



Comtech EF Data is an  
AS9100 Rev B / ISO9001:2000 Registered Company



# *STS11/STS11L*

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## Solid-State Transfer Switch Installation and Operation Manual

**IMPORTANT NOTE:** The information contained in this document supersedes all previously published information regarding this product. Product specifications are subject to change without prior notice.





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

Part Number MN-ST511-11  
Revision 0

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# PREFACE

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## About this Manual

This manual provides installation and operation information for the Comtech EF Data Radyne STS11/STS11L Solid-State Transfer Switch. This document is intended for persons responsible for the operation and maintenance of the unit.

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## Conventions and References

### Cautions and Warnings



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



**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.



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

### Trademarks

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



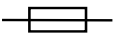

## Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations.

## Installation

The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.

The unit is designed for connection to a power system that has separate ground, line and neutral conductors. The equipment is not designed for connection to power system that has no direct connection to ground.

International Symbols			
Symbol	Definition	Symbol	Definition
	Alternating Current		Protective Earth
	Fuse		Chassis Ground

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## Telecommunications Terminal Equipment Directive

In accordance with the Telecommunications Terminal Equipment Directive 91/263/EEC, this equipment should not be directly connected to the Public Telecommunications Network.

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## RoHS Compliancy

This unit satisfies (with exemptions) the requirements specified in the European Union Directive on the Restriction of Hazardous Substances, Directive 2002/95/EC, (EU RoHS).



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## Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. 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 warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

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.

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## 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.comtechefdata.com/support.asp](http://www.comtechefdata.com/support.asp)**:

- **Click** on “Return Material Authorization” 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@comtechefdata.com](mailto:service@comtechefdata.com)**.

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



# Chapter 1. INTRODUCTION

## 1.1 Overview

The STS11 (70/140 MHz) and STS11L (L-Band) Solid-State Transfer Switches (Figures 1-1 and 1-2) provide simple backup redundancy protection for the DM240-PIIC Modulators. Their straightforward design and easy access to connectors and LEDs allow for ease of use.

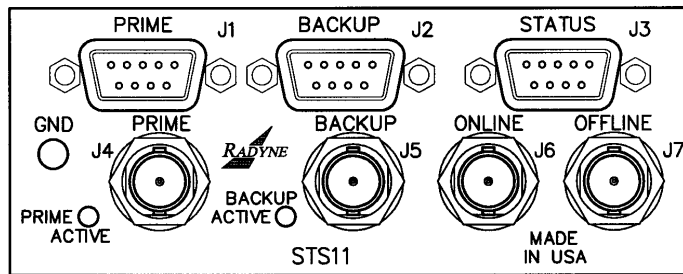


Figure 1-1. STS11 Solid-State Transfer Switch

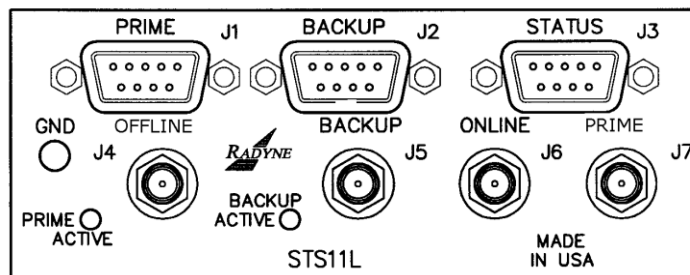


Figure 1-2. STS11L L-Band Solid-State Transfer Switch

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# Chapter 2. INSTALLATION


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

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## 2.1 Installation Requirements

The STS11 and STS11L Solid-State Transfer Switches are designed for installation in any convenient location (with the included brackets). They stand one rack unit (1RU) high (1.75 inches/4.45 cm) vertically, 4.4 inches (11.18 cm) wide, and 3.4 inches (8.63 cm) deep.

	<p><i>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.</i></p>
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	<p><i>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.</i></p>
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## 2.2 Unpacking

The STS11/STS11L Solid-State Transfer Switch was carefully packaged to avoid damage and should arrive complete with the following items for proper installation:

- STS11 or STS11L Solid-State Transfer Switch Unit
- STS11 or STS11L Test Data Sheet
- Interconnect Cables and Materials as Required
- Mounting Brackets
- Installation and Operation Manual

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## 2.3 Test Data Sheet

Each STS11/STS11L 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 Inc. recommends that the user save this report for future reference.

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## 2.4 System Connections

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 4, User Interface for information on the Solid-State Transfer Switch controls and indicators.

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## 2.5 Connecting to DM240-PIIC Digital Modulators

Figure 2-1 illustrates the cable connections between the STS11 and two DM240-PIIC units. Refer to Table 2-1 for cable part numbers.



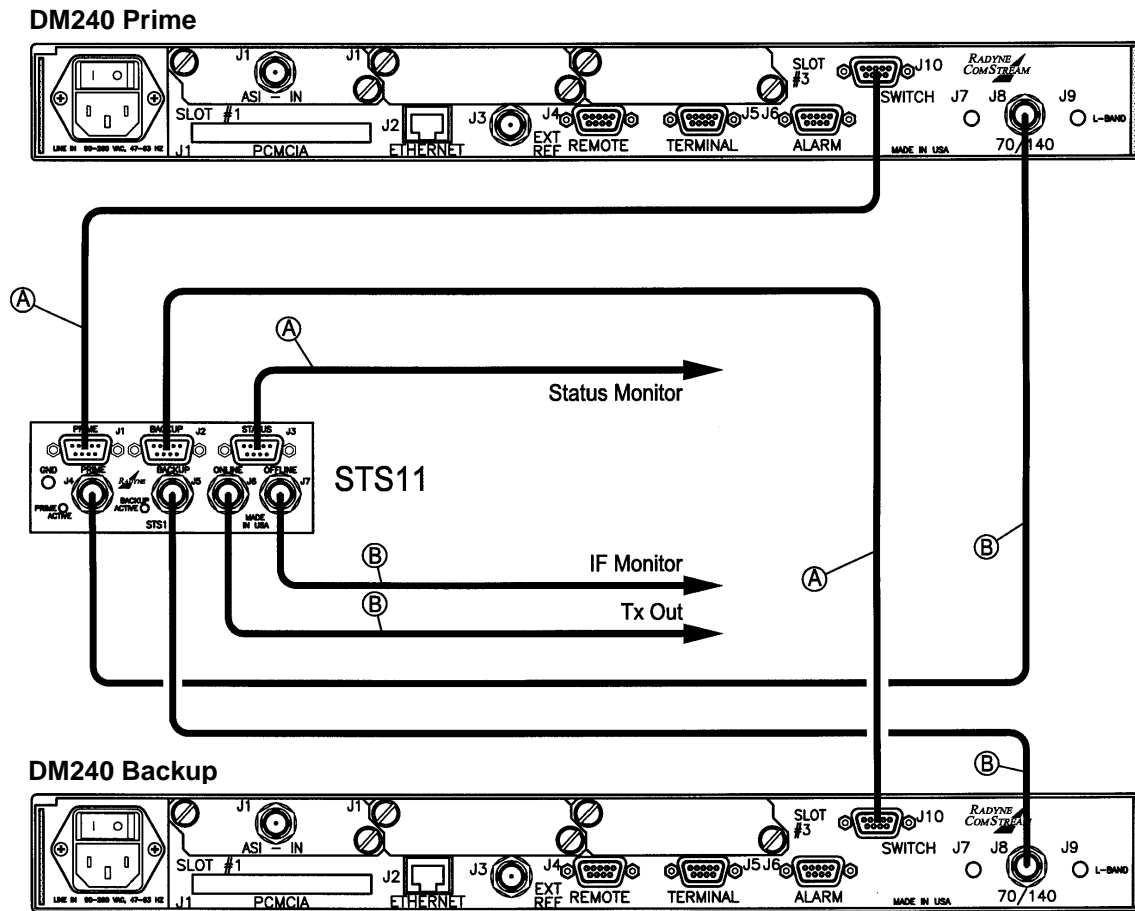


Figure 2-1. STS11 Solid-State Transfer Switch to DM240 Connections

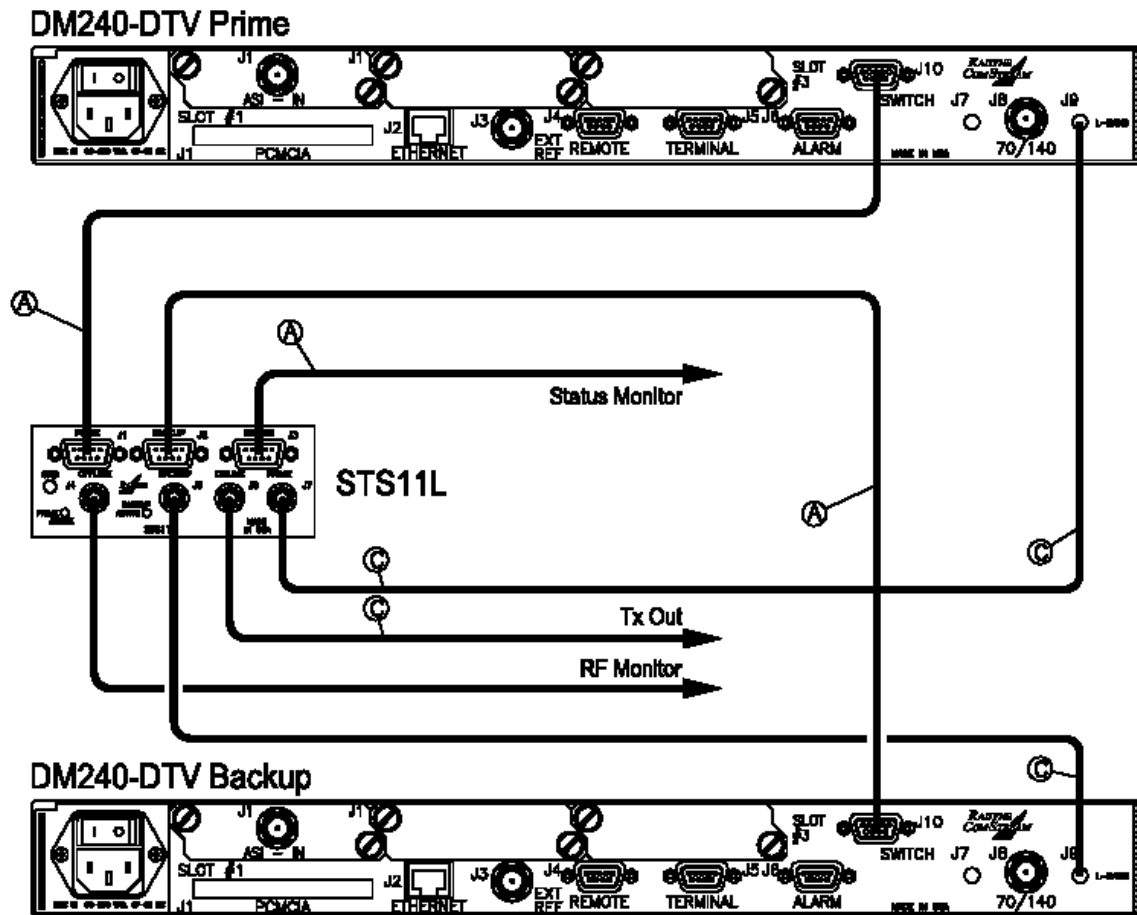


Figure 2-2. STS11L Solid-State Transfer Switch to DM240 Connections

Table 2-1. Interconnection Cable Part Numbers			
Cable	Quantity	Name	Part Number
A	3	Control Cable (DB-9 Straight Cable)	CA/3677-1
B	2	IF Cable (75-Ohm BNC)	CA/3598-36
C	2	L-Band Cable (50-Ohm SMA)	CA/LMR200SMA3FT

# Chapter 3. OPERATION

## 3.1 Solid-State Transfer Switch Operation

A block diagram of the signal flow is shown in Figure 3-1 (70/140 MHz) and Figure 3-2 (L-Band) below.

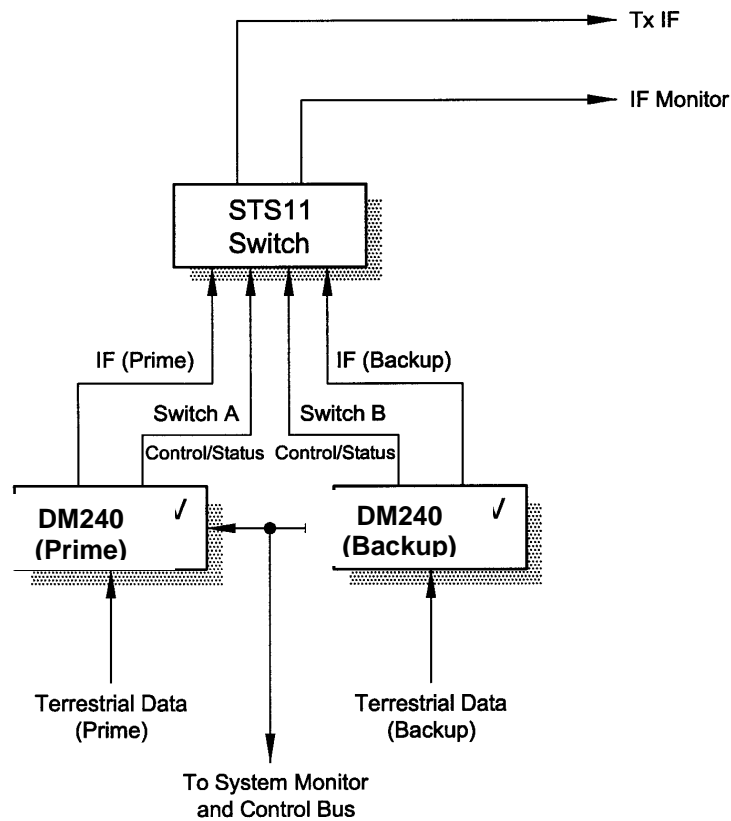


Figure 3-1. STS11 Functional Block Diagram

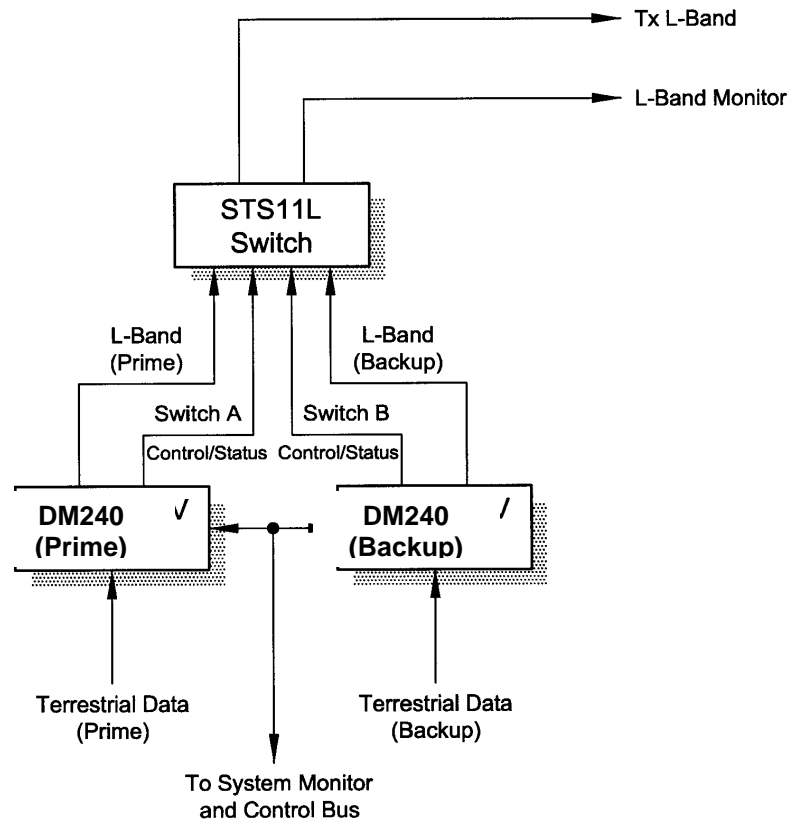


Figure 3-2. STS11L Functional Block Diagram

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### 3.2 Operating Procedures

The Solid-State Transfer Switch is designed to require 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

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### 3.3 Solid-State Transfer Switch Backup Operation

Each modulator monitors the fault status of the other modulators through the switch. An additional connector has been added to the standard DM240 to provide a wiring port to the external IF switch. Each modulator is capable of powering the IF 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. In normal operation, the M&C in the backup modulator monitors the prime for faults. If one is detected, it will automatically cause the IF 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 on-line. 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 IF 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 Tables 3-1 and 3-2.

<b>Table 3-1. STS11 Connectors</b>		
<b>Connector ID</b>	<b>Nomenclature</b>	<b>Description</b>
J1	Prime Mod Control	9-Pin D-Sub Control Connector From Prime Modulator
J2	Backup Mod Control	9-Pin D-Sub Control Connector From Backup Modulator
J3	Switch Status Output	9-Pin D-Sub Switch Status Form-C Relay Outputs
J4	Prime Mod Input	75 Ohm, BNC From Prime Modulator
J5	Backup Mod Input	75 Ohm, BNC From Backup Modulator
J6	On-Line Output	75 Ohm Output of On-Line Modulator to Uplink Chain.
J7	Off-Line Output	75 Ohm Output of Monitor Port of Off-Line Modulator

<b>Table 3-2. STS11L Connectors</b>		
<b>Connector ID</b>	<b>Nomenclature</b>	<b>Description</b>
J1	Prime Mod Control	9-Pin D-Sub Control Connector From Prime Modulator
J2	Backup Mod Control	9-Pin D-Sub Control Connector From Backup Modulator
J3	Switch Status Output	9-Pin D-Sub Switch Status Form-C Relay Outputs
J7	Prime Mod Input	50 Ohm, SMA From Prime Modulator
J5	Backup Mod Input	50 Ohm, SMA From Backup Modulator
J6	On-Line Output	50 Ohm, SMA Output of On-Line Modulator to Uplink Chain.
J4	Off-Line Output	50 Ohm, SMA Output of Monitor Port of Off-Line Modulator

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

<b>Table 3-3. Switch Control Pinout</b>			
<b>Pin No.</b>	<b>Signal Name</b>	<b>Direction</b>	<b>Description</b>
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 3-4.

<b>Table 3-4. Switch Monitor Pinout</b>		
<b>Pin No.</b>	<b>Signal Name</b>	<b>Description</b>
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

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## 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 Customer Service for further information and instructions.

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## 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.

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# Chapter 5. TECHNICAL SPECIFICATIONS

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## 5.1 Introduction

This section defines the technical performance parameters and specifications for the Solid-State Transfer Switch.

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## 5.2 General Specifications

Configuration:	Modulator Only
Switch Time:	50 msec Maximum
Ports:	IF: BNC, 75 Ohms L-Band: SMA, 50 Ohms
Control Ports:	DB-9 Male
Status Port:	DB-9 Male
Return Loss:	20 dB IF 14 dB L-Band

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## 5.3 Power and Environmental

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

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## 5.4 Physical

Size:	4.4" W x 3.4" D x 1.75" H (11.18 cm x 8.63 cm x 4.45 cm)
Weight:	0.5 lb. (0.22 Kg)

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## METRIC CONVERSIONS

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### Units of Length

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

### Temperature Conversions

Unit	° Fahrenheit	° Centigrade
32° Fahrenheit	—	0 (water freezes)
212° Fahrenheit	—	100 (water boils)
-459.6° Fahrenheit	—	273.1 (absolute 0)

Formulas
$C = (F - 32) * 0.555$
$F = (C * 1.8) + 32$

### Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoir.	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	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. avoir.	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	$1.0 \times 10^3$	35.27	32.15	2.205	2.679	—



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