



RRS11

**Solid-State Transfer Switch
Installation and Operation Manual**

Part Number MN-RRS11

Rev. 3

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IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding this product. This manual is subject to change without prior notice.

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Table of Contents

TABLE OF CONTENTS	III
CHAPTER 1. INTRODUCTION.....	1-1
1.1 Overview	1-1
CHAPTER 2. INSTALLATION	2-1
2.1 Installation Requirements	2-1
2.2 Unpacking.....	2-2
2.2.1 Test Data Sheet	2-2
2.3 System Connections	2-2
CHAPTER 3. OPERATION.....	3-1
3.1 Solid-State Transfer Switch Operation.....	3-1
3.2 Operating Procedures.....	3-3
3.3 Solid-State Transfer Switch Backup Operation.....	3-3
CHAPTER 4. MAINTENANCE AND TROUBLESHOOTING	4-1
4.1 Basic Troubleshooting and Maintenance.....	4-1
4.2 Basic User Checks.....	4-1
4.2.1 Checking the Cabling and Connectors.....	4-1
CHAPTER 5. TECHNICAL SPECIFICATIONS.....	5-1
5.1 RRS11 and RRS11 L Technical Specifications	5-1
5.2 Introduction - RRS11 L-Band Switch.....	5-1
5.2.1 General Specifications	5-1
5.2.2 Power and Environmental.....	5-2
5.2.3 Physical	5-2
5.3 Introduction - RRS11 70/140 MHz Switch	5-2
5.3.1 General Specifications	5-2
5.3.2 Power and Environmental.....	5-2
5.3.3 Physical	5-2

PREFACE

About this Manual

This manual describes the installation and operation for the Radyne RRS11. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the RRS11.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Comtech EF Data Technical Publications department:

TechnicalPublications@comtechefdata.com

Conventions and References

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-Metric to Metric conversions.

Cautions and Warnings



IMPORTANT or **NOTE** indicates a statement associated with the task being performed or information critical for proper equipment function.



CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. **CAUTION** may also be used to indicate other unsafe practices or risks of property damage.



WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.



Examples of
Multi-Hazard Formats

Trademarks

Product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

Safety Compliance

EN 60950

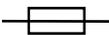
Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN60950. This equipment meets the Safety of Information Technology Equipment specification as defined in EN60950.

Low Voltage Directive (LVD)

The following information is applicable for the European Low Voltage Directive (EN60950):

<HAR>	Type of power cord required for use in the European Community.
	CAUTION: Double-pole/Neutral Fusing ACHTUNG: Zweipolige bzw. Neutraleiter-Sicherung

International Symbols:

Symbol	Definition
	Alternating Current
	Fuse

Symbol	Definition
	Protective Earth / Safety Ground
	Chassis Ground



For additional symbols, refer to Cautions and Warnings, listed earlier in this Preface.

Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a period of two years from the date of shipment. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original two year warranty, or a 90 day extended warranty, whichever is longer.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Customer Support

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Reporting comments or suggestions concerning manuals
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA
480.333.2200 (Main Comtech EF Data number)
480.333.4357 (Customer Support Desk)
480.333.2161 FAX

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- **Contact** the Comtech EF Data Customer Support Department. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
- **Request** a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support representative.
- **Pack** the product in its original shipping carton/packaging to ensure that the product is not damaged during shipping.
- **Ship** the product back to Comtech EF Data. (Shipping charges should be prepaid.)

Online Customer Support

An **RMA number request** can be requested electronically by contacting the Customer Support Department through the online support page at **www.comtechedata.com/support.asp**:

- **Click** on the “Service” hyperlink, then read the “Return Material Authorization” section for detailed instructions on our return procedures.
- **Click** on the “RMA Request Form” hyperlink, then fill out the form completely before sending.
- **Send e-mail** to the Customer Support Department at **service@comtechedata.com**.

For information regarding this product’s warranty policy, refer to the Warranty Policy, p. xxii.

Chapter 1. INTRODUCTION

1.1 Overview

The RRS11 Solid State Transfer Switch offers IF or L-Band redundancy for the DM240XR in a simple straight forward plug and play design. The RRS11 includes monitor ports that allows the user access to the online and offline ports. The RRS11 also includes front panel LEDs that indicate online status of the modulator.

The RRS11 can be configured to support 70/140 MHz or L-Band System. An external power source is not required. DC power and fault status is supplied to by each DM240XR. The RRS11 will trigger a switchover in the event that the modulator faults. Figure 1-1 through 1-4 illustrates the front panel and rear panel of the RRS11 models.



Figure 1-1 RRS11 70/140 MHz Solid-State Transfer Switch (Front Panel)



Figure 1-2 RRS11 70/140 MHz Solid-State Transfer Switch (Rear Panel)



Figure 1-3 RRS11-L L-Band Solid-State Transfer Switch (Front Panel)



Figure 1-4 RRS11-L L-band Solid-State Transfer Switch (Rear Panel)

Chapter 2. Installation

This section provides unpacking and installation instructions, and a description of external connections, status and contact closure alarm information.

2.1 Installation Requirements

The RRS11 Solid-State Transfer Switches is a standard one rack unit (1RU) high (1.75 inches/4.45 cm) vertically, 19 inches (48.3 cm) wide, and 17 inches (43.2 cm) deep. The RRS11 Switch is installed between two DM240-PIIC or DM240XR modulators. The supplied cables lengths only allow for this configuration.

**WARNING!!**

There are no user-serviceable parts or configuration settings located inside any Solid-State Transfer Switch Chassis. There is a potential shock hazard internally at the power supply module. DO NOT open the Solid-State Transfer Switch Chassis under any circumstances.

**CAUTION!!**

Before initially applying power to the unit, it is a good idea to disconnect the transmit output from the operating ground station equipment. This is especially true if the current Solid-State Transfer Switch configuration settings are unknown, where incorrect settings could disrupt existing communications traffic.

2.2 Unpacking

The RRS11 Solid-State Transfer Switch was carefully packaged to avoid damage and should arrive complete with the following items for proper installation:

- RRS11 Solid-State Transfer Switch Unit
- RRS11 Test Data Sheet
- Interconnect Cables (IF, Monitor and Control)
- Installation and Operation Manual

2.2.1 Test Data Sheet

Each RRS11 Solid-State Transfer Switch is shipped with a Test Data Sheet. This report contains information on the results of the Switch quality control testing. The report also includes information pertaining to the system settings that were made at the factory. Radyne Corporation recommends that the user save this report for future reference.

2.3 System Connections

Figures 2-1 illustrates a typical setup with an RRS11-L and two DM240-PIIC modulators. Figure 2-2 illustrates a typical setup with RRS11 and two DM240XR modulators.

For initial Solid-State Transfer Switch setup and configuration, perform the following procedure:

1. Interconnect the units as shown in the figures below.
2. Proceed to Section 3, User Interface for information on the Solid-State Transfer Switch controls and indicators.

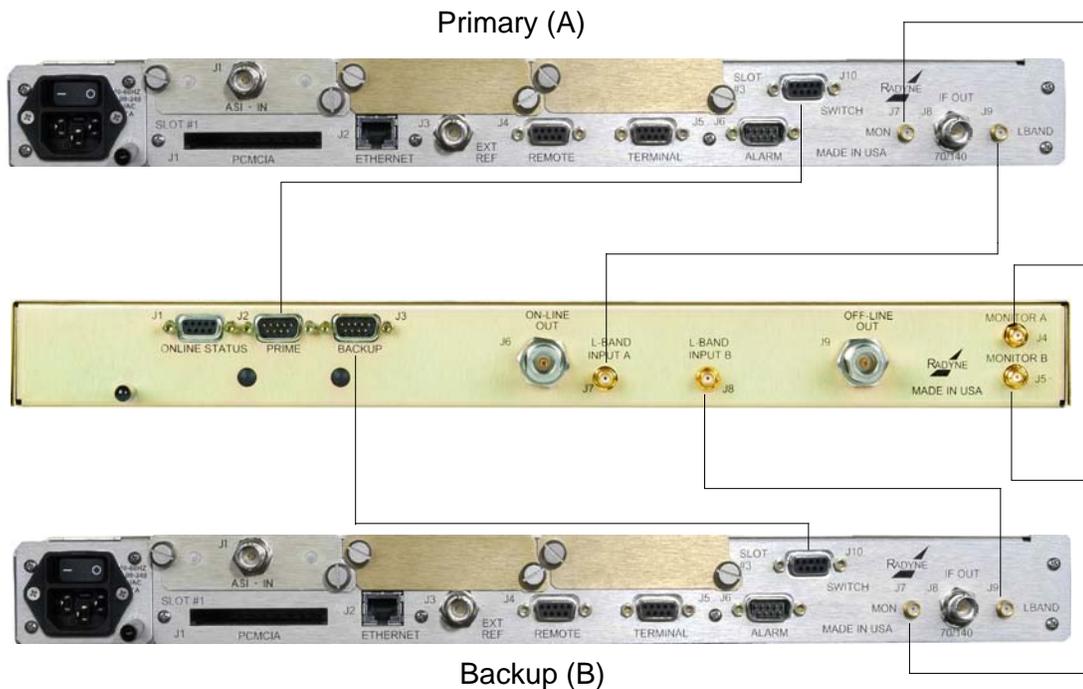


Figure 2-1 Cable Connections between RRS11-L and Two DM-240-PIIC Units

Table 2-1 RRS11-L Interconnect Cable Part Numbers			
Cable	Quantity	Description	Part Number
A	2	Control Cable (DB-9 Straight Cable)	CA/3677-1
B	4	L-Band Cable (50-Ohm SMA)	CA/5127AMAM-16

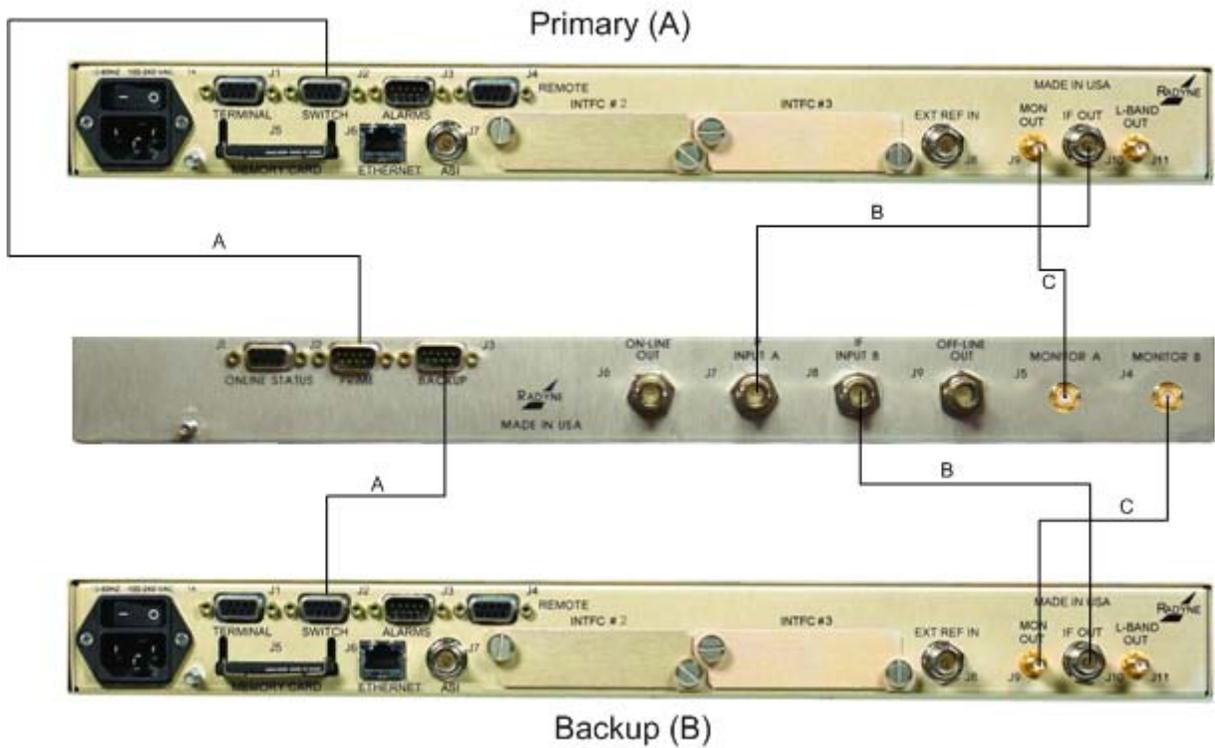


Figure 2-2 Cable Connections between RRS11 and two DM240XR Units

Table 2-2 70/140 MHz Interconnect Cable Part Numbers			
Cable	Quantity	Description	Part Number
A	2	Control Cable (DB-9 Straight Cable)	CA/3677-1
B	2	IF - BNC/BNC 75 Ohm Cable	CA/3598-12
C	2	L-Band Cable (50 Ohm SMA)	CA/5127AMAM-16

Chapter 3. Operation

3.1 Solid-State Transfer Switch Operation

A functional block diagram of the RRS11/RRS11-L signal flow is illustrated in Figure 3-1 below.

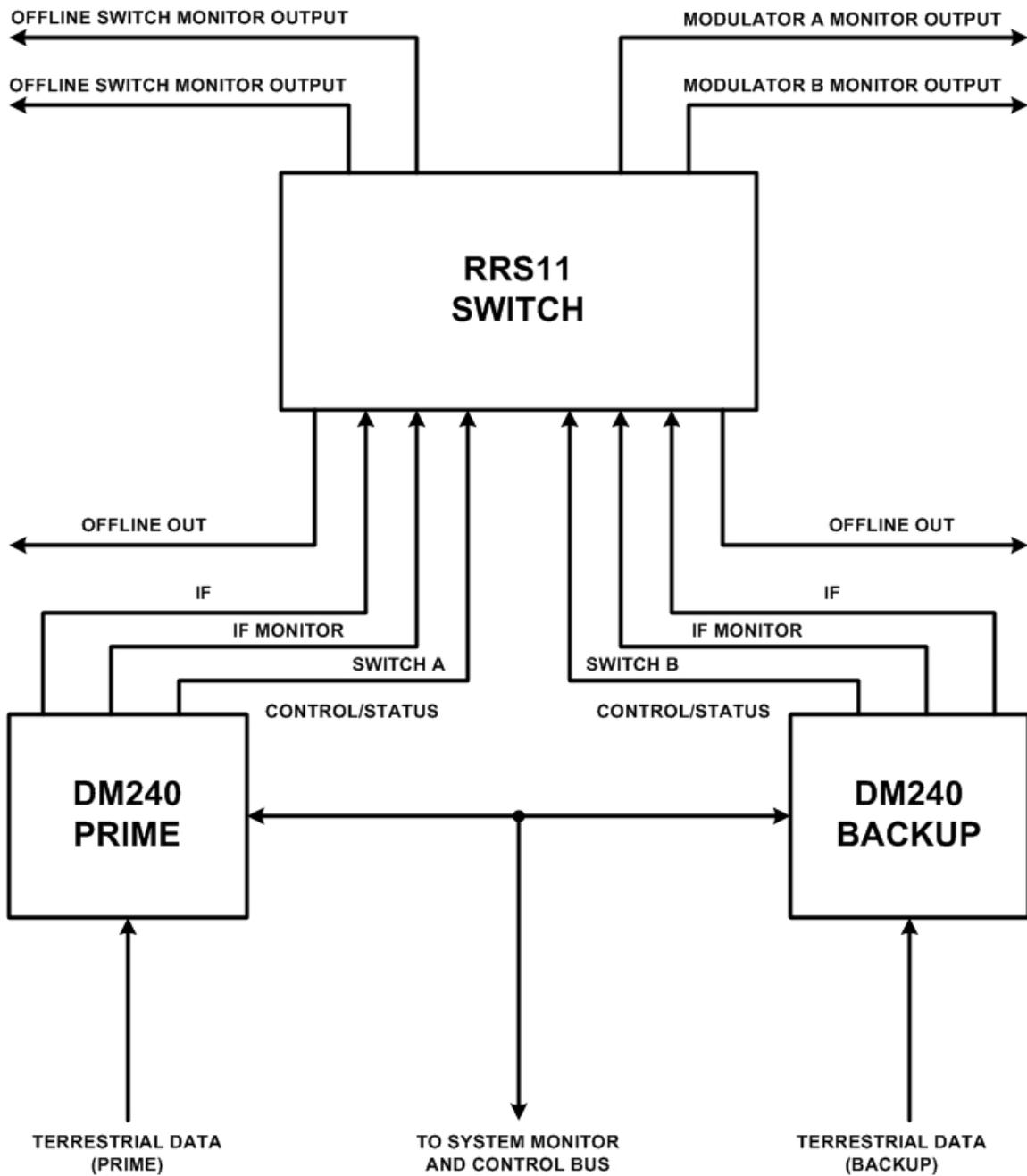


Figure 3-1 RRS11 Functional Block Diagram

3.2 Operating Procedures

The Solid-State Transfer Switch is designed for minimal operator intervention and control during normal operation. After initial setup, the unit should operate in a relatively 'transparent' manner, providing trouble-free backup of the online modulators

3.3 Solid-State Transfer Switch Backup Operation

The RRS11 Switch monitors the fault status from each modulator. Each DM240-PIIC or DM240XR supplies DC voltage and fault status to the RRS11. An additional DB9 connector has been added to the rear panel of the DM240-PIIC or DM240XR that provides a wiring port to the external switch. Each modulator is capable of powering the switch through a current limited, diode or'ed power signal. Either of the DM240s is also capable of commanding the switch to the prime or backup state, as well as monitoring in which state it is. Additional menus are available on the DM240 front panel menus or remote port that allow user to control switching parameters.

In normal operation, the M&C in the backup modulator monitors the prime for faults. If one is detected, it will automatically cause the switch to place the backup on-line. The switch is non-revertive. That is, once a switch occurs, it requires a manual command (either through the M&C or from the front panel) to return the prime unit to an on-line status. This will be the default operation, but the switching software is capable of implementing revertive switching as well. Either modulator will be capable of changing the state of the switch (assuming it is not faulted). This can be done remotely or from the front panel. Remote control will occur through the standard Ethernet M&C interface implementing SNMP. The switch connectors are listed in Table 3-1 and 3-1A.

Connector ID	Nomenclature	Description
J1	Online Status Output	9-Pin D-Sub Switch Status Form-C Relay Outputs
J2	Prime Mod Control	9-Pin D-Sub Control Connector From Prime Modulator
J3	Backup Mod Control	9-Pin D-Sub Control Connector From Backup Modulator
J4	Monitor A Input	SMA (f) 50 Ohm from Modulator A Monitor Output
J5	Monitor B Input	SMA (f) 50 Ohm from Modulator B Monitor Output
J6	On-Line Output	BNC (f) 75 Ohm, Output of On-Line Modulator to Uplink Chain.
J7	Off-Line Output	BNC (f) 75 Ohm Output of Monitor Port of Off-Line Modulator
J8	70/140 IF Input A	BNC (f) 75 Ohm From Modulator A
J9	70/140 IF Input B	BNC (f) 75 Ohm From Modulator B

Table 3-1A, RRS11-L L-Band Rear Panel Connectors		
Connector ID	Nomenclature	Description
J1	Online Status Output	9-Pin D-Sub Switch Status Form-C Relay Outputs
J2	Prime Mod Control	9-Pin D-Sub Control Connector From Prime Modulator
J3	Backup Mod Control	9-Pin D-Sub Control Connector From Backup Modulator
J4	Monitor A Input	SMA 50 Ohm from Modulator A Monitor Output
J5	Monitor B Input	SMA 50 Ohm from Modulator B Monitor Output
J6	On-Line Output	N-Type 50 Ohm, Output of On-Line Modulator to Uplink Chain.
J7	Off-Line Output	N-Type 50 Ohm Output of Monitor Port of Off-Line Modulator
J8	L-Band Input A	SMA 50 Ohm From Modulator A
J9	L-Band Input B	SMA 50 Ohm From Modulator B

Each modulator has a 9-Pin D-Sub Connector that connects to the RRS11 switch. A 1:1 cable is connected from each modulator to the RRS11 switch. The pinout for the control connector is listed in Table 3-2.

Table 3-2. Switch Prime/Backup Control Pinout			
Pin No.	Signal Name	Direction	Description
5	Signal Ground	Input	Modulator GND
9	Backup Select	Output	One modulator is designated as Backup. This line is tied low on the Backup Mod Control connector.
1	+DC	Input	+12V DC Power
2	nPrime_Sel	Input	Forces On-Line Output to Prime
7	nBackup_Sel	Input	Forces On-Line Output to Backup
8	Fault-In	Input	Fault Output From Modulator
4	Fault-Out	Output	Connects to Fault-In Monitor on Modulator
3	Switch-State	Output	Switch State Monitor. Logic '1' = Prime Online
6	NC	---	---

An additional 9-Pin D-Sub Connector is supplied for switch monitoring. The I/O on this connector comes from a Form-C relay. The pinouts for the monitor connector is listed in Table 3-3.

Table 3-3. Switch Online Statue Pinout		
Pin No.	Signal Name	Description
4	Signal Ground	Switch GND
1	Relay 1 NO	Relay Normally Open Contact (Closed When the Backup Modulator is On-Line)
3	Relay 1 NC	Relay Normally Closed Contact (Closed When the Prime Modulator is Online)
2	Relay 1 C	Relay Common Contact
7	Relay 2 NO	Relay Normally Open Contact
9	Relay 2 NC	Relay Normally Closed Contact
8	Relay 2 C	Relay Common Contact
5	NC	---
6	NC	---

Chapter 4. Maintenance and Troubleshooting

4.1 Basic Troubleshooting and Maintenance

This section provides information on the basic troubleshooting and repair procedures for the Solid-State Transfer Switch that may be performed on-site by qualified personnel. Only minor repairs will be discussed. For serious failures, the user should not attempt to repair the unit without first contacting Radyne Corporation Customer Service Department at 602-437-9620 for further information and instructions.

4.2 Basic User Checks

Upon the detection of an operational failure, the source of the failure must be determined. Basic user checks include checking the power line fuses, and the various cables and connectors.

4.2.1 Checking the Cabling and Connectors

Problems that appear difficult to solve can often be traced to a loose or defective cable or connector. The user should first verify the following:

- All cables within the system have no broken or loose connections. Cables that are suspect should be replaced.
- All jacks on the units have no bent or broken pins.

Chapter 5.

Technical Specifications

5.1 RRS11 and RRS11 L Technical Specifications

5.2 Introduction - RRS11 L-Band Switch

This section defines the technical performance parameters and specifications for the Solid-State Transfer Switch. The RRS11L is intended to operate with the DM240-PIIC or DM240XR modulators.

5.2.1 General Specifications

RRS11-L L-Band Configuration:	DM240-PIIC OR DM240XR only
Switch Time:	50 msec Maximum
Rear Panel Ports:	L-Band input: J7 - SMA, 50 ohm (mod A) L-Band input: J8 – SMA, 50 ohm (mod B) L-Band output: J6 – N-type, 50 ohm (online) L-Band output: J9 – N-type, 50 ohm (offline) L-Band Monitor input: J4 - SMA, 50 ohm (Mod A) L-Band Monitor input: J5: - SMA, 50 ohm (Mod B)
Front Panel Ports:	L-Band Monitor output: BNC 50 ohm (Mod A) L-Band Monitor output: BNC 50 ohm (Mod B) L-Band Monitor output (online) L-Band Monitor output (offline)
Control Ports:	DB-9 Male: J2 (prime)
Status Port:	DB-9 Male: J3 (backup)
Return Loss:	SMA: 14 dB (L-band input) N-Type: 14dB (L-band output)

5.2.2 Power and Environmental

Prime Power:	+12 VDC provided to the Unit through the Prime and Backup Cabling from the Modulators
Operating Temp:	0 to 50°C, 95% Humidity, Non-Condensing
Storage Temp:	-20 to 70°C, 99% Humidity, Non-Condensing

5.2.3 Physical

Size:	19" L x 17" W x 1.75" H (48.26 cm x 43.2 cm x 4.45 cm)
Weight:	5 Pounds (2.27 Kg)

5.3 Introduction - RRS11 70/140 MHz Switch

This section defines the technical performance parameters and specifications for the Solid-State Transfer Switch. The RRS11 is intended to operate with the DM240-PIIC or DM240XR modulators.

5.3.1 General Specifications

RRS11 70/140 MHz Configuration:	DM240-PIIC OR DM240XR only
Switch Time:	50 msec Maximum
Rear Panel Ports:	IF input: J7 - BNC (F), 75 ohm (mod A) IF input: J8 - BNC (F), 75 ohm (mod B) IF output: J6 - BNC (F), 75 ohm (online) IF output: J9 - BNC (F), 75 ohm (offline) IF Monitor input: J4: - SMA (F), 50 ohm (Mod A) IF Monitor input: J5: - SMA (F), 50 ohm (Mod B)
Front Panel Ports:	IF Monitor output: BNC (F) 75 ohm (Mod A) IF Monitor output: BNC (F) 75 ohm (Mod B) IF Monitor output: BNC (F) 75 ohm (online) IF Monitor output: BNC (F) 75 ohm (offline)
Control Ports:	DB-9 Male: J2 (prime)
Status Port:	DB-9 Male: J3 (backup)
Return Loss:	BNC: 20 dB

5.3.2 Power and Environmental

Prime Power:	+12 VDC provided to the Unit through the Prime and Backup Cabling from the Modulators
Operating Temp:	0 to 50°C, 95% Humidity, Non-Condensing
Storage Temp:	-20 to 70°C, 99% Humidity, Non-Condensing

5.3.3 Physical

Size:	19" L x 17" W x 1.75" H (48.26 cm x 43.2 cm x 4.45 cm)
Weight:	5 Pounds (2.27 Kg)

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^5	6.336×10^4	5.280×10^3	1.760×10^3	—	1.609×10^3	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-459.69	-273.16

Formulas
$^{\circ}\text{C} = (\text{F} - 32) * 0.555$
$^{\circ}\text{F} = (\text{C} * 1.8) + 32$

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoird.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoird.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^3	35.27	32.15	2.205	2.679	—



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