power Output	65W at 24V
Mechanical	
Size (width x height x depth)	16.70” x 3.5” x 12.0”
Packaging	19” rack mount case , 2U height, aluminum and Steel
Weight	4 kgs.
Operating Temperature	10 - 50 degrees C
Humidity	non-condensing 5 - 95 % RH
Connectors	
Transmit Output	N female (50 ohm)
Transmit Inputs (4)	N female (50 ohm)
Transmit Test Point	BNC female (50 ohm)
Receive Input	F female (75 ohm)
Receive Outputs (4)	F female (75 ohm)
Receive Auxiliary Output	F female (75 ohm)
Receive Test Point	F female (75 ohm)
Power Input	IEC Socket
Temperature Input	Souriau 851-07A-8-3AS-50
Temperature Outputs(4)	Souriau 851-07A-8-3AS-50
Transmit path	
Impedance	50 Ohms
Frequency range	10Mhz, 950-1450 MHz
Gain, 950-1450	-2dB min, 2 dB max.
DC Current	2 Amp max. *see note 1
DC Voltage	24 Volts nominal
Receive Path	
Impedance	75 Ohms
Frequency range	950-1450 MHz
Gain	12 dB max.
DC Current	300 mA max. *see note 1
DC Voltage Output	17 Volts nominal
Temperature I/O	
5V inputs to output	diode blocked

note 1 - the combined LNB and SSPB current cannot exceed 2.2 Amps.

Appendix B