COMTECH EF DATA ™

SMS-451

IMPORTANT

This document supersedes the following documents:
SMS-451A, MN/SMS451A.IOM, Rev. 1 dated 4 August 1995
SMS-451E, MN/SMS451E.IOM, Rev. 1 dated 4 June 2001
SMS-451T, MN/SMS451T.IOM, Rev. 1 dated 24 August 1995

SMS-451

Satellite Switch
Model A, E, and T
Installation and Operation Manual

Customer Support

Contact the Comtech EF Data Customer Support Department for:

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

An Comtech EF Data 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)
480.333.2161 (Main FAX Number)
480.333.2540 (Marketing FAX Number)

or, E-Mail can be sent to the Customer Support Department at:

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or, contact Customer Support Department at the web site:

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3. Ship the product back to Comtech EF Data. (Shipping charges should be prepaid.)

For more information regarding the warranty policies, refer to the disclaimer page located behind the title page.

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Preface

About this Manual

This manual describes the installation and operation information for the Comtech EF Data:

- SMS-451A 1:1 Satellite Modem Switch
- SMS-451E 1:1 ECL Modem Protection Switch
- SMS-451T 1:1 ESC ESC Protection Switch

This is a technical document intended for earth station engineers, and operators responsible for the operation and maintenance of the switch.

Conventions Used in this Manual

Cautions, Warning, and Important Notes

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.

IMPORTANT indicates a statement that is associated with the task being performed.

Metric Conversion

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

Trademarks

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

Related Documents

The following documents are referenced in this manual:

ELECTRICAL SAFETY

The SMS-451 Satellite Switch has been shown to comply with the following safety standard:

- EN 60950: Safety of Information Technology Equipment, including electrical business machines.

The equipment is rated for operation over the range 85 to 264 volts AC. It has a maximum power consumption of 60 watts.

FUSES

The SMS-451 Satellite Switch is fitted with two fuses, one each for line and neutral connections. These are contained within the body of the IEC power connector, behind a small plastic flap.

- For 230 volt AC operation, use T0.75A, 20mm fuses.
- For 115 volt AC operation, use T1.25A fuses, 20mm fuses.

IMPORTANT

For continued operator safety, always replace the fuses with the correct type and rating.

Environmental

The SMS-451 Satellite Switch must not be operated in an environment where the unit is exposed to extremes of temperature outside the ambient range 0 to 50°C (32 to 122°F), precipitation, condensation, or humid atmospheres above 95% RH, altitudes (un-pressurized) greater than 2000 meters, excessive dust or vibration, flammable gases, corrosive or explosive atmospheres.

Operation in vehicles or other transportable installations that are equipped to provide a stable environment is permitted. If such vehicles do not provide a stable environment, safety of the equipment to EN60950 may not be guaranteed.
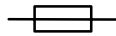
Installation

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

The SMS-451 Satellite Switch 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.

The SMS-451 Satellite Switch is shipped with a line inlet cable suitable for use in the country of operation. If it is necessary to replace this cable, ensure the replacement has an equivalent specification. Examples of acceptable ratings for the cable include HAR, BASEC and HOXXX-X. Examples of acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

International Symbols:

Symbol	Definition
~	Alternating Current
⊐⊏	Fuse

Symbol	Definition
⏚	Protective Earth
⏛	Chassis Ground

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.

EMC (Electromagnetic Compatibility)

In accordance with European Directive 89/336/EEC, the SMS-451 Satellite Switch has been shown, by independent testing, to comply with the following standards:

Emissions: EN 55022 Class B - Limits and methods of measurement of radio interference characteristics of Information Technology Equipment.

                   (Also tested to FCC Part 15 Class B)

Immunity: EN 50082 Part 1 - Generic immunity standard, Part 1: Domestic, commercial and light industrial environment.

Additionally, the SDM-2020D has been shown to comply with the following standards:

EN 61000-3-2	Harmonic Currents Emission
EN 61000-3-3	Voltage Fluctuations and Flicker
EN 61000-4-2	ESD Immunity
EN 61000-4-4	EFT Burst Immunity
EN 61000-4-5	Surge Immunity
EN 61000-4-6	RF Conducted Immunity
EN 61000-4-8	Power frequency Magnetic Field Immunity
EN 61000-4-9	Pulse Magnetic Field Immunity
EN 61000-4-11	Voltage Dips, Interruptions, and Variations Immunity
EN 61000-4-13	Immunity to Harmonics

IMPORTANT

In order that the Modem continues to comply with these standards, observe the following instructions:

- Connections to the transmit and receive IF ports (Type N and Type F, female, connectors) should be made using a good quality coaxial cable - for example RG58/U (50Ω or RG59/U (75Ω).

- All 'D' type connectors attached to the rear panel must have back-shells that provide continuous metallic shielding. Cable with a continuous outer shield (either foil or braid, or both) must be used, and the shield must be bonded to the back shell.

- The equipment must be operated with its cover on at all times. If it becomes necessary to remove the cover, the user should ensure that the cover is correctly re-fitted before normal operation commences.

Warranty Policy

This Comtech EF Data product is warranted against defects in material and workmanship for a period of one year 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.

For equipment under warranty, the customer is responsible for freight to Comtech EF Data and all related custom, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges **only** for return of the equipment from the factory to the customer. 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.

Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from improper installation or maintenance, abuse, unauthorized modification, or operation outside of environmental specifications for the product, or, for damages that occur due to improper repackaging of equipment for return to Comtech EF Data.

No other warranty is expressed or implied. Comtech EF Data specifically disclaims the implied warranties of merchantability and fitness for particular purpose.

Exclusive Remedies

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.

Disclaimer

Comtech EF Data has reviewed this manual thoroughly in order that it will be an easy-to-use guide to your equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, please contact the Comtech EF Data Customer Support Department.

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Chapter 1. INTRODUCTION

This manual describes the SMS-451 Satellite Switch (Model A, E, or T), referred to in this document as "the switch."

1.1   Description

The following descriptions are referenced to the applicable switch.

1.1.1   SMS-451A Description
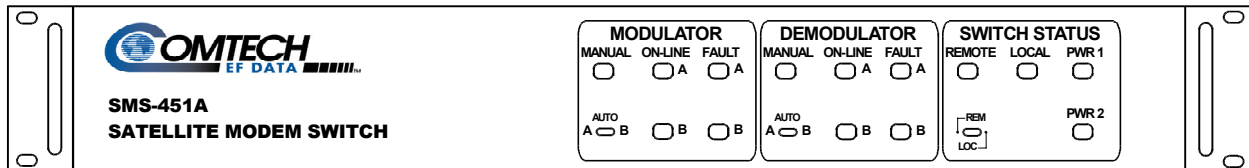
Figure 1-1. SMS-451A

The SMS-451A 1:1 Satellite Modem Switch (Figure 1-1) is a fully-automated 1:1 satellite modem (protection) switch for the following Comtech EF Data modems:

- SDM-450
- SDM-9000 with the G.703 interface.

The switch provides redundancy for one prime modem with one backup modem.

The switch contains:

- Circuitry for the data
- IF switching
- Remote and local status reporting
- Remote and local control

A 50Ω system consists of the following assemblies:

Switch Top Assembly	AS/1781-1
1:1 Switch Modem PCB	AS/1760-1
Chassis Assembly	AS/1780
Front Panel Assembly	AS/1090
Power Supply	PS/AC40W03P02
Cable Assembly (75Ω)	CA/1798B
Cable Assembly (75Ω)	CA/1799B
Cable Assembly, DC Power	CA/1772B

A 75Ω system consists of the following assemblies:

Switch Top Assembly	AS/1781-2
1:1 Switch Modem PCB	AS/1760-2
Chassis Assembly	AS/1780
Front Panel Assembly	AS/1090
Power Supply	PS/AC40W03P02
Cable Assembly (50Ω)	CA/1800B
Cable Assembly (75Ω)	CA/1799B
Cable Assembly (75Ω)	CA/1798B
Cable Assembly, DC Power	CA/1772B

Additional versions of the SMS-451 also support the SDM-2020 Modulator and demodulator:

- SDM-2020 with G.703 Interface
- SDM-2020 with ASI Interface

IMPORTANT

The 70/140 MHZ and L-Band versions of the SMS-451 are available to support the SDM-2020 Demodulator. The TX IF of the SMS-451 is alaways 70/140 MHz.

The system block diagram (Figure 1-2) shows how the switch provides the interface between the prime modem, the terminal, and the customer equipment.
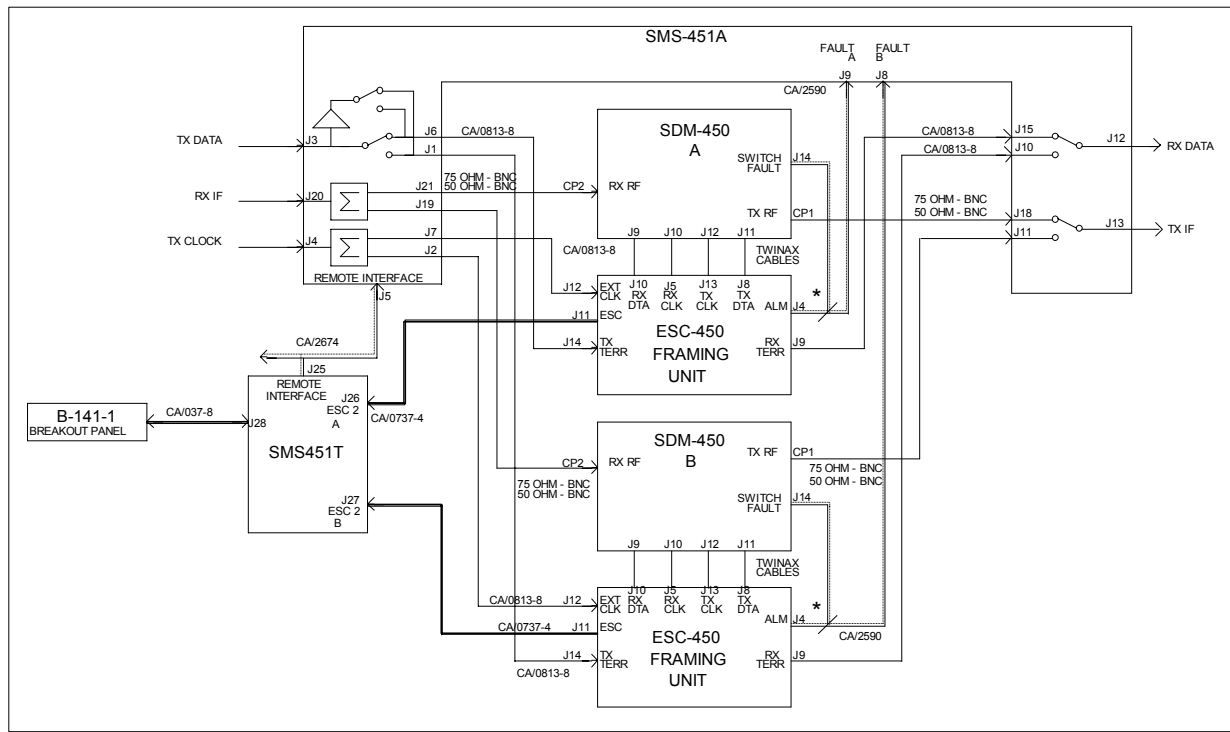
Figure 1-2. System Block Diagram

A block diagram of the switch is shown in Figure 1-3.
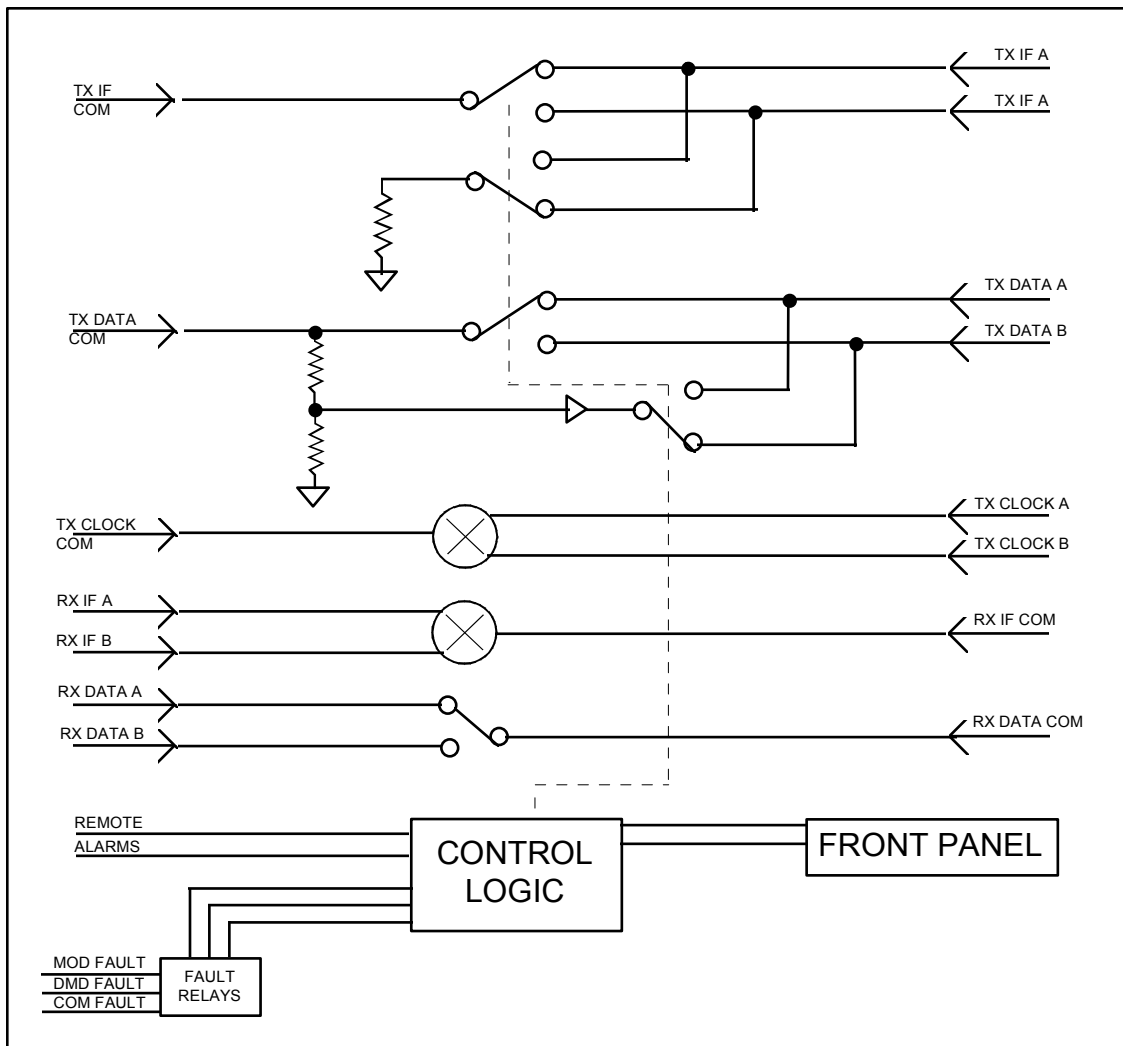
Figure 1-3. SMS-451A Switch Block Diagram

1.1.2   SMS-451E Description
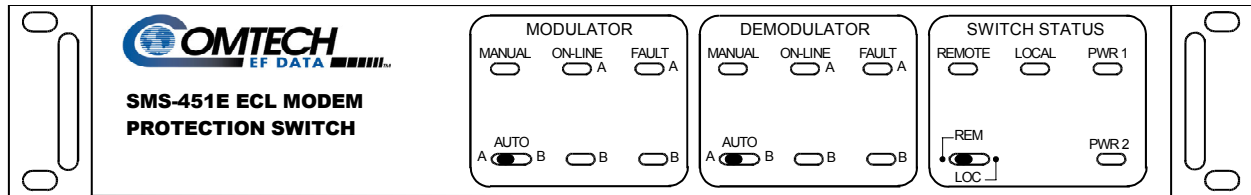
Figure 1-4.   SMS-451E

The SMS-451E 1:1 ECL Modem Protection Switch (Figure 1-4) is a fully automated 1:1
ECL protection switch for the Comtech EF Data SDM-9000 satellite modem.

> **IMPORTANT**
>
> ECL/HSSI connection also is available for the SDM-2020 Modems.

The switch is used to protect SDM-9000 modems using an ECL, Positive Emitter
Coupled Logic (PECL), or MIL-STD-188 terrestrial interface. The switch provides
redundancy for one prime modem with one backup modem.

The switch contains circuitry for:

- Data and IF switching
- Remote and local status reporting
- Remote and local control

The switch can be supplied with any of the following baseband interfaces:

- ECL
- PECL (positive level ECL)
- MIL-STD-188

The switch top assembly has the following configurations:

Operation	Input	Frequency	Interface
Modem (Dependent)	AC 75Ω	70	ECL
Mod/Demod (Independent)	AC 50Ω	140	PECL
	DC 50Ω		188
	DC 75Ω		

The system block diagram (Figure 1-5) shows how the switch provides the interface between the prime modem and the terminal and IF converter equipment.
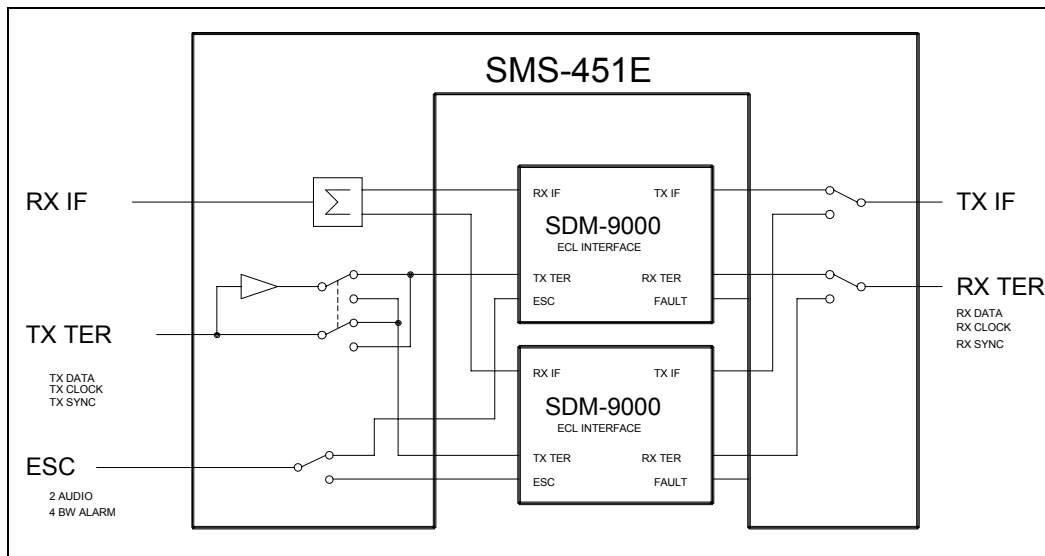
Figure 1-5. SMS-451E Block Diagram with SDM-9000 Satellite Modem

Connection of the SMS-451E with the SDM-2020 Modulator and/or Demodulator with a HSSI Interface along with a Cisco router and test translator is shown in Figure 1-6. The Y-cables between the modem and switch are provided. The cable between the switch and the router is ordered separately.
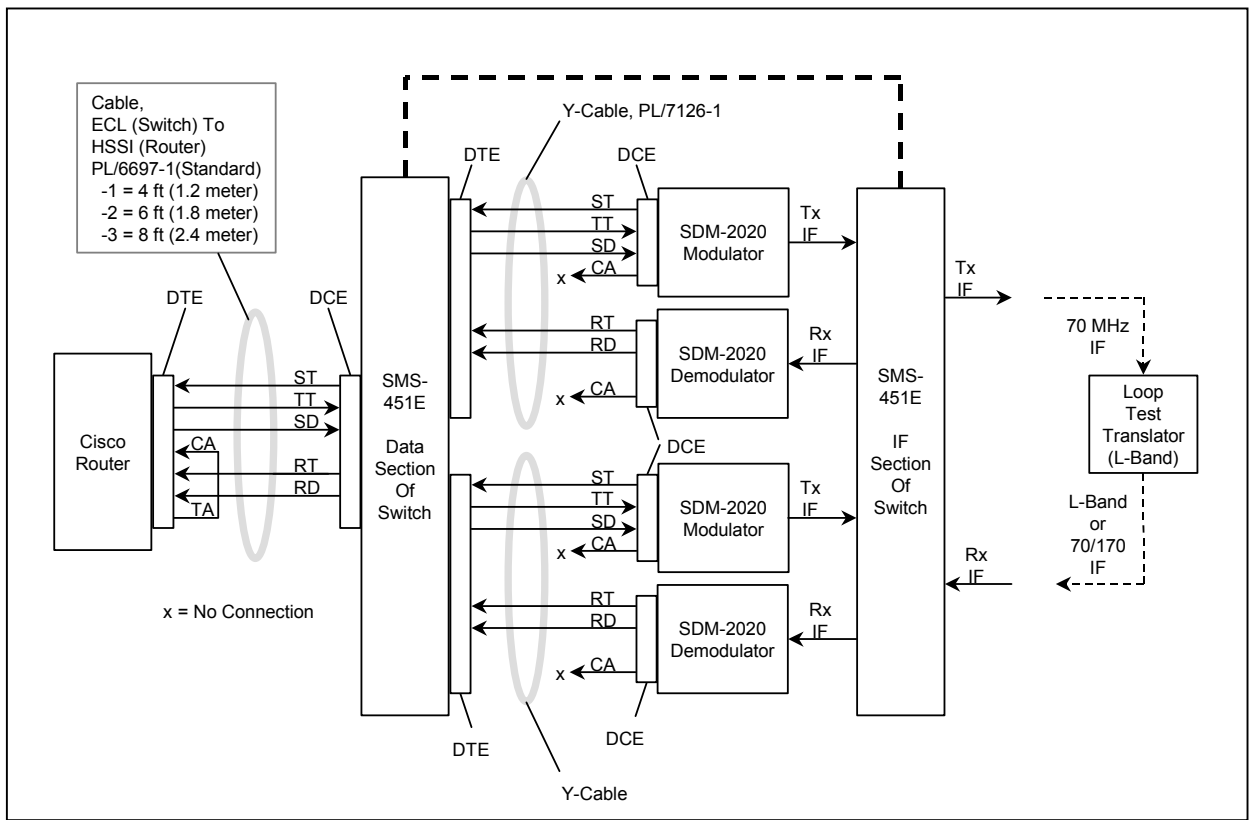
Figure 1-6. SMS-451 Block Diagram with SDM-2020 Modulator and Demodulator with a HSSI Interface

1.1.3　SMS-451T Description

Note: The SMS-451T 1:1 ESC Protection Switch can only be used in conjunction with an SMS-451A switch. All controls for the switch are provided by the SMS-451A Switch.

Figure 1-7. SMS-451T

The switch (Figure 1-7) adds 1:1 ESC switching capability to the SMS-451A 1:1 satellite modem switch. The ESC channel is compatible with the optional ESC channels used on the ESC-450 framing unit.

The switch also provides redundancy for the ESC channel of the prime framing unit with the ESC channel of one backup framing unit.

A system consists of the following assemblies:

Switch Top Assembly	AS/1941
ESC 1 PCB	AS/1862
ESC 2 PCB	AS/1863
Chassis Assembly	AS/1942
Front Panel Assembly	AS/1855-1
Power Supply	PS/AC40W03P02

A block diagram of the switch is shown in Figure 1-8.
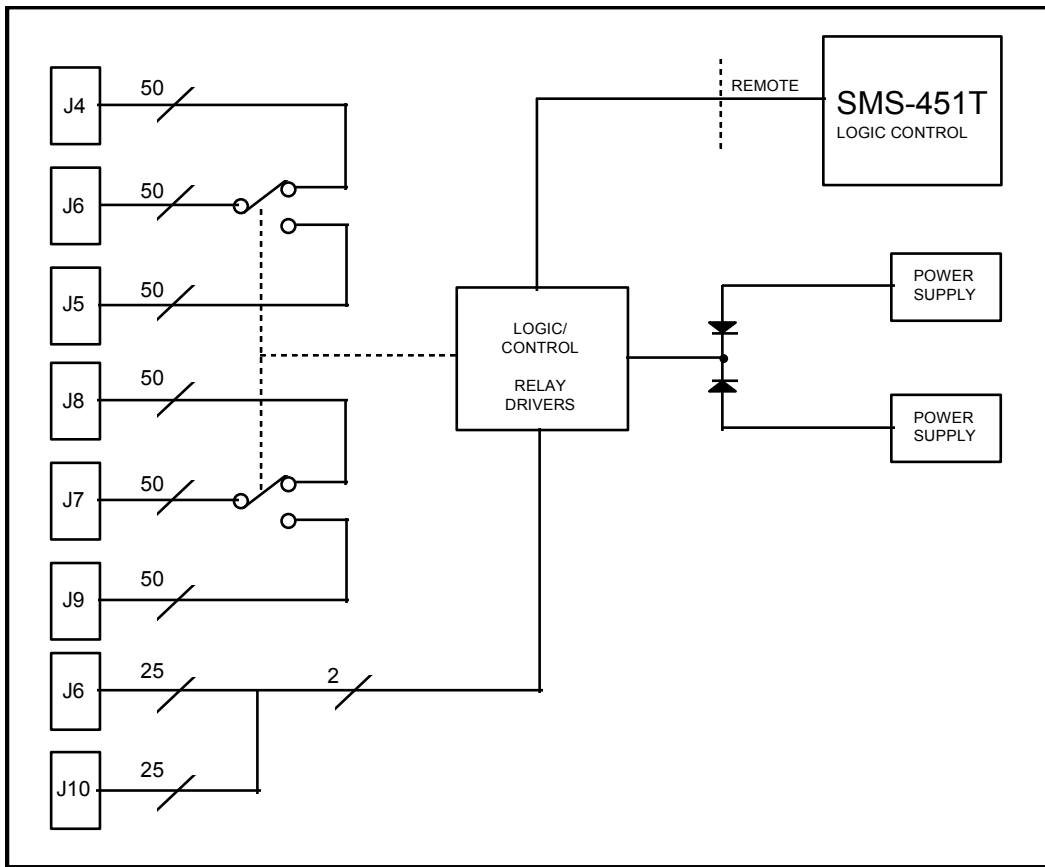
Figure 1-8. SMS-451T Block Diagram

1.2   Specifications

The following specifications are referenced to the applicable switch.

1.2.1   SMS-451A Specifications

The interface operates to the specifications described in Table 1-1.

Table 1-1. SMS-451A Specifications

General Specifications	
Interface:	
IF	75Ω BNC (50Ω optional)
Baseband Data	75Ω BNC (50Ω optional)
TX Clock	75Ω BNC (50Ω optional)
Controls:	
Modulator	A or B online select
	Auto
Demodulator	A or B online select
	Auto
Common	Remote or Local
Indicators:	
Modulator	A or B online
	A and B faults
Demodulator	A and B online
	A and B faults
Common	Power supply 1 and 2 On
	Remote control activated
Remote Control	Via external contact closures on a 25-pin female D connector for A/B modulator select and A/B demodulator select.
Physical Specifications	
Operating Temperature	0 to 40°C (32 to 104°F)
Power	90 to 264 VAC
	47 to 63 Hz
	10W maximum
Size	19 W x 18 D x 3.5 H inches (48.26 H x 45.72 D x 8.89 cm)
Weight	10 lbs (4.5 kg)
Humidity	0 to 90% Noncondensing

1.2.2   SMS-451E Specifications

The interface operates to the specifications described in Table 1-2.

Table 1-2. SMS-451E Specifications

General Specifications	
Interface:	
Digital	ECL, PECL, MIL-STD-188 50-pin D.
IF	75Ω BNC (50Ω optional).
Controls:	
Modulator	A or B online select.
	Auto.
Demodulator	A or B online select.
	Auto.
Common	Remote or local.
Indicators:	
Modulator	A or B online.
	A and/or B fault.
Demodulator	A or B online.
	A and/or B fault.
Common	Power supply 1 and/or 2 ON.
	Remote control activated.
Remote Control	Via external contact closure on a 25-pin female D connector for A/B modulator select and A/B demodulator select.
Physical Specifications	
Power	90 to 260 VAC.
	47 to 63 Hz.
	10W max.
	-48 VDC optional.
Size	19 W x 18 D x 3.5 H inches (48.26 W x 45.72 D x 8.89 H cm)
Weight	10 lbs (4.5 kg)

1.2.3   SMS-451T Specifications

The interface operates to the specifications described in Table 1-3.

Table 1-3. SMS-451T Specifications

General Specifications	
ESC Interface	Engineering Service Channels. 50-pin D female.
Remote Control Interface	Via external contact closures on a 25-pin female D connector.
Indicators	Power Supply 1 and 2 On each for ESC 1 and ESC 2.
Physical Specifications	
Power	90 to 264 VAC 47 to 63 Hz 10W max.
Size	19 W x 18 D x 3.5 H inches (48.26 W x 45.72 D x 8.89 H cm)
Weight	10 lbs (4.5 kg)

Chapter 2. INSTALLATION

This chapter provides system installation and external connection information.

2.1 Unpacking

The switch and manual are packaged in pre-formed reusable foam inside a cardboard carton.

To remove the switch:

> ⚠ **CAUTION**
>
> ***Do not use any cutting tool that will extend more than 1 inch into the container and cause damage to the switch.***

1. Cut the tape at the top of the carton where it is indicated OPEN THIS END.

2. Lift off the foam covering the switch.

3. Remove the switch, manual, and power cords from carton.

4. Save the packing material for reshipment either back to the factory or to another site.

5. Inspect the equipment for damage incurred during shipment.

6. Check the equipment against the packing list shipped with the equipment to ensure that the shipment is complete.

7. Refer to Section 2.2 system installation instructions.

2.2　　　　System Installation

2.2.1　　　SMS-451A Installation

Install the switch as follows:

1.　Mount the switch in a 19-inch (48 cm) rack with four screws between the two modems.

Notes:
1.　Refer to Chapter 1 for a block diagram with ESC-450 framing units.
2.　Refer to Figure 2-1 for the interconnect diagram of a system with EB-450 buffers.
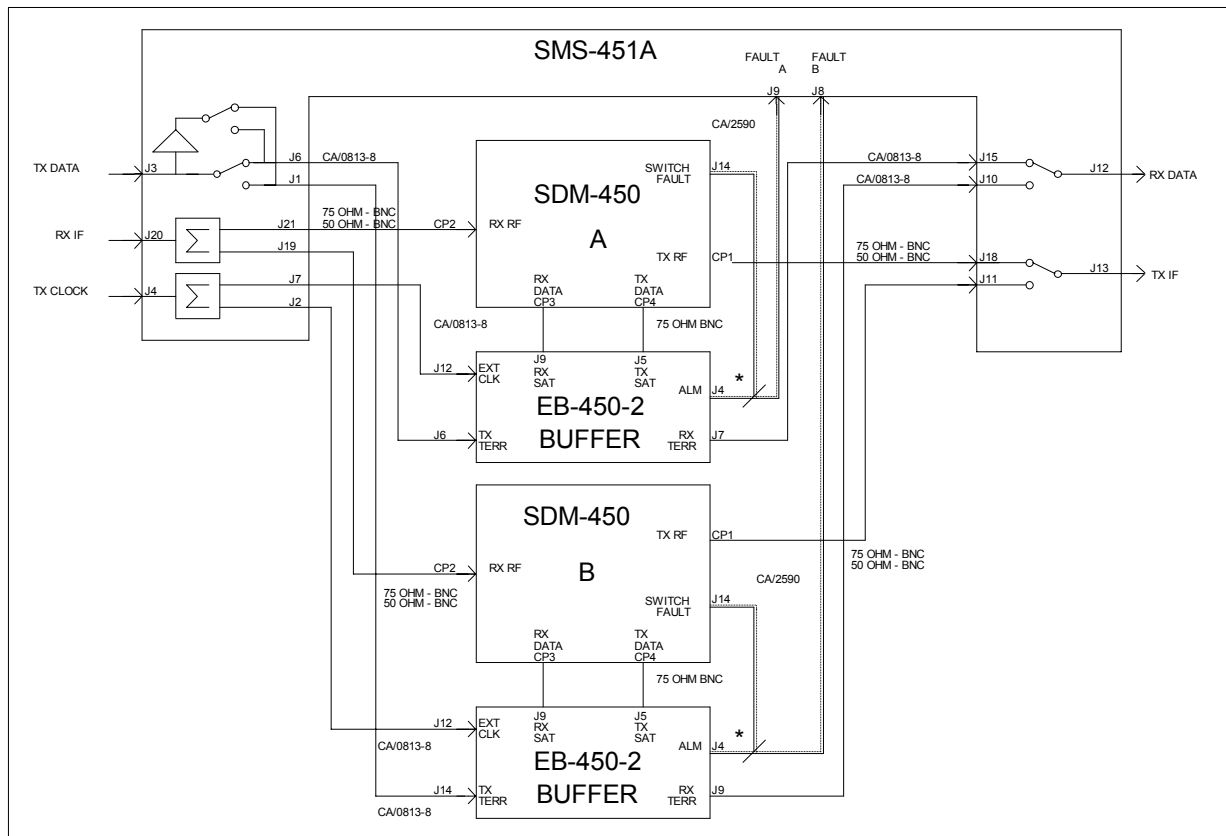
Figure 2-1. Interconnect Diagram with EB-450 Buffers

2. Connect the **"RX IF COM" BNC** connector on the rear panel to the customer equipment **RX IF** input.

3. Connect the **"A" BNC** to the prime modem **RX IF** input (cable provided).

4. Connect the **"B" BNC** the backup modem **RX IF** input (cable provided).

5. Connect the **"TX IF COM" BNC** connector on the rear panel to the customer equipment **TX IF** output.

6. Connect the **"A" BNC** to the prime modem **TX IF** output (cable provided).

7. Connect the **"B" BNC** the backup modem **TX IF** output (cable provided).

8. Connect the **"RX DATA COM" BNC** connector on the rear panel to the customer equipment **RX DATA** input.

9. Connect the **"A" BNC** to the prime modem **RX DATA IN** (cable provided).

10. Connect the **"B" BNC** the backup modem **RX DATA IN** (cable provided).

11. Connect the **"TX DATA COM" BNC** connector on the rear panel to the customer equipment **TX DATA** output.

12. Connect the **"A" BNC** to the prime modem **TX DATA OUT** (cable provided).

13. Connect the **"B" BNC** the backup modem **TX DATA OUT** (cable provided).

14. Connect the **"MODEM FAULT A"** 9-pin D connector on the rear panel to the prime modem **TTL** fault connector.

15. Connect the **"MODEM FAULT B"** 9-pin D connector on the rear panel to the backup modem **TTL** fault connector.

16. Connect the remote interface connector to the customer remote terminal.

17. Connect **AC** power to **AC 1** and **AC 2** with power cables that are provided.

> **IMPORTANT**
> If two **AC** power sources are available, connect **AC 1** and the prime modem to one **AC** source. Connect **AC 2** and the backup modem to the other **AC** source.

18. Refer to the appropriate installation and operation manual for installation instructions for the prime and backup modems. The configurations of both modems must be set the same.

19. If there is any problem installing the switch, call Comtech EF Data Customer Support department for troubleshooting assistance.

2.2.2   SMS-451E Installation

Install the switch as follows:

1. Using four screws, mount the switch in a 19-inch rack.

2. Connect the **"TX IF" BNC** connector on the switch rear panel to the up converter.

3. Connect the **"A" BNC** to the prime modem **TX IF** Out (cable provided).

4. Connect the **"B" BNC** to the backup modem **TX IF** Out (cable provided).

5. Connect the data interface common 50-pin connector to the DTE equipment.

6. Connect the **"A"** baseband cables (BNCs or 50-pin connectors as in Step 5) to the prime modem data connector (cables provided).

7. Connect the **"B"** baseband cables to the backup modem data connector (cables provided).

8. Connect the **"RX IF" BNC** to the down converter.

9. Connect the **"A" BNC** to the prime modem **RX IF IN**.

10. Connect the **"B" BNC** to the backup modem **RX IF IN**.

11. Connect **AC** power to **AC 1** (J11) and **AC 2** (J12) with power cables that are provided.

> **IMPORTANT**
>
> If two **AC** power sources are available, connect **AC 1** and the prime modem to one **AC** source. Connect **AC 2** and the backup modem to the other **AC** source.

12. Refer to the appropriate modem installation and operation manual for installation instructions of the prime and backup modems. The configurations of both modems must be set the same.

13. Connect the remote terminal to the Remote connector.

14. If there is any problem installing the switch, call Comtech EF Data Customer Support for troubleshooting assistance.

2.2.3   SMS-451T Installation

Install the switch as follows:

1. Mount the switch chassis in the assigned position in the equipment rack.

2. Connect the cables to the appropriate locations on the rear panel.

    Notes:
    1. Refer to Section 2.3 for connector pinouts, placement, and function.
    2. Refer to Chapter 1 in the SMS-451A manual for a typical interconnect diagram of the system.

3. Turn ON the power switches located on the rear panel.

4. If there is any problem during installation, contact Comtech EF Data Customer Support department..

2.3　　　External Connections

2.3.1　　SMS-451A External Connections

Connections between the switch and other equipment are made through rear panel connectors. The connectors are listed in Table 2-1and the locations are shown in Figure 2-2.

Table 2-1. SMS-451A Rear Panel Connectors

Name	Ref. Desig.	Connector Type	Function
REMOTE	J5	25-pin D	Remote Interface Control/Status
FAULT	J9	9-pin D	Modem Fault A
	J8	9-pin D	Modem Fault B
IF IN A	J21	BNC	Modem A Input
IF IN COM	J20	BNC	RX IF Input
IF IN B	J22	BNC	Modem B Input
IF OUT A	J18	BNC	Modem A
IF OUT COM	J13	BNC	TX IF Output
IF OUT B	J11	BNC	Modem B
RX DATA A	J15	BNC	Modem A
RX DATA COM	J12	BNC	RX Data Com
RX DATA B	J10	BNC	Modem B
TX DATA A	J6	BNC	Modem A
TX DATA COM	J3	BNC	TX Data Com
TX DATA B	J1	BNC	Modem B
TX CLK A	J7	BNC	Modem A
TX CLK COM	J4	BNC	TX Clock Com
TX CLK B	J2	BNC	Modem B
AC POWER	J23, J24	CEE22	AC Power Input
GND	J25, J26	#10-32 STUD	Ground
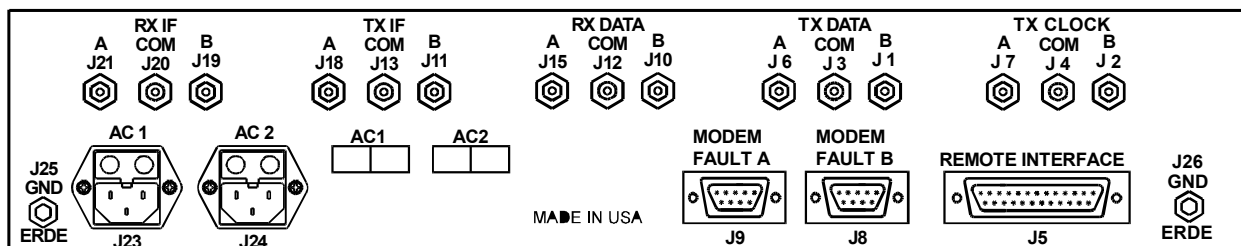
Figure 2-2. SMS-451A Rear Panel View

2.3.1.1   Remote Interface (J5)

The remote interface is provided on a 25-pin female D connector. The remote interface connector provides remote control and online/offline status of the switch.

The Local/Remote switch on the front panel must be in the Remote mode in order to control from this input. Status is available regardless of the position of the Local/Remote switch. Screw locks are provided for mechanical security of the mating connector.

Signal Function	Name	Pin #
DEMOD SWITCH STATUS	NO(B)	8
	NC(A)	7
	COM	15
MOD SWITCH STATUS	NO(B)	6
	NC(A)	5
	COM	13
CONTROL MOD REMOTE	MR(A)	4
	MR(B)	3
	GND	14
CONTROL DEMOD REMOTE	DR(A)	2
	DR(B)	1
	GND	9
MODE STATUS	COM	18
LOCAL	NO	16
REMOTE	NC	17
GROUND	GND	24
NO CONNECTION	---	19, 20, 21, 22, 23

Note: A closure between the "COM" and "NC" indicates that the "A" unit is online. An external connection between "GND" and "MR(A)" will force the "A" modulator online.

2.3.1.2 Modem Fault A and B (J8, J9)

The modem fault is provided on a 9-pin female D connector. Modem Fault A and B are Transistor-Transistor Logic (TTL) inputs from the modem's modulator and demodulator TTL fault outputs.

Screw locks are provided for mechanical security on the mating connector.

Pin #	Name	Function
1	NC	NO CONNECTION
2	NC	NO CONNECTION
3	NC	NO CONNECTION
4	MOD FLT	MODULATOR FAULTED
5	GND	MODULATOR GROUND
6	NC	NO CONNECTION
7	DEM FLT	DEMODULATOR FAULTED
8	GND	DEMODULATOR GROUND
9	NC	NO CONNECTION

2.3.1.3 Receive IF Connectors (J19, J20, J21)

These connectors are the RX IF splitter connectors. The RX IF of the prime modem connects to RX IF A. The RX IF of the backup modem connects to RX IF B. RX IF COM connects to the customer equipment. The characteristic impedance of these connections is 75Ω (50Ω optional) from 50 to 180 MHz.

There will be a 3 dB loss between A or B and the COM connector. If the backup or prime modem is disconnected for any reason, place a 75Ω or 50Ω termination on the unused connector.

2.3.1.4 Transmit IF Connectors (J11, J13, J18)

The TX IF output of the prime modem connects to TX IF "A." The TX IF output of the backup modem connects to TX IF "B." TX IF COM is the transmit IF output connector and connects to the customer equipment. The TX IF output of the online modem will be present at this connector. The characteristic impedance of these connections is 75Ω (50Ω optional) from 50 to 180 MHz

2.3.1.5   Receive Data (J10, J12, J15)

The RX Data output of the prime modem connects to RX DATA "A." The RX Data output of the backup modem connects to RX DATA "B." RX DATA COM is the data output to the customer. The characteristic impedance of these connections is 75Ω from 50 to 180 MHz.

2.3.1.6   Transmit Data (J1, J3, J6)

The TX Data input of the prime modem connects to TX DATA "A." The TX Data input of the backup modem connects to TX DATA "B." TX DATA COM is the data input to the customer. The characteristic impedance of these connections is 75Ω from 50 to 180 MHz. The offline unit will always have buffered data.

2.3.1.7   Transmit Clock (J2, J4, J7)

The TX Clock input of the prime modem connects to TX CLOCK "A." The TX Clock input of the backup modem connects to TX CLOCK "B." TX CLOCK COM is the clock input to the customer. The characteristic impedance of these connections is 75Ω from 50 to 180 MHz. There will be a 3 dB loss between the COM and the "A" or "B" connector.

2.3.1.8   AC Power (J34, J24)

The 90 to 264 AC power is supplied independently to each of the two power supplies by a standard detachable, non-locking, 3-prong power cord. Maximum power consumption is 10W. The input range is 90 to 264 VAC continuous and self-adjusting. The switch is designed to operate on one power supply.

2.3.1.9   Ground (J25, J26)

There are two #10-32 studs available on the rear for the purpose of connecting a common chassis ground between all of the equipment.

2.3.2   SMS-451E External Connections

Connections between the switch and other equipment are made through rear panel connectors. These connectors are listed in Table 2-2 and the locations are shown in Figure 2-3.

Table 2-2. SMS-451E Rear Panel Connectors

Name	Connector Type	Function
DATA INTERFACE	50-pin D	ECL Interface
REMOTE	25-pin D	Remote Control/ Remote Status
RX IF	BNC	RX IF Input
A	BNC	Demodulator A
B	BNC	Demodulator B
TX IF	BNC	TX IF Output
A	BNC	Modulator A
B	BNC	Modulator B
AC POWER	CEE22	AC Power Input
Ground	#10-32 STD	Chassis Ground
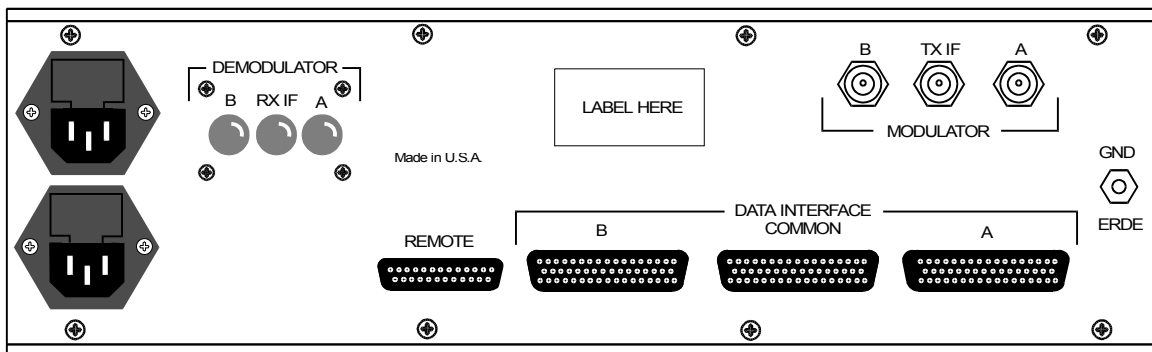
Figure 2-3. SMS-451E Rear Panel View

2.3.2.1   ECL Baseband DATA I/O (B, Common, and A)

The ECL interface is provided on a 50-pin female D connector. The switch DATA I/O connectors provide the baseband data interface from the DTE equipment to the switch, and from the switch to the prime and backup modems. Screw locks are provided for mechanical security of the mating connector.

Signal Function	Name	Pin #
GROUND	GND	1, 2
SEND DATA (SD)	TXD-A (ECL-)	37
	TXD-B (ECL+)	38
TERRESTRIAL TIMING (TT)	TXO-A (ECL-)	4
	TXO-B (ECL+)	5
SYNC TX FRAME (TX SYNC)	SD-A (ECL-)	34
	SD-B (ECL+)	18
EXTERNAL BUFFER CLOCK	EXC-A (ECL-)	35
	EXC-B (ECL+)	19
RECEIVE DATA (RD)	RXD-A (ECL-)	39
	RXD-B (ECL+)	40
RECEIVE TIMING (RT)	RXC-A	23
	RXC-B	24
SYNC RX FRAME (RX SYNC)	RD-A	36
	RD-B	20
SEND TIMING (ST)	RXC-A	21
	RXC-B	22
RECEIVE LINE SIGNAL DET	RXO-A	6
	RXO-B	7
ADPCM1 AUDIO IN	A1I-A	45
	A1I-B	29
ADPCM1 AUDIO OUT	A1O-A	46
	A1O-B	30
ADPCM2 AUDIO IN	A2I-A	47
	A2I-B	31
ADPCM2 AUDIO OUT	A2O-A	48
	A2O-B	32
BACKWARD ALARM 1 OUT	BWO1-C	8 *(See Note 1)*
	BWO1-NC	25
	BWO1-NO	41
BACKWARD ALARM 2 OUT	BWO2-C	9 *(See Note 1)*
	BWO2-NC	26
	BWO2-NO	42
BACKWARD ALARM 3 OUT	BWO3-C	10 *(See Note 1)*
	BWO3-NC	27
	BWO3-NO	43
BACKWARD ALARM 4 OUT	BWO4-C	11 *(See Note 1)*
	BWO4-NC	28
	BWO4-NO	44

Signal Function	Name	Pin #
BACKWARD ALARM 1 IN	BWI1	12 *(See Note 2)*
BACKWARD ALARM 2 IN	BWI2	13 *(See Note 2)*
BACKWARD ALARM 3 IN	BWI3	14 *(See Note 2)*
BACKWARD ALARM 4 IN	BWI4	15 *(See Note 2)*
MODULATOR FAULT (J2 and J4 only)	MF	49 *(See Note 3)*
DEMODULATOR FAULT (J2 and J4 only)	DF	33 *(See Note 3)*
DEFERRED MAINTENANCE ALARM	DMA	17 *(See Note 3)*
DEMODULATOR FAULT RELAY	DF-C DF-NO	16 *(See Note 4)* 50
AGC OUT	AGC-OUT	3

Notes:
1. BACKWARD ALARM relay contacts named for normal "No Fault" condition (BWOx-C connected to BWOx-NC if no fault).
2. BACKWARD ALARM inputs must be grounded or pulled logic low to clear alarm.
3. SIGNALS MF, DF, and DMA are open-collector high-impedance if faulted. MF and DF are used by the switch for switching and are not present at J1.
4. RELAY CONTACTS DF-C and DF-NO named for faulted condition (DF-C connected to DF-NO unless Demod Fault).

2.3.2.2   Remote Connector

The Remote interface is provided on a 25-pin female D connector. The Remote connector
provides interface to the switch for remote control and online/offline status of the switch.
The Local/Remote toggle switch on the front panel must be set to Remote mode in order
to control the switch from this input. Status is available regardless of the position of the
Local/Remote toggle switch. Screw locks are provided for mechanical security of the
mating connector.

Signal Function	Name	Pin #
DEMOD SWITCH STATUS	NO(B)	8
	NC(A)	7
	COM	15
MOD SWITCH STATUS	NO(B)	6
	NC(A)	5
	COM	13
CONTROL MOD REMOTE	MR(A)	4
	MR(B)	3
	GND	14
CONTROL DEMOD REMOTE	DR(A)	2
	DR(B)	1
	GND	9
MODE STATUS	COM	18
LOCAL	NO	16
REMOTE	NC	17
REMOTE STATUS	NO(B)	19
DN/CONV SWITCH	NC(A)	20
	COM	21
REMOTE CONTROL	DC(A)	22
DOWN/CONVERTER	DC(B)	23
GROUND	GND	24

Note: A closure between the "COM" and "NC" indicates that the "A" unit is online.
An external connection between "GND" and "MR(A)" will force the "A" modulator
online. Pins 19 through 23 are reserved for converters and are not used on the switch.

2.3.2.3   Demodulator IF Inputs (B, RX IF, and A)

These connectors are the RX IF input connectors. The IF input of the prime
modem connects to demodulator A, and the input of the backup modem connects to
demodulator B. RXIF is the input from the customer. The input impedance is 75Ω
(50Ω optional), and the frequency range is 50 to 180 MHz.

2.3.2.4   Modulator IF Outputs (B TX IF, and A)

The TX IF output of the prime modem connects to modulator A. The transmit IF output
of the backup modem connects to modulator B. TXIF is the transmit IF output connector.
The IF output of the online modem will be present at this connector. The output
impedance is 75Ω (50Ω optional), and the frequency range is 50 to 180 MHz.

2.3.2.5   Power Connections

The AC power supplies are self-adjusting between 90 and 264 VAC. Manual switching
is not necessary. Maximum power consumption is 10W. The AC power is supplied
independently to each of the two power supplies by two standard detachable, non-
locking, 3-prong power cords.

2.3.2.6   Ground (ERDE)

There is one #10-32 stud available on the rear for the purpose of connecting a common
chassis ground between all of the equipment.

2.3.3   SMS-451T External Connections

Connections between the switch and other equipment are made through rear panel
connectors. These connectors are listed in Figure 2-4 and their locations are shown in
Figure 2-4.

Table 2-3. SMS-451T Rear Panel Connectors

Name	Ref Des	Connector Type	Function
ESC 1 A	J16	50-pin D	ESC Prime
ESC 1 B	J17	50-pin D	ESC Backup
ESC 1 COM	J18	50-pin D	ESC Common
ESC 2 A	J26	50-pin D	ESC Prime
ESC 2 B	J27	50-pin D	ESC Backup
ESC 2 COM	J28	50-pin D	ESC Common
Remote Interface Out	J25 J5	25-pin D	Remote Control and Remote Status
AC Power #1 AC Power #2	J24 J2	CEE22	AC Power Input
GND	J3	#10-32 STUD	Ground
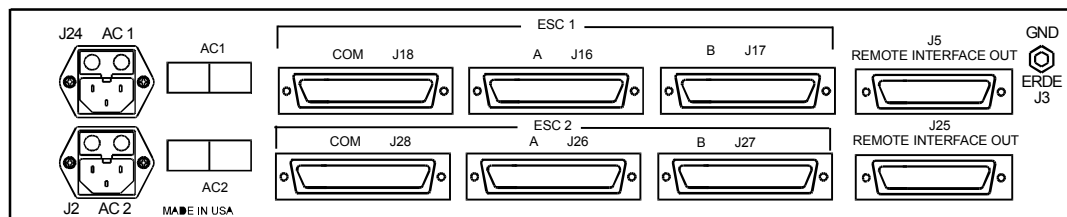
Figure 2-4. SMS-451T Rear Panel View

2.3.3.1 ESC "A" Connector Pin Assignments (J16 and J26)

The ESC prime interface is provided on a 50-pin female D connector. Screw locks are provided for mechanical security of the mating connector.

Signal Function	Name	Pin #
GROUND	A-GND	1, 9, 50
SEND 64 KBPS DATA 1	A-SD1-A	34
	A-SD1-B	18
SEND 64 KBPS TIMING 1	A-ST1-A	2
	A-ST1-B	35
SEND 64 KBPS DATA 2	A-SD2-A	19
	A-SD2-B	3
SEND 64 KBPS TIMING 2	A-ST2-A	36
	A-ST2-B	20
SEND 64 KBPS DATA 3	A-SD3-A	4
	A-SD3-B	37
SEND 64 KBPS TIMING 3	A-ST3-A	21
	A-ST3-B	5
SEND 64 KBPS DATA 4	A-SD4-A	38
	A-SD4-B	22
SEND 64 KBPS TIMING 4	A-ST4-A	6
	A-ST4-B	39
SEND 64 KBPS DATA 5	A-SD5-A	23
	A-SD5-B	7
SEND 64 KBPS TIMING 5	A-ST5-A	40
	A-ST5-B	24
TX OCTET	A-TOCT-A	8
	A-TOCT-B	41
SPARE	A-SPR-1	25
	A-SPR-2	42
	A-SPR-3	26
RX OCTET	A-ROCT-A	10
	A-ROCT-B	43
RECEIVE 64 KBPS TIMING 5	A-RT5-A	27
	A-RT5-B	11
RECEIVE 64 KBPS DATA 5	A-RD5-A	44
	A-RD5-B	28
RECEIVE 64 KBPS TIMING 4	A-RT4-A	12
	A-RT4-B	45
RECEIVE 64 KBPS DATA 4	A-RD4-A	29
	A-RD4-B	13
RECEIVE 64 KBPS TIMING 3	A-RT3-A	46
	A-RT3-B	30
RECEIVE 64 KBPS DATA 3	A-RD3-A	14
	A-RD3-B	47
RECEIVE 64 KBPS TIMING 2	A-RT2-A	31
	A-RT2-B	15
RECEIVE 64 KBPS DATA 2	A-RD2-A	48
	A-RD2-B	32
RECEIVE 64 KBPS TIMING 1	A-RT1-A	16
	A-RT1-B	49
RECEIVE 64 KBPS DATA 1	A-RD1-A	33
	A-RD1-B	17

2.3.3.2   ESC "B" Connector Pin Assignments (J17 and J27)

The ESC backup interface is provided on a 50-pin female D connector. Screw locks are provided for mechanical security of the mating connector.

Signal Function	Name	Pin #
GROUND	B-GND	1, 9, 50
SEND 64 KBPS DATA 1	B-SD1-A	34
	B-SD1-B	18
SEND 64 KBPS TIMING 1	B-ST1-A	2
	B-ST1-B	35
SEND 64 KBPS DATA 2	B-SD2-A	19
	B-SD2-B	3
SEND 64 KBPS TIMING 2	B-ST2-A	36
	B-ST2-B	20
SEND 64 KBPS DATA 3	B-SD3-A	4
	B-SD3-B	37
SEND 64 KBPS TIMING 3	B-ST3-A	21
	B-ST3-B	5
SEND 64 KBPS DATA 4	B-SD4-A	38
	B-SD4-B	22
SEND 64 KBPS TIMING 4	B-ST4-A	6
	B-ST4-B	39
SEND 64 KBPS DATA 5	B-SD5-A	23
	B-SD5-B	7
SEND 64 KBPS TIMING 5	B-ST5-A	40
	B-ST5-B	24
TX OCTET	B-TOCT-A	8
	B-TOCT-B	41
SPARE	B-SPR-1	25
	B-SPR-2	42
	B-SPR-3	26
RX OCTET	B-ROCT-A	10
	B-ROCT-B	43
RECEIVE 64 KBPS TIMING 5	B-RT5-A	27
	B-RT5-B	11
RECEIVE DATA 5	B-RD5-A	44
	B-RD5-B	28
RECEIVE 64 KBPS TIMING 4	B-RT4-A	12
	B-RT4-B	45
RECEIVE 64 KBPS DATA 4	B-RD4-A	29
	B-RD4-B	13
RECEIVE 64 KBPS TIMING 3	B-RT3-A	46
	B-RT3-B	30
RECEIVE 64 KBPS DATA 3	B-RD3-A	14
	B-RD3-B	47
RECEIVE 64 KBPS TIMING 2	B-RT2-A	31
	B-RT2-B	15
RECEIVE 64 KBPS DATA 2	B-RD2-A	48
	B-RD2-B	32
RECEIVE 64 KBPS TIMING 1	B-RT1-A	16
	B-RT1-B	49
RECEIVE 64 KBPS DATA 1	B-RD1-A	33
	B-RD1-B	17

2.3.3.3   ESC "COMMON" Connector Pin Assignments (J18 and J28)

The ESC "2" common connector is the customer interface provided on a 50-pin female D connector. Screw locks are provided for mechanical security of the mating connector.

Signal Function	Name	Pin #
GROUND	C-GND	1, 9, 50
SEND 64 KBPS DATA 1	C-SD1-A	34
	C-SD1-B	18
SEND 64 KBPS DATA 2	C-SD2-A	19
	C-SD2-B	3
SEND 64 KBPS TIMING 2	C-ST2-A	36
	C-ST2-B	20
SEND 64 KBPS DATA 3	C-SD3-A	4
	C-SD3-B	37
SEND 64 KBPS TIMING 3	C-ST3-A	21
	C-ST3-B	5
SEND 64 KBPS DATA 4	C-SD4-A	38
	C-SD4-B	22
SEND 64 KBPS TIMING 4	C-ST4-A	6
	C-ST4-B	39
SEND 64 KBPS DATA 5	C-SD5-A	23
	C-SD5-B	7
SEND 64 KBPS TIMING 5	C-ST5-A	40
	C-ST5-B	24
TX OCTET	C-TOCT-A	8
	C-TOCT-B	41
SPARE	C-SPR-1	25
	C-SPR-2	42
	C-SPR-3	26
RX OCTET	C-ROCT-A	10
	C-ROCT-B	43
RECEIVE 64 KBPS TIMING 5	C-RT5-A	27
	C-RT5-B	11
RECEIVE 64 KBPS DATA 5	C-RD5-A	44
	C-RD5-B	28
RECEIVE 64 KBPS TIMING 4	C-RT4-A	12
	C-RT4-B	45
RECEIVE 64 KBPS DATA 4	C-RD4-A	29
	C-RD4-B	13
RECEIVE 64 KBPS TIMING 3	C-RT3-A	46
	C-RT3-B	30
RECEIVE 64 KBPS DATA 3	C-RD3-A	14
	C-RD3-B	47
RECEIVE 64 KBPS TIMING 2	C-RT2-A	31
	C-RT2-B	15
RECEIVE 64 KBPS DATA 2	C-RD2-A	48
	C-RD2-B	32
RECEIVE 64 KBPS TIMING 1	C-RT1-A	16
	C-RT1-B	49
RECEIVE 64 KBPS DATA 1	C-RD1-A	33
	C-RD1-B	17

2.3.3.4   Remote Interface OUT (J5 and J25)

The Remote Interface is provided on a 25-pin female D connector. Screw locks are provided for mechanical security of the mating connector.

Signal Function	Name	Pin #
DEMOD SWITCH STATUS	NO(B)	8
	NC(A)	7
	COM	15
MOD SWITCH STATUS	NO(B)	6
	NC(A)	5
	COM	13
CONTROL MOD REMOTE	MR(A)	4
	MR(B)	3
	GND	14
CONTROL DEMOD REMOTE	DR(A)	2
	DR(B)	1
	GND	9
MODE STATUS	COM	18 LOCAL
	NO	16 REMOTE
	NC	17
DEMOD SET	D_SET	11 MOD SET
	M_SET	12
	GND	24

2.3.3.5   AC Power

The AC power is supplied to the switch by two standard detachable, non-locking, 3-prong power cords. Normal input voltage is 90 to 264 VAC, 47 to 63 Hz. The power supplies are self-adjusting. For maximum redundancy protection, the switch will operate with only one power supply. Maximum power consumption is less than 10W.

2.3.3.6   Ground

A#10-32 stud is available on the rear for the purpose of connecting a common chassis ground between all of the equipment.

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Chapter 3. OPERATION

This chapter provides operation procedures for the switch.

3.1   Overview

Note: In the event of power loss to the switch (Figure 3-1), the relays that connect data will be switched to the **"A"** position for the modulator and the demodulator. The modulator RF will also be connected to position **"A**.**"**

Power supply operation is indicated when the PWR 1 and PWR 2 green LEDs (on the front panel) are illuminated. The switch is designed to operate on one power supply; redundant power supplies are provided for maximum protection.

<u>**SMS-451T Only:**</u> Operation of the switch is controlled by the SMS-451A switch via the remote control connector. There must be an SMS-451A Switch in the system to operate the SMS-451T switch. The SMS-451T Switch tracks the SMS-451A Switch for all switching functions. The primary function of the SMS-451T Switch is to add ESC switching capabilities to the SMS-451A Switch.

3.2   SMS-451A/E Front Panel

The front panel (Figure 3-1) has indicators to show the online status of the prime and backup modems. Indicators also show if a fault is present in the prime or backup modems.
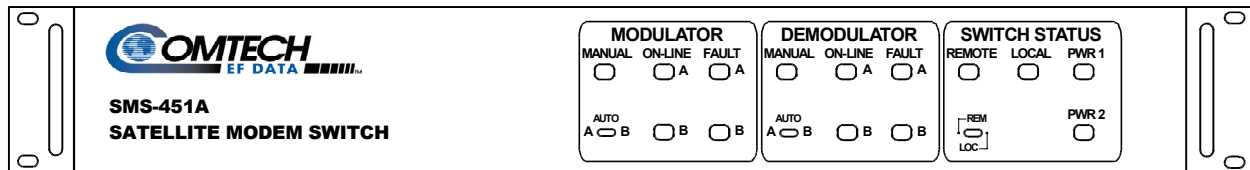

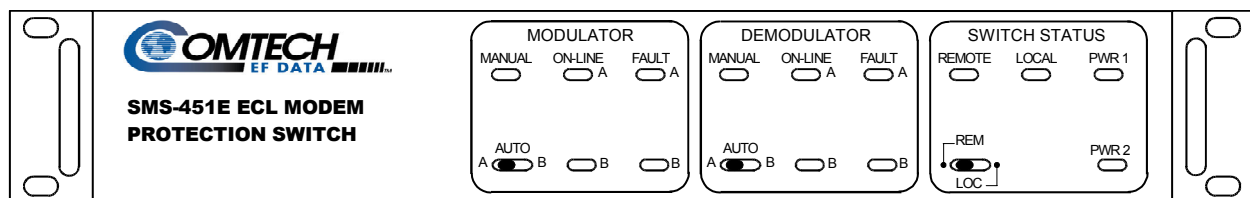**Figure 3-1. SMS-451A Front Panel View**

Figure 3-1A. SMS-451E Front Panel

3.2.1   SMS-451A/E Front Panel Indicators

The following is a list of front panel indicator functions and their colors.

Function	Color
PS1	Green
PS2	Green
Local	Yellow
Remote	Yellow
Demodulator Fault A	Red
Demodulator Fault B	Red
Demodulator A Online	Green
Demodulator B Online	Green
Demodulator Auto/Manual	Yellow
Modulator Fault A	Red
Modulator Fault B	Red
Modulator A Online	Green
Modulator B Online	Green
Modulator Auto/Manual	Yellow

3.2.2   SMS-451A/E Front Panel Switches

The front panel has the following switches:

- Local/Remote Control
- Demodulator Online A/Auto/B
- Modulator Online A/Auto/B

3.3   SMS-451A/E Local Control

Note: All local controls are located on the front panel of the switch.

3.3.1   SMS-451A/E Modulator Operation

To operate the switch from the front panel, REM/LOC must be set to the LOC position.

1. Manually force Modulator "A" online by switching the modulator switch to the "A" position. The yellow **MANUAL LED** and the green **ONLINE "A" LED** will light.

2. Manually force Modulator "B" online by switching the modulator switch to the "B" position. The yellow **MANUAL LED** and the green **ONLINE "B" LED** will light.

Notes:
1. The AUTO position will allow the switch to automatically backup the faulty modulator, which will be indicated by a red FAULT LED on the front panel.
2. In the event that both modulators are in fault condition, the switch will remain on the last known operational modulator if independent modem-switching firmware is installed. The switch will default to "A" if dependent modem-switching firmware is installed.

3.3.2   SMS-451A/E Demodulator Operation

To operate the switch from the front panel, **REM/LOC** must be set to the **LOC** position.

1. Manually force Demodulator "A" online by switching the demodulator switch to the "A" position. The yellow **MANUAL LED** and the green **ONLINE "A" LED** will light.

2. Manually force Demodulator "B" online by switching the demodulator switch to the "B" position. The yellow **MANUAL LED** and the green **ONLINE "B" LED** will light.

Notes:
1. The **AUTO** position will allow the switch to automatically backup the faulty demodulator, which will be indicated by a red **FAULT LED** on the front panel.
2. In the event that both demodulators are in fault condition, the switch will remain on the last known operational demodulator if independent modem-switching firmware is installed. The switch will default to "A" if dependent modem-switching firmware is installed.

3.4   SMS-451A/E Remote Operation

Remote control operation of the switch is available only when the front panel **REM/LOC** switch is in the **REM** position (the yellow **REMOTE LED** should be illuminated). Remote status information of the online modulator and demodulator is available regardless of the position of the **REM/LOC** switch.

> **Example:** A closure between pin 15 and pin 7 on the remote interface connector is an indication that demodulator "A" is online.

Remote control is accomplished by making an external contact closure between the proper control pins and one of the pins that is assigned to **GND**.

> **Example:** An external closure between pin 14 and pin 2 on the remote interface connector will force demodulator "A" online.

Mode Status is an indicator of which configuration (local or remote) is selected.

> **Example:** A closure between pin 16 and pin 18 on the remote interface connector is an indication that the switch is in local operation.

3.5 SMS-451T Front Panel

IMPORTANT

Operation of the switch is controlled by the SMS-451A switch via the remote control connector. There must be an SMS-451A Switch in the system to operate the SMS-451T switch. The SMS-451T Switch tracks the SMS-451A Switch for all switching functions. The primary function of the SMS-451T Switch is to add ESC switching capabilities to the SMS-451A Switch

Power supply operation for **ESC 1** and **ESC 2** are indicated by the **PWR 1** and **PWR 2** green LEDs respectively (Figure 3-2). There are no other indicators on the switch.

Figure 3-2. SMS-451T Panel Panel

3.5.1 SMS-451T ESC "1"

ESC "1" services the Intermediate Data Rate (IDR) channels with octet support along with backward allarms and audio input and output support.

All signals for the **ESC "1"** are switched on the AS/1862 board.

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Appendix A. B-141-1 INTERFACE BREAKOUT PANEL

This appendix provides a description and external connections of the breakout panel used with the SMS-451T 1:1 ESC Protection Switch.

A.1   Overview

The B-141-1 breakout panel (Figure A-1) provides industry standard connectors for the signals present on the SDM-140 ESC-1 connector. The signals are identical to the ESC overhead channel specified by IESS-308, Rev. 4.The assembly number for the breakout panel is AS/1953. The cable used to connect between the breakout panel and the modem ESC-1 port is CA/0737.
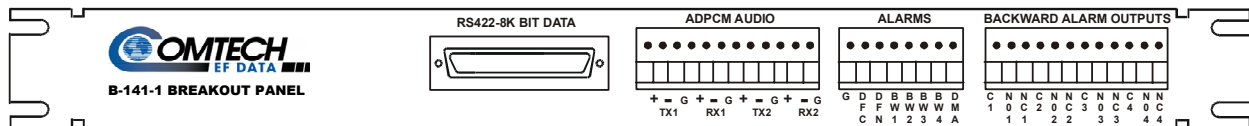

Figure A-1. B-141-1 Breakout Panel

Connections between the breakout panel and other equipment are made through front and rear panel connectors. These connectors are listed in Table A-1.

Table A-1. B-141-1 Breakout Panel Connectors

Name	Ref Des	Connector Type
ESC-1 Interface	J1	50-pin D
RS-422 Interface	P2	37-pin D
Alarms Output	TB1	Terminal Block
Backward Alarms	TB2	Terminal Block
ADPCM Audio Out	TB3	Terminal Block

A.2 External Connections

A.2.1 ESC-1 Interface J1

The ESC-1 interface is provided on a 50-pin female D connector accessible from the rear of the breakout panel. Screw locks are provided for mechanical security of the mating connector.

Signal Function	Name	Pin #
GROUND	GND	1, 2
1KHZ TX OCTET	TXO-A	4
	TXO-B	5
8KBIT TX DATA	TXD-A	37
	TXD-B	38
8KHZ TX CLOCK	TXC-A	21
	TXC-B	22
1KHZ RX OCTET	RXO-A	6
	RXO-B	7
8KBIT RX DATA	RXD-A	39
	RXD-B	40
8KHZ RX CLOCK	RXC-A	23
	RXC-B	24
BACKWARD ALARM OUTPUT 1	BWO1-C	8
	BWO1-NO	41
	BWO1-NC	25
BACKWARD ALARM OUTPUT 2	BWO2-C	9
	BWO2-NO	42
	BWO2-NC	26
BACKWARD ALARM OUTPUT 3	BWO3-C	10
	BWO3-NO	43
	BWO3-NC	27
BACKWARD ALARM OUTPUT 4	BWO4-C	11
	BWO4-NO	44
	BWO4-NC	28
BACKWARD ALARM INPUT	BWI-1	12
	BWI-2	13
	BWI-3	14
	BWI-4	15
ADPCM 1 AUDIO IN	A1I-A	45
	A1I-B	29
ADPCM 1 AUDIO OUT	A1O-A	46
	A1O-B	30
ADPCM 2 AUDIO IN	A2I-A	47
	A2I-B	29
ADPCM 2 AUDIO OUT	A2O-A	48
	A2O-B	32
DEMOD FAULT RELAY	DF-COM	16
	DF-NO	50
DEFERRED MAINTENANCE ALARM	DMA	17

Refer to Figure A-2 for the schematic diagram of the B-141-1 interface breakout panel.
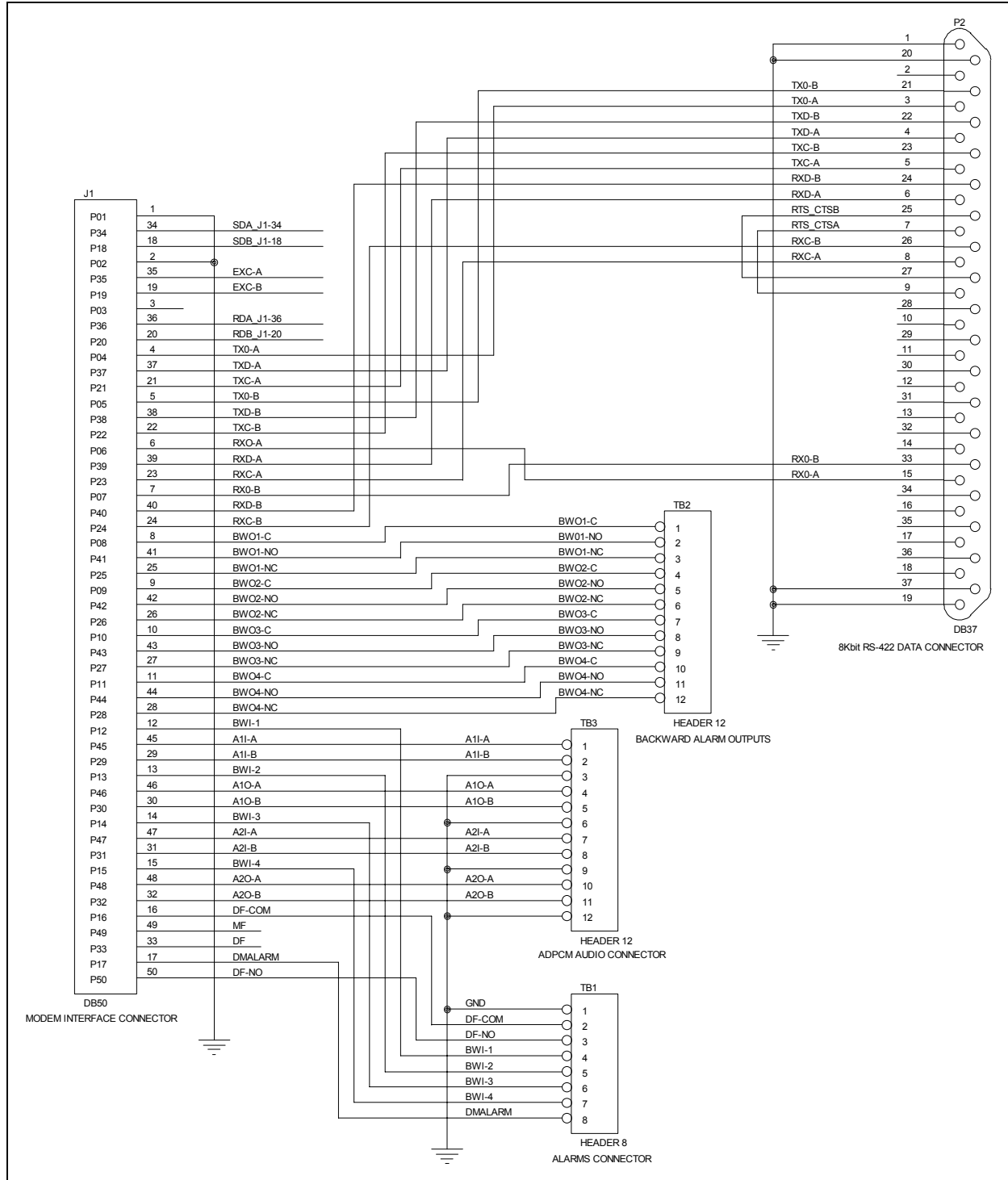

Figure A-2. B-141-1 Interface Breakout Panel Schematic Diagram

A.2.2   8 kbps RS-422 Interface (P2)

The 8 kbps RS-422 interface is provided on a 37-pin female D connector accessible from
the front of the breakout panel. Screw locks are provided for mechanical security of the
mating connector.

Signal Function	Name	Pin #
GROUND	GND	1, 19, 20, 37
1KHZ TX OCTET	TXO-A	3
	TXO-B	21
8KBIT TX DATA	TXD-A	4
	TXD-B	22
8KHZ TX CLOCK	TXC-A	5
	TXC-B	23
8KBIT RX DATA	RXD-A	6
	RXD-B	24
REQUEST TO SEND/	RTS_CTSB	25, 27
CLEAR TO SEND	RTS_CTSA	7, 9
8KHZ RX CLOCK	RXC-A	8
	RXC-B	26
1KHZ RX OCTET	RXO-A	15
	RXO-B	33

Note: RTS and CTS are looped together on the connector.

A.2.3   Alarm Outputs (TB1)

The alarm outputs are provided on an 8-position terminal block located on the front panel
of the breakout panel.

Signal Function	Name	Pin #
GROUND	GND	1
DEMOD FAULT RELAY	DF-COM	2
	DF-NO	3
BACKWARD ALARM INPUT	BWI-1	4
	BWI-2	5
	BWI-3	6
	BWI-4	7
DEFERRED MAINTENANCE ALARM	DMA	8

A.2.4   Backward Alarm (TB2)

The backward alarm outputs are provided on a 12-position terminal block located on the front panel of the breakout panel.

Signal Function	Name	Pin #
BACKWARD ALARM OUTPUT 1	BWO-1_C	1
	BWO-1_NO	2
	BWO-1_NC	3
BACKWARD ALARM OUTPUT 1	BWO-2_C	4
	BWO-2_NO	5
	BWO-2_NC	6
BACKWARD ALARM OUTPUT 1	BWO-3 _C	7
	BWO-3_NO	8
	BWO-3_NC	9
BACKWARD ALARM OUTPUT 1	BWO-4_C	10
	BWO-4_NO	11
	BWO-4_NC	12

A.2.5   ADPCM Audio Connector (TB3)

The ADPCM audio connector is provided on a 12-position terminal block located on the front panel of the breakout panel.

Signal Function	Name	Pin #
GROUND	GND	3, 6, 9, 12
ADPCM 1 AUDIO INPUT	A1I-A	1
	A1I-B	2
ADPCM 2 AUDIO OUTPUT	A1O-A	4
	A1O-B	5
ADPCM 3 AUDIO INPUT	A2I-A	7
	A12-B	8
ADPCM 4 AUDIO OUTPUT	A2I-A	10
	A2I-B	11

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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

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	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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