SMS-758

Modem Protection Switch
Installation and Operation Manual

Part Number MN/SMS758.IOM
Revision 3

EFData Corporation is an ISO 9001 Registered Company

SMS-758

Modem Protection Switch
Installation and Operation Manual

Part Number MN/SMS758
Revision 3
May 19, 1995

EFData Top Assembly No. AS/1891

Special Instructions:

This is the fourth edition of the manual.

Change bars were not utilized.

This revision supersedes part number MN/U-SMS758 Edition 3 dated January, 1992.

Comtech EFData, 2114 West 7th Street, Tempe, Arizona 85281 USA, (480) 333-2200, FAX: (480) 333-2161.

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If you have any questions regarding your equipment or the information in this manual, please contact the EFData Customer Service Department. (For more information, refer to the preface.)

Preface

About this Manual

This manual describes the installation and operation for the EFData SMS-758 modem protection switch.

Audience

This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the SMS-758 modem protection switch.

Organization

This manual includes the following chapters and appendixes:

- Chapter 1 — describes the unit's purpose, function, and specifications.
- Chapter 2 — describes the installation process.
- Chapter 3 — describes the operation.
- Chapter 4 — describes the theory of operation.
- Chapter 5 — describes maintenance and troubleshooting.
- Appendix A — describes remote control operation for modem switching.
- Appendix B — describes remote control operation for independent mod/demod switching.
- Appendix C — describes the 7 downlink/1 backup option.

Revision Numbering Scheme

The following table identifies the revision numbering scheme utilized for EFData installation and operation manuals, addenda, and supplements:

Part Number	Description
MN/SMS758 Rev. 0	1st edition of the manual.
MN/SMS758 Rev. 1	1st revision of the manual.
MN/SMS758 Rev. 2	2nd revision of the manual.
MN/SMS758 Rev. 1 **SA**	Supplement A to Rev. 1 of the manual. (The "**S**" in "**SA**" designates "**S**upplement.")
MN/SMS758 Rev. 2 **A**	Addendum A to Rev. 2 of the manual.
MN/SMS758 Rev. 2 **B**	Addendum B to Rev. 2 of the manual.
MN/SMS758 Rev. 3	3rd revision of the manual (it includes information from Addenda A and B).

Conventions Used in this Manual

Screen Output and Command Syntax

A distinctive type of font is used for screen output and command syntax, which looks like this:

```
This line is in monospace font.
```

Notes

Note: This is the style for a note.

Cautions, Warnings, and Dangers

The international hazard alert signal is shown below. The signal word listed beneath the symbol is changed to indicate the nature of the hazard. The terms, in increasing order of seriousness, are CAUTION, WARNING, and DANGER.

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.

DANGER indicates an imminent hazard that, if not avoided, will result in death or serious injury.

Heading Hierarchy

Each section of this manual is structured according to the following heading hierarchy:

Level	Heading Format
1 (Highest)	**Level Heading 1**
2	**Level Heading 2**
3	**Level Heading 3**
4 (Lowest)	**Level Heading 4**

Case Sensitivity

Unless stated otherwise, commands and arguments listed in this manual are not case sensitive.

References Used in this Manual

Military Standards

References to “MIL-STD-118” apply to the 114A series (i.e., MIL-STD-118-114A), which provides electrical and functional characteristics of the unbalanced and balanced voltage digital interface circuits applicable to both long haul and tactical communications. Specifically, these references apply to the MIL-STD-188-114A electrical characteristics for a balanced voltage digital interface circuit, Type 1 generator, for the full range of data rates.

For more information, refer to the following document:

- Department of Defense (DOD) MIL-STD-188-114A, “Electrical Characteristics of Digital Interface Circuits.”

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:

- Department of Defense (DOD) MIL-STD-188-114A, “Electrical Characteristics of Digital Interface Circuits.”
- EFData Specification SP/1891.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please complete the Technical Publications Remarks Form found at the end of this manual.

Returning a Product

To return an EFData (in-warranty and out-of-warranty) product for repair or replacement:

1. Request a Return Material Authorization (RMA) number from the EFData Customer Service Department.

   Be prepared to supply the Customer Service representative with the model number, serial number, and a description of the problem.

2. To ensure that the product is not damaged during shipping, pack the product in its original shipping carton/packaging.

3. Ship the product back to EFData. (Shipping charges should be prepaid.)

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

Upgrading a Product

To receive product upgrade information (i.e., hardware and/or software), contact an EFData Customer Service representative.

Product Training

To obtain product training information, contact an EFData Customer Service Representative.

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APPENDIX B. REMOTE CONTROL OPERATION: INDEPENDENT MOD/DEMOD B–1

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Chapter 1. INTRODUCTION

1.1 Scope

This manual describes the SMS-758 modem protection switch (Figure 1-1), hereafter called “the switch.”

The switch is a rack-mounted unit that provides independent backup control for modulators and demodulators, or simultaneous modulator and demodulator (modem) switching.

If a primary modem element failure occurs, the switch limits the loss of communication.

1.2 Purpose and Function

The switch is a fully automated, self-contained switching unit for many EFData satellite data modems, including:

- SDM-650B
- SDM-308B
- SDM-309B
- SDM-8000
- SDM-100
- SLM-4650
- SLM-8650

The switch, with one or two backup modems, provides redundancy for up to eight primary modems.

The switch will automatically or manually switch one of two backup modulators online to take the place of any of eight primary modulators. Also, one of two backup demodulators may be switched online to receive any one of four possible downlinks.

The switch does not contain an IF signal combining/dividing section, so that the user may externally tailor each application for minimum loss. An example system configuration using four prime modems is shown in Figure 1-6.

In normal operation, each prime modulator input is fed through to its corresponding IF output, and the backup modulators are fed to the offline IF outputs. When a modulator fault is detected, the faulted modulator is switched offline and re-routed to one of the offline IF outputs. The next available backup modulator is configured identically to the failed modulator, and is switched ON in its place.

Figure 1-2 shows the switch interface between the prime and backup modems, the terminal equipment, and IF converter equipment. The switch provides:

- All data and IF switching circuitry
- Complete status and fault reporting

The switch provides a high degree of flexibility by utilizing the multiple data rate feature of the modems, and dual backups. Automatic configuration greatly reduces setup time.

1.3 Description

The switch is complete and self contained, in a standard 19” rack-mountable enclosure weighing approximately 50 lbs. It is of modular construction. The chassis assembly is segmented with upper and lower chassis mounted backplanes.

The top section (Figure 1-3) contains:

- Two power supplies providing redundancy in case of power failure, four printed circuit board (PCB) assemblies, and the front panel keypad and display, which are accessible from the front of the switch.

- Serial remote interfaces, relay-remote/fault, modulator and demodulator status, and IF connections accessible from the rear panel. Figure 1-4 is a block diagram of the IF switching matrix.

The lower section contains:

- An enclosed storage area, accessible from the front panel.
- The data switch interface modules, accessible from the rear.

The switch contains a microcontroller system. This system controls all switching functions and maintains communication with the modems. It also communicates with an optional external controller. A remote operator can control the switching by using a terminal or computer, and the remote serial interface.

Redundant power supplies maintain switch operation even if one power supply fails. The switch and modem configurations are stored in battery-backed memory devices, for protection against power loss.

A block diagram of the switch is shown in Figure 1-5.

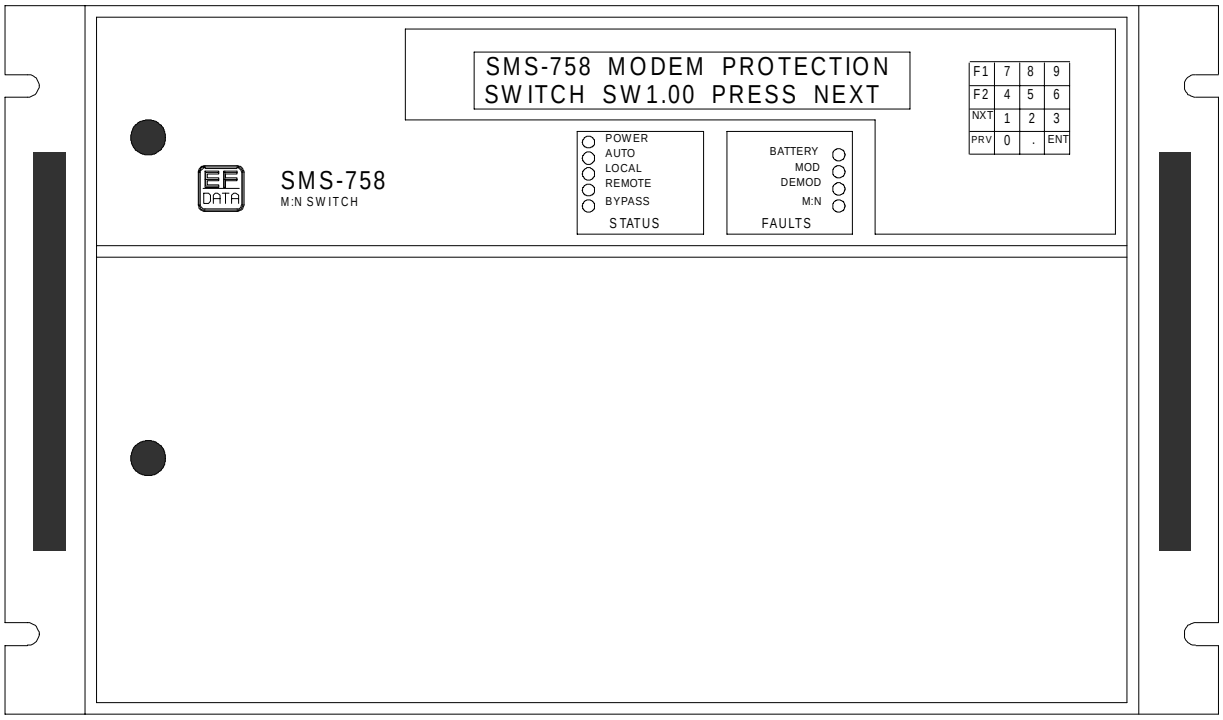

Figure 1-1. SMS-758 Modem Protection Switch

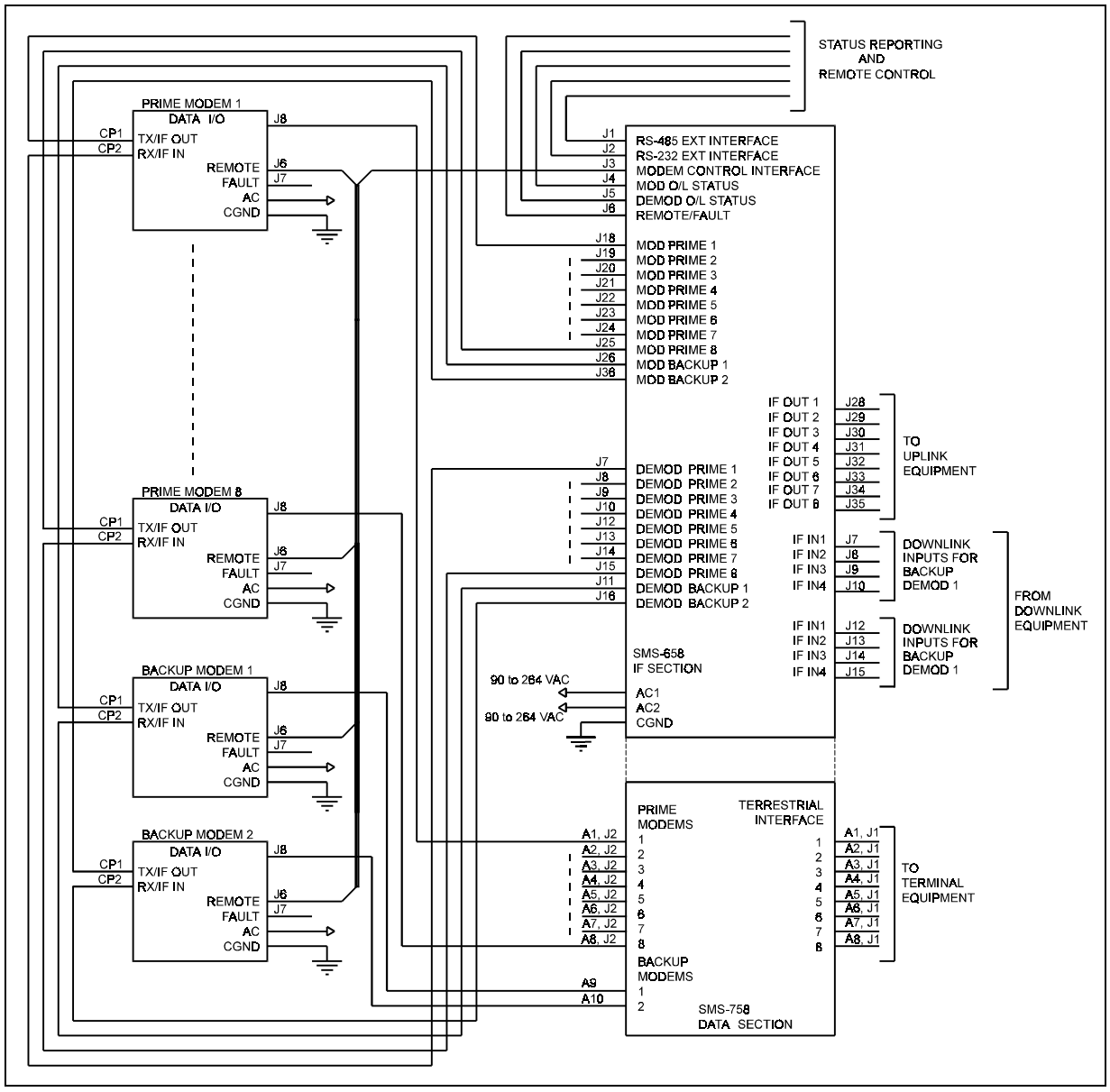

Figure 1-2. System Block Diagram

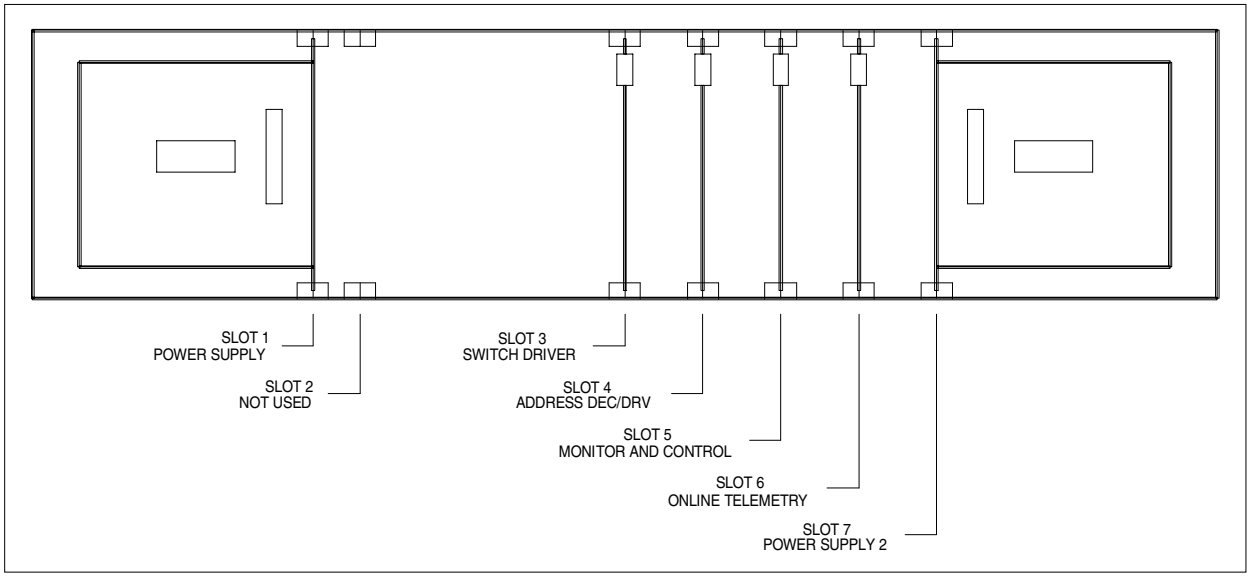

Figure 1-3. SMS-758 Upper Front Section Interior

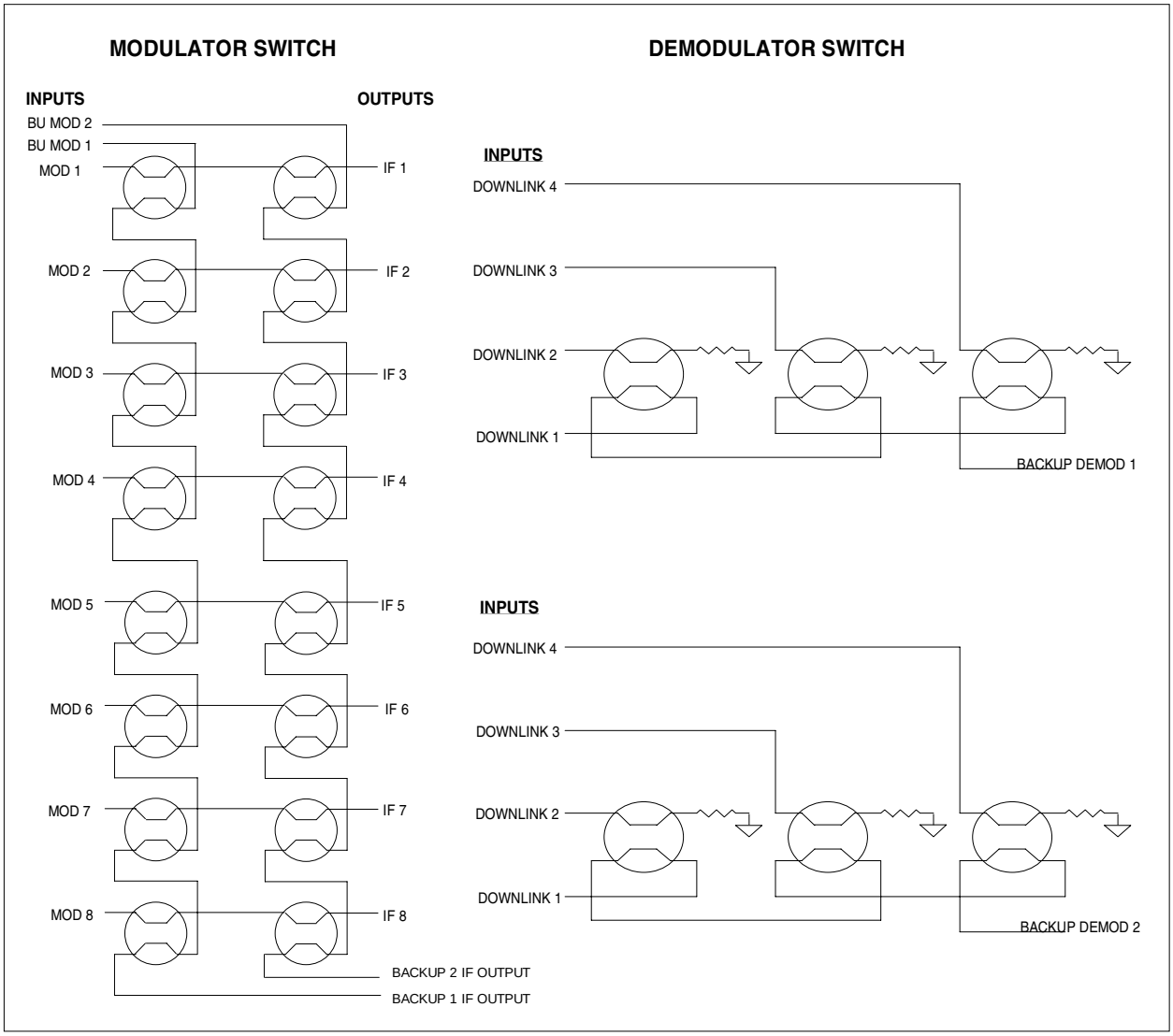

Figure 1-4. SMS-758 IF Switching Matrix

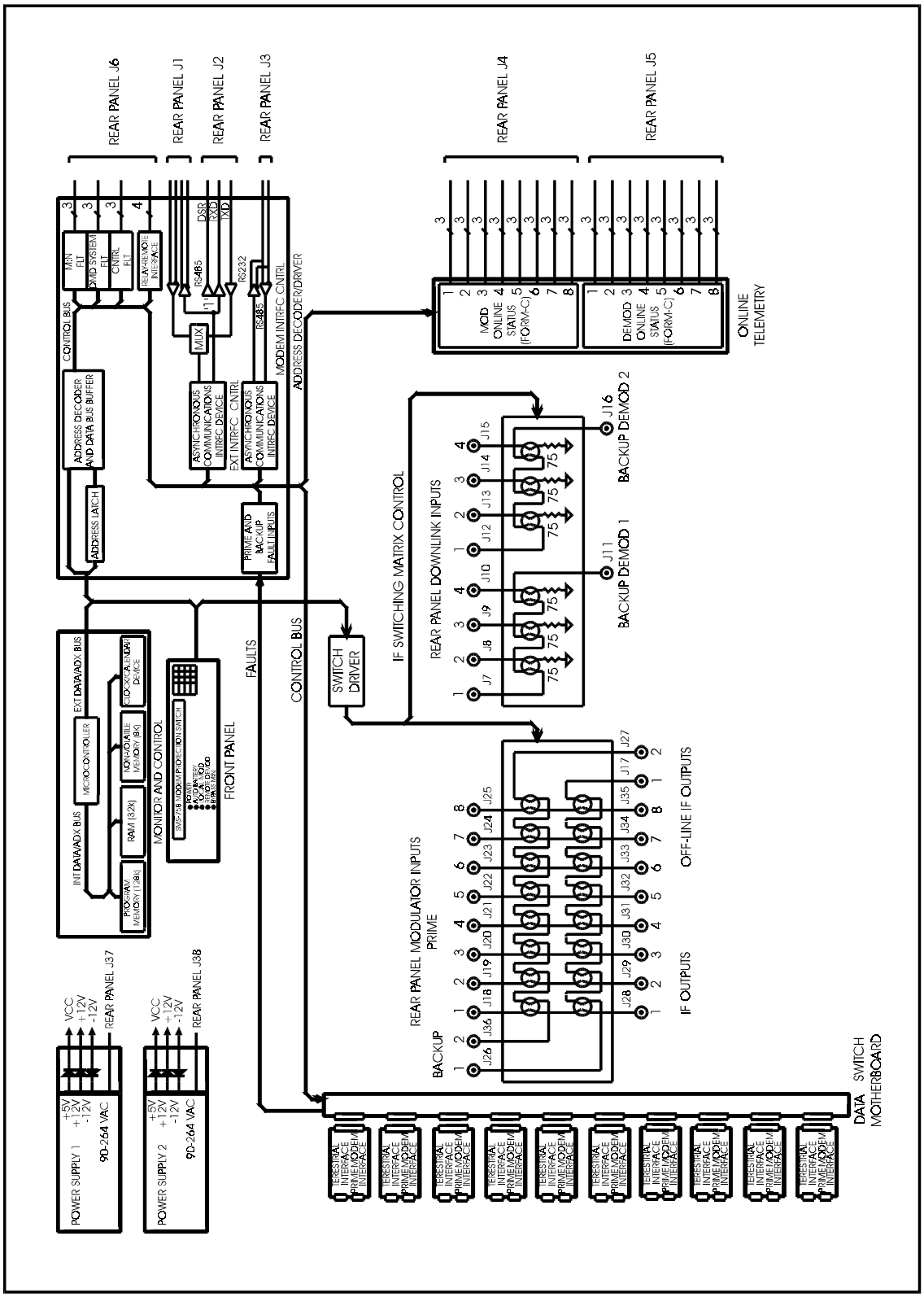

Figure 1-5. SMS-758 Block Diagram

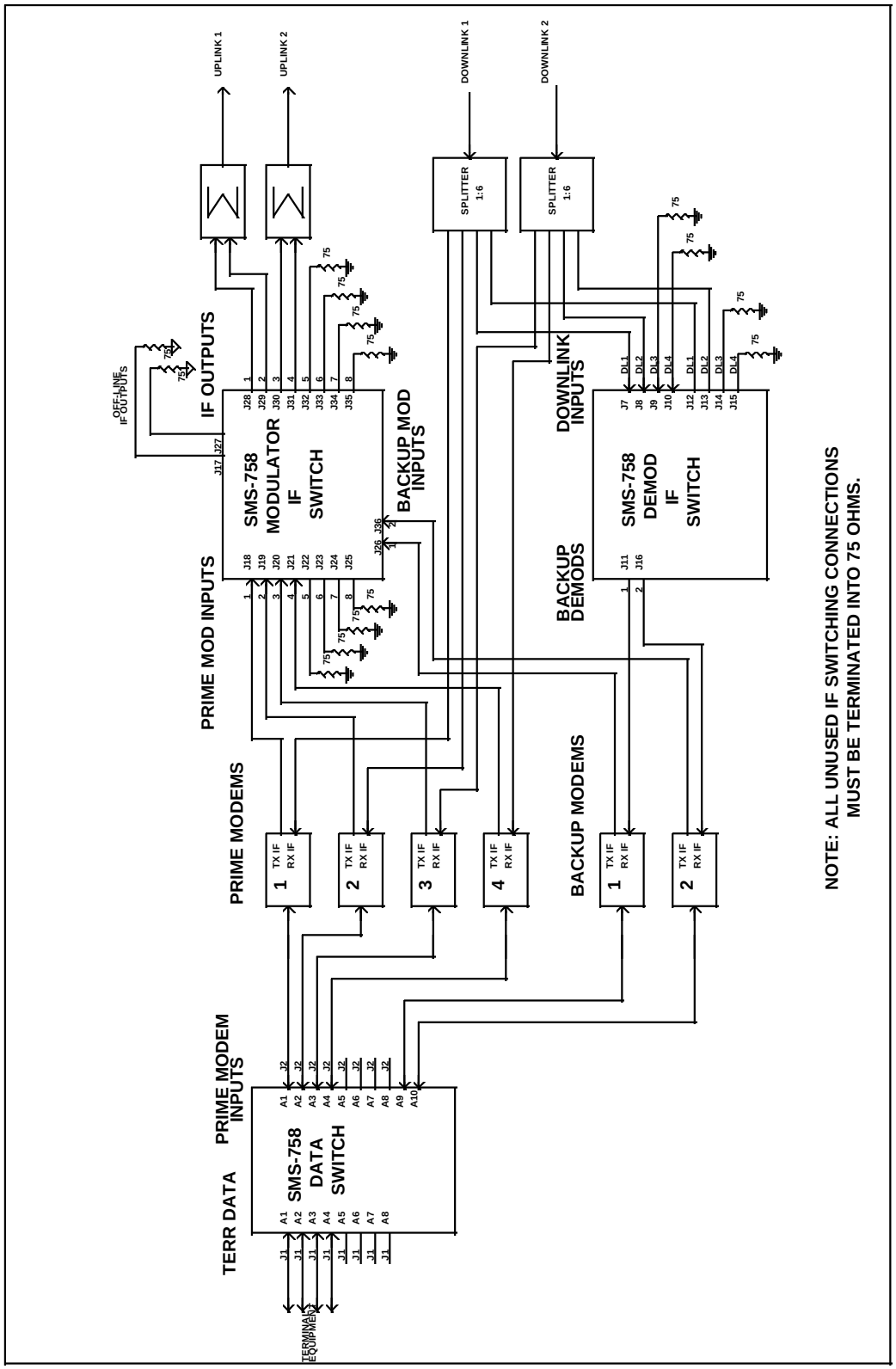

Figure 1-6. Example System Configuration

The switch consists of the following assemblies:

Assembly Description	Drawing No.	
Chassis	AS/1890	
Controller Motherboard	AS/1317	
Data Switch Motherboard	AS/1349	
Monitor and Control	AS/0356	
Address Decoder/Driver	AS/1048	
Switch Driver	AS/1316	
IF Switch	AS/1314	
O/L Telemetry	AS/0585	
Display/Keypad	AS/0540	
Power Supply (2 each)	AS/0584	
DS-1 Prime Interface Switch	AS/0893	8 Optional
DS-1 Backup Interface Switch	AS/0894	2 Optional
V.35 Prime Interface Switch	AS/0891	8 Optional
V.35 Backup Interface Switch	AS/0892	2 Optional
RS-422 Prime Interface Switch	AS/0890	8 Optional
RS-422 Backup Interface Switch	AS/0899	2 Optional
IDR Prime Interface Switch (1:N)	AS/0895	8 Optional
IDR Backup Interface Switch (1:N)	AS/0896	1 Optional
IDR 45MB Prime Interface Switch	AS/0936	8 Optional
IBS/ASYNC Prime Interface Switch	AS/1695	8 Optional
IBS/ASYNC Backup Interface Switch	AS/1694	2 Optional
IDR Prime Interface Switch (2:N)	AS/1877-1	8 Optional
IDR Backup Interface Switch (2:N)	AS/1879	2 Optional
Drop & Insert daisy chain Interface Switch	AS/1877-2	9 Optional

1.4 Performance Specification

The operating specifications of the switch are described in Table 1-1.

Table 1-1. SMS-758 Performance Specification

Operation	
Number of Online Modems	Expandable from 1 to 8 with plug-in prime interface switch modules (the modems can be of different data rates and interfaces, as long as the backup modems are compatible).
Number of Backup Modems	Expandable from 1 to 2 with plug-in backup interface switch modules (IDR AS/0895 interface limits the backup to one).
Data Interfaces	DS-1 and G.703, V.35, RS-422/449/ MIL-STD-188-114, IBS, IDR, or D&I.
IF Frequency Response	50 MHz to 180 MHz.
Downlinks	Each demodulator is configurable for 1 of 4 or 7 downlink connections.
Uplinks	Eight modulator outputs may be externally combined/divided for any number of uplinks.
Prime Modulator to Output Loss	Less than 1 dB.
Backup Modulator to Prime Output Loss	Less than 1 dB.
Manual Delay Switch-Over Time:	
Modulator	0 to 127.5 sec., in 0.5 sec. steps.
Demodulator	0 to 127.5 sec., in 0.5 sec. steps.
Auto Delay Switch-Over Time:	
Modulator	< 1 sec.
Demodulator	< 3 sweep periods of the back-up demodulator.
Switch-Over Priority	One of three priority levels available independently for each modulator and demodulator, if independent mod/demod firmware is used. Modulators and demodulators will switch simultaneously with modem switch firmware.
Remote Control Interfaces:	
External control	RS-485 or RS-232C. Baud rates from 110 to 9600, Even or Odd parity, Addresses from 1 to 255.
Modem Control	RS-485, Baud rate 9600, Even parity, Addresses from 1 to 255.
Batteries	M&C: NiCad, 30 day memory retention. 48 hr. charge time.

Indicators:	
Front Panel LEDs	Power supply on, controller and power supply alarm, demodulator system failure, modulator system failure, low battery alarm, auto mode, local mode, remote mode, and bypass mode.
48-character display	Prime and backup modulator and demodulator status (fault and online status), active modulators and demodulators (prime and backup), modem address, modem interface, modem uplink and downlink, priority, delay, configuration, and fault menus.
Alarm Reporting:	
Controller Fault Alarm	Form C relay contact to indicate controller or power supply failure.
System Fault Alarm	Form C relay contact to indicate any non-catastrophic failure.
Demodulator Fault Alarm	Form C relay contact to indicate all demodulators faulted and a probable IF loss.
Operational Modes	Auto, Local, Remote, and Bypass.
Controls	Complete control of all M:N functions from the front panel, or through the remote interface.

General	
Input Voltage	90 to 264 VAC (self-adjusting). -48 VDC optional.
Line Power	40W maximum when both power supplies are operating.
Line Frequency	47 to 63 Hz.
Size	19" W x 22" D x 12.20" H.
Weight	50 lbs.

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Chapter 2.
INSTALLATION

This chapter consists of:

- Unpacking instructions
- System installation
- System requirements
- Description of the external connections

The equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting printed circuit boards.

2.1 Unpacking

The switch and manual are packaged in pre-formed, reusable, cardboard cartons containing foam spacing for maximum shipping protection. To remove the switch:

Do not use any cutting tool that will extend more than 1" into the container and cause damage to the modem.

1. Cut the tape at the top of the carton (indicated by OPEN THIS END).
2. Remove the cardboard/foam space covering the switch.
3. Remove the switch, manual, and power cord from carton.
4. Save the packing material for storage or reshipment purposes.
5. Inspect the equipment for any possible damage incurred during shipment.
6. Check the equipment against the packing list to ensure the shipment is correct.
7. Refer to Section 2.2 for further system installation instructions.

2.2 System Installation

2.2.1 Switch Setup

After unpacking, refer to the following steps to install the switch:

1. Mount the switch chassis in the assigned position of the equipment rack. It is recommended that the switch be supported by a rack-mounted shelf.

2. Be sure that all interface switch modules are in their proper positions, and are fully seated in the rear backplane.

3. Connect the cables to the proper locations on the rear panel. Refer to Section 2.4 for connector pinouts, placement, and function.

4. Open the front panel and verify that the two power supplies and four circuit modules are properly seated in the upper backplane.

5. Before turning the power switch ON, become familiar with front panel operation in Chapter 3.

6. Turn ON each power supply, located inside the front panel. The power switch is ON when the switch is depressed toward the “1”, or when the red side of the switch is exposed.

7. Close the front panel, and configure the switch as described in Section 3.2. Place the switch in the proper mode for operation.

8. If any installation problems occur, refer to Chapter 5 for troubleshooting the system.

2.2.2 Modem Setup

J28 through J35 are the eight IF outputs available to connect to the customer-supplied uplink power combiners.

J7 through J10, and J12 through J15, are the downlink inputs available for use with up to eight customer-supplied downlink splitters. The following steps describe the uplink and downlink connections:

1. Connect the IF output cables 1 through 8 to the appropriate customer-furnished uplink signal combiner inputs.

2. Connect the downlink input cables 1 through 4, or 1 through 7, to the appropriate customer-furnished downlink splitters.

3. When using the 7 downlink option, connect J16 (backup 2 output) to J7, and specify 7 downlinks/1 backup in the System menu.

   Note: Be sure to terminate all unused IF outputs and downlink inputs with the supplied 75Ω BNC terminations.

2.3 System Requirements

The switch, with all interface assemblies installed (Figure 2-1), is capable of operating as a 2:8 protection switch. This means that two full-duplex standby modems back up eight full-duplex primary modems.

Note: When IDR interface AS/0895 is used, only one backup is available.

The switch can be configured in any combination including:

- TX only modems.
- RX only modems.
- Mixed interfaces (limited to two).
- Multiple uplinks (limited to eight).
- Multiple downlinks (limited to four with 2 backups, 7 with 1 backup).
- Multiple data rate and code rate operation.
- Refer to Section 3.2 for a complete explanation of the configuration function.

2.4 External Connections

All connections between the switch and other equipment are made through rear panel connections. Table 2-1 lists these connectors, and Figure 2-1 shows the locations. The uses of these connectors are described in the following sections.

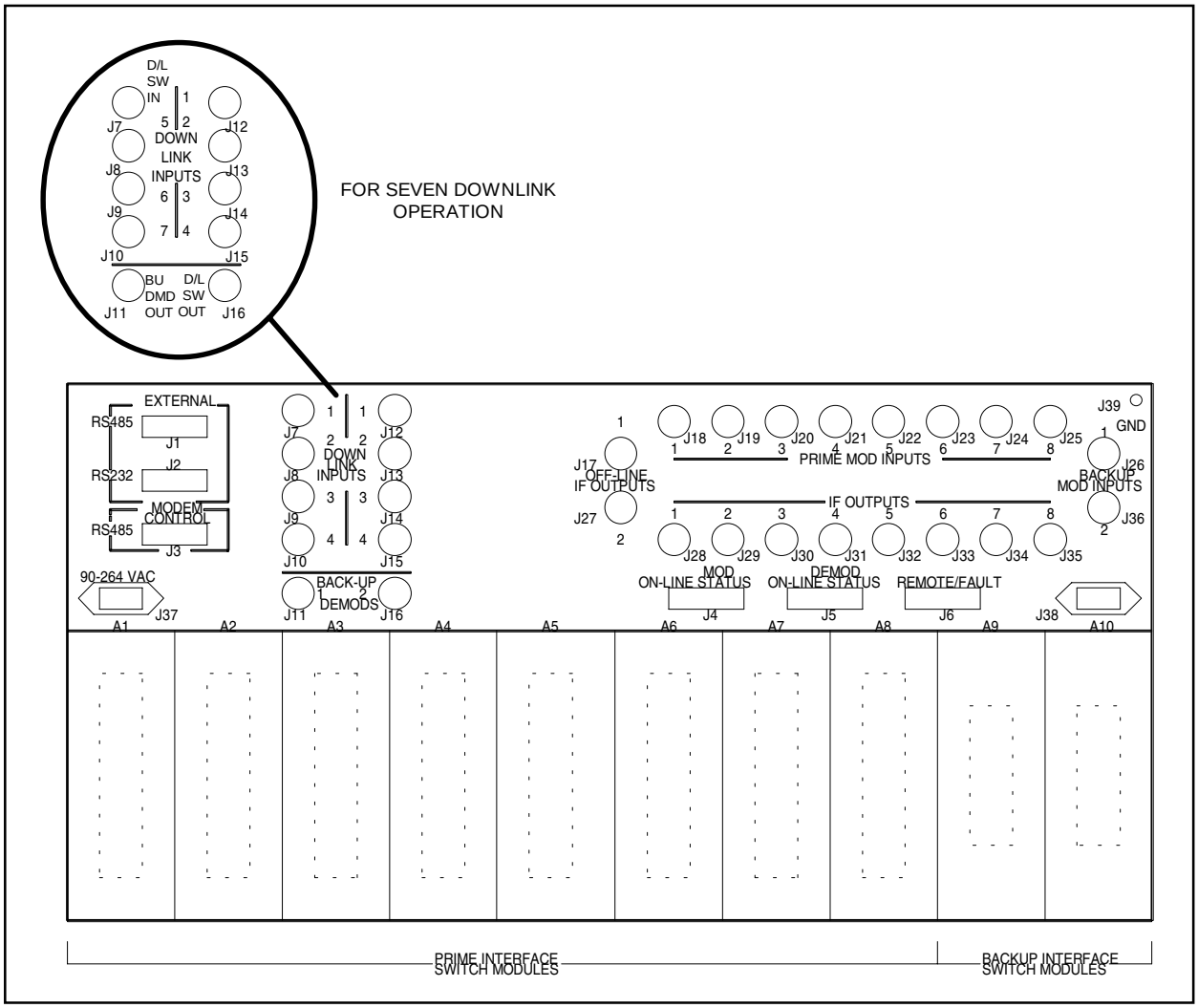

Figure 2-1. SMS-758 Rear Panel

Table 2-1. Rear Panel Connections

Name	Ref. Desig.	Connector	Function
DATA I/O	A1 - A10 J1, J2	37-Pin D 34-Pin Block 15-Pin D 37-Pin D 50-Pin D 50-Pin D	RS-422/449 and MIL-STD-188-114 I/O V.35 I/O DS-1 and G.703 I/O DCTN I/O IDR I/O IBS I/O
EXTERNAL RS485 RS232	 J1 J2	 9-Pin D 9-Pin D	Remote Interface
MODEM CONTROL RS485	J3	9-Pin D	Remote Interface
ON-LINE STATUS	J4 and J5	25-Pin D	Mod and Demod Online Status Reporting
REMOTE/FAULTS	J6	25-Pin D	Relay/Remote and Faults
DOWNLINK INPUTS	J7 through J10, J12 through J15	BNC	Downlink IF Inputs
BACK-UP DEMODS	J11 through J16	BNC	Downlink Outputs to Backup Demods
PRIME MOD INPUTS	J18 through J25	BNC	Modulator IF Inputs
BACK-UP MOD INPUTS	J26 and J36	BNC	Backup Mod IF Inputs
OFF-LINE IF OUTPUTS	J17 and J27	BNC	Offline Mod IF Outputs
IF OUTPUTS	J28 through J35	BNC	IF Outputs to Uplinks
AC POWER	J37, J38	CEE22	AC Power Input
DC POWER	J37, J38	Terminal Block	48 VDC Power Input
GROUND	J39	#10-32 Stud	Chassis Ground

Note: All unused BNC connectors must have a 75Ω termination.

2.4.1 Data I/O

Connect the Modem and Terrestrial Data I/O to the plug-in interface switch modules in the lower rear section of the switch. The interface switch module slots are designated A1 through A10 (left to right, viewed from the rear). A1 through A8 are slots for prime interface switch modules 1 through 8. A9 and A10 are backup module slots 1 and 2.

Prime interface switch modules have two connectors: J1 on the top connects to terrestrial equipment; J2 on the bottom connects to the prime modem. (See **Note** below.) Backup interface switch modules have one connector, J1, for backup modem connection. Refer to Section 4.3 for electrical specifications, and data pin-outs.

Note: For the RS-422/449/MIL-STD-188-114 interface switch modules: J1 on the left connects to the prime modem, and J2 on the right connects to the terrestrial equipment.

2.4.2 External RS485 and RS232 Interface (J1 and J2)

The external interface connectors provide serial remote interface to the switch. An external controller can connect through J1 (RS-485) or J2 (RS-232C).

Use M&C module switch pack SP1 switch 5 (SP1-5) to configure each switch for external remote interface type, either RS-485 or RS-232C. The ON position (nearer the PCB) selects RS-232C interface, and OFF selects RS-485.

The external interface connectors are 9-pin female D connectors with screw locks for mechanical security. The remote connector is a DCE interface.

RS-485		RS-232C	
Pin Number	**Name**	**Pin Number**	**Name**
1	GND	1	
2		2	RD (RX)
3		3	TD (TX)
4	+RX/TX	4	
5	RX/TX	5	GND
6		6	
7		7	
8	+RX/TX	8	
9	-RX/TX	9	

2.4.3 Modem Control RS485

The prime and backup modems connect to the switch through J3, the modem control interface connector. This connector provides the bus-type control interface required for system operation.

Refer to Sections 4.2.2, 4.2.3, and the remote specifications (Appendixes A and B) for a complete explanation of the remote interface functions.

Refer to the RS-485 pinout listed in Section 2.4.2

2.4.4 On-Line Status (J4, J5)

Connectors J4 and J5 provide the output for the modulator and demodulator backup online status in form C format:

- J4 is for the modulator online status.
- J5 is for the demodulator online status.

Refer to Section 4.1.7 for a complete explanation of the online status functions.

Two 25-pin female D connectors interface with the online status reporting sections. Screw locks provide mechanical security for the mating connector.

ON-LINE STATUS INTERFACE		
Pin #	J4 Name	J5 Name
1	Mod 1 COM	Demod 1 COM
2	Mod 1 NC	Demod 1 NC
3	Mod 1 NO	Demod 1 NO
4	Mod 2 COM	Demod 2 COM
5	Mod 2 NC	Demod 2 NC
6	Mod 2 NO	Demod 2 NO
7	Mod 3 COM	Demod 3 COM
8	Mod 3 NC	Demod 3 NC
9	Mod 3 NO	Demod 3 NO
10	Mod 4 COM	Demod 4 COM
11	Mod 4 NC	Demod 4 NC
12	Mod 4 NO	Demod 4 NO
13	Mod 5 COM	Demod 5 COM
14	Mod 5 NC	Demod 5 NC
15	Mod 5 NO	Demod 5 NO
16	Mod 6 COM	Demod 6 COM
17	Mod 6 NC	Demod 6 NC
18	Mod 6 NO	Demod 6 NO
19	Mod 7 COM	Demod 7 COM
20	Mod 7 NC	Demod 7 NC
21	Mod 7 NO	Demod 7 NO
22	Mod 8 COM	Demod 8 COM
23	Mod 8 NC	Demod 8 NC
24	Mod 8 NO	Demod 8 NO
25	GROUND	GROUND

2.4.5 Relay-Remote/Fault (J6)

This 25 pin connector provides both input and output signals. The inputs are contact closures or logic-level remote control inputs. The outputs are form C relay contact closures for controller fault, M:N fault, and demodulator system fault.

Refer to Sections 3.2.4, 3.2.5, and 4.3 for more information on the relay-remote and fault functions.

The relay-remote input and fault status interface connects through a 25-pin female D connector. Screw locks provide mechanical security for the mating connector.

Relay-Remote Input and Fault Output Interface	
Pin No.	**Name**
1	Controller Fault COM
2	Controller Fault NC
3	Controller Fault NO
4	Relay-Remote Input 0
5	Relay-Remote Input 1
6	Relay-Remote Input 2
7	Relay-Remote Input 3
8	Demodulator Fault COM
9	Demodulator Fault NC
10	Demodulator Fault NO
11	M:N Fault COM
12	M:N Fault NC
13	M:N Fault NO
14 through 24	No Connection
25	Ground

2.4.6 Downlink Inputs (J7 through J10, J12 through J15)

These are the downlink input connectors. These connections provide the inputs to the downlink switching matrix:

- J7 through J10 are the inputs to backup modem 1.
- J12 through J15 are the inputs to backup modem 2, when the switch is configured for 4 downlinks/2 backups.

Up to seven downlinks can be connected to the switch in the 7 downlink/1 backup configuration. This option is available in the System menu on the front panel.

Downlink inputs that are not being used must be terminated into 75Ω.

Refer to Appendix C for more information on the 7 downlink/1 backup option.

2.4.7 Back-up Demods (J11, J16)

J11 and J16 provide the outputs from the downlink switching matrix. J11 is the backup demod 1 output, and J16 is the backup demod 2 output. They connect to the backup modem's RX IF inputs.

Any of the 4 downlinks can be directed internally to J11 and J16. The default setting is downlink 1.

The input frequency range is 50 to 180 MHz, with an input impedance of 75Ω.

Terminate any back-up demod port into 75Ω when not being used.

2.4.8 Prime Mod Inputs (J18 through J25)

J18 through J25 are the prime modulator IF input connections to the Modulator IF switching matrix. They connect to the prime modem IF outputs.

The input frequency range is 50 to 180 MHz, with an input impedance of 75Ω.

Prime mod inputs that are not being used must be terminated into 75Ω.

2.4.9 Back-up Mod Inputs (J26, J36)

J26 and J36 are the backup modulator IF input connectors. They connect to the backup modem IF outputs.

The input frequency range is 50 to 180 MHz, with an input impedance of 75Ω.

2.4.10 Offline IF Outputs (J17, J27)

The offline IF output connectors, J17 and J27 are used as a monitor and test point:

- The outputs of the backup modulators are routed here when not in use.
- When backups are online, the offline primes are routed here.

2.4.11 IF Outputs (J28 through J35)

J28 through J35 are the modulator IF switching matrix output connections. They connect to the external uplink power combiners. Up to 8 uplinks can be connected to the switch, or as few as 1.

During normal operation, the prime modulator IF outputs are switched here. During a fault condition, the backup modulator's IF output will be switched here.

The frequency range is 50 to 180 MHz, with an output impedance of 75Ω. The typical output power level is equal to the modem TX output level, which is from -5 dBm to -30 dBm.

Any IF outputs that are not being used must be terminated into 75Ω.

2.4.12 AC Power (J37, J38)

Two independent, non-locking, 3-prong power cords connect AC power to the two power supplies.

Normal input voltage is 90 to 264 VAC (self-adjusting) at 47 to 63 Hz. Maximum power consumption is 40W.

It is recommended that each power supply be plugged into a different power source, to provide continuous power to the switch if one source fails.

2.4.13 DC Power (J37, J38)

Two terminal blocks are provided for optional -48 VDC (± 4.8V) power supplies. Customer supplied power wires should be fitted with standard #6 screw lugs.

Maximum power consumption is 40W.

It is recommended that each power supply be plugged into a different power source, to provide continuous power to the switch if one source fails.

Note: Applying incorrect input voltage to these connectors can cause severe damage to the switch and will void the product warranty. Verify that the source voltage is correct before connecting the switch.

2.4.14 Ground (J37)

A #10-32 stud is available on the rear panel for connecting the chassis to ground.

Chapter 3. OPERATION

3.1 Front Panel Description

The switch front panel (Figure 3-1) provides the local interface to configure, operate, and monitor the switch:

- A 48-character, 2-line LCD display in the upper-front panel displays options and status for the operator.
- Nine LEDs grouped under the LCD display provide mode and fault status at a glance.
- A 16-key keypad to the right allows the operator to perform setup, configuration, and operation functions.
- An audible beeper signals the pressing of a keypad key.

The display, LEDs, and beeper are mapped into address space of the external bus structure. The display updates every second, and the LEDs and beeper update as needed.

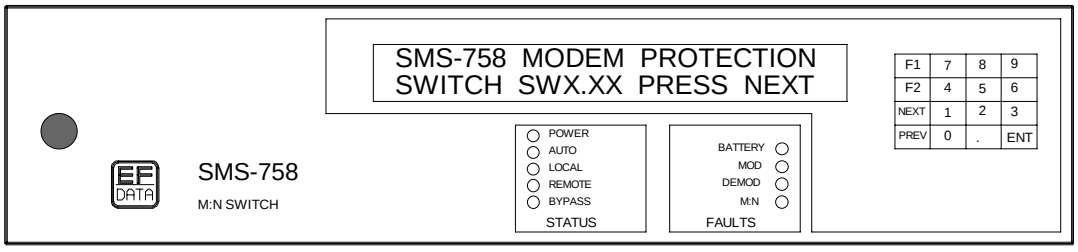

Figure 3-1. SMS-758 Front Panel

Any keypad activity provides an interrupt to the processor, which then scans the keypad. After the input has been recognized, the processor takes the appropriate action.

All switch functions are accessible to the operator from the front panel through the [F1] and [F2] keys, the [PREV] key, and the [NEXT] key.

Proper operation of the switch depends on its proper configuration and setup. The following sections describe the front panel and its operation in detail.

3.1.1 LED Indicators

Nine LEDs on the front panel indicate the general switch status and summary fault information, as follows:

Faults		
M:N	Red LED	Lights if M:N fault condition occurs.
MOD	Red LED	Lights if a modulator operation fault occurs.
DEMOD	Red LED	Lights if demodulator operation fault occurs.
BATTERY	Red LED	Lights if the M&C battery voltage is low.

Status		
POWER ON	Green LED	Lights when power is applied to the switch.
AUTO	Green LED	Lights when the switch is in the automatic operating mode.
LOCAL	Green LED	Lights when the switch is in the local operating mode.
REMOTE	Green LED	Lights when the switch is in the remote operating mode.
BYPASS	Green LED	Lights when the switch is in the bypass operating mode.

3.1.2 Keypad and LCD Display

The keypad and LCD display provide an interface for the local operator to access the menus that configure and operate the switch. The keypad includes the following keys:

- Numbers 0 through 9
- Decimal
- [ENT] key
- [F1] and [F2] keys
- [NEXT] and [PREV] keys

The [F1], [F2], [NEXT], and [PREV] keys control the hierarchical menu structure. Menus provide for local setup, configuration, and operation.

Each menu contains a portion of the switch control, or setup algorithm.

Only a limited knowledge of the switch is required, as the menus are self-prompting, and all options are displayed.

The base levels of this tree-structured front panel menu are as follows:

- ID menu displayed at power-on
- SYSTEM and MODEM SETUP menu
- CONFIGURATION and VERIFICATION menu
- FAULT menu
- MODE menu
- STATUS display

The ID menu displays the model number of the switch and version of firmware installed.

The [NEXT], [PREV], [F1], [F2], and [ENT] keys control the menus, and allow menu selections.

Some display messages have menu options on the right side, aligned with the [F1] and [F2] keys. Pressing either of those keys directs the display to the selected menu.

The operator can move forward or backward through the selected menu by pressing the [NEXT] or [PREV] keys.

The switch beeps in response to keypad inputs:

- One beep acknowledges a valid entry, with the appropriate action being taken.
- Two beeps indicate that the entry was invalid, and no action was taken.

Once the correct menu is selected, the operator can press the [ENT] key to enter, change, or view the functions within that menu.

Refer to Figure 3-2 for details of the menu hierarchy and displays.

The display maps show the menus available with independant mod/demod firmware installed (version 6.x.x). Modem switching firmware (version 5.x.x) has slight differences in the “Modem Setup” and “Local Mode” menus.

In the “Modem Setup” menu:

- The “Select Interface” menu with the options 7, 8, and 9 does not exist.
- “Mod Priority” and “Demod Priority” are conbined into “Modem Priority.”
- “Demod Delay” and “Mod Delay” are combined into “Modem Delay.”

In the “Local Mode” menu,

- The “Select Mod or Demod” menu does not exist.

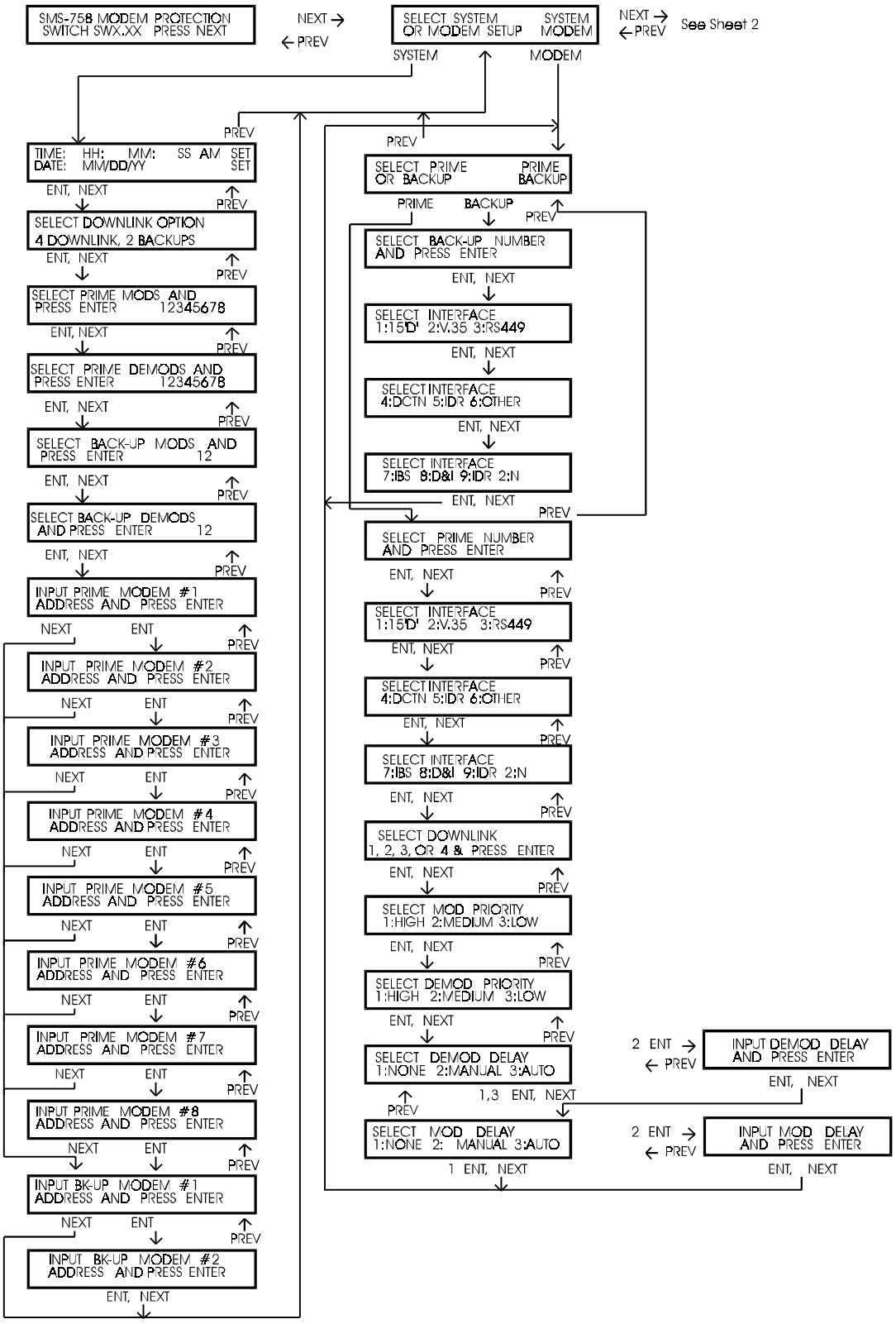

Figure 3-2. SMS-758 Display Map (Sheet 1 of 2)

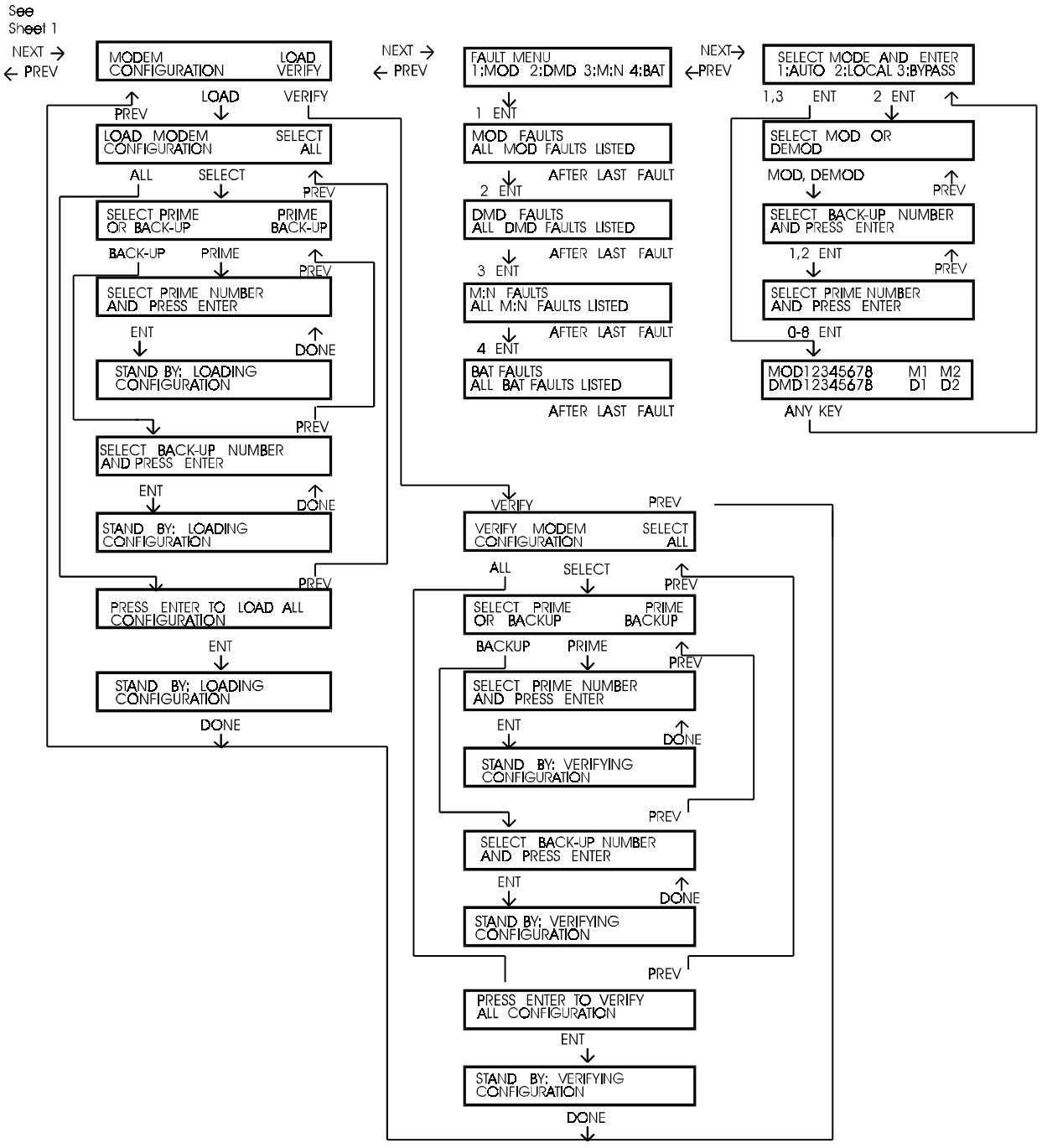

Figure 3-2. SMS-758 Display Map (Sheet 2 of 2)

3.2 Switch Setup

3.2.1 System Setup

Enter the SYSTEM SETUP menu to enter, change, or view the system setup configuration. The definitions of the system setup functions are as follows:

TIME AND DATE	Time and date are entered and displayed.
DOWNLINK OPTION	Downlink options are entered and displayed. (Refer to Appendix C.)
PRIME MODS	Active prime modulators are selected and displayed.
PRIME DEMODS	Active prime demodulators are selected and displayed.
BACKUP MODS	Active backup modulators are selected and displayed.
BACKUP DEMODS	Active backup demodulators are selected and displayed.
MODEM ADDRESSES	Prime and backup modem addresses are selected and displayed.

In the SYSTEM SETUP menu, the operator views system configuration parameters by using the [NEXT] and [PREV] keys. The operator can also enter data or change a parameter through keypad entries.

When all data or changes for that parameter are entered correctly, press [ENT] to load the information into memory.

After [ENT] is pressed, the display will increment to show the next available menu. If an incorrect entry is made, press [PREV] to return to that menu, and re-enter the data.

The following sections describe each parameter in detail.

3.2.1.1 Time and Date Menu

This menu displays the current time and date. The operator can enter the time by pressing [F1] and following the format:

```
HH MM
```

[F1] should then be pressed to select AM, or [F2] for PM.

When [ENT] is pressed, seconds reset to 0, and the new time loads into the clock device.

The operator can enter the date by pressing [F2] and following the format:

```
MM DD YY
```

Pressing [ENT] loads the new date into the clock device.

3.2.1.2 Downlink Option

This menu displays the current downlink option, showing how many downlinks and backups are selected.

The operator may choose from four downlinks with two backups possible, or seven downlinks and only one backup. Pressing any number key will toggle the two options, and pressing [ENT] will load the displayed choice into memory.

Refer to Appendix C for more information about the 7 downlink/1 backup option.

3.2.1.3 Active Prime Modulators Menu

This menu displays the current prime modulators that are active in the system. Pressing the keys [1] through [8] will toggle the active status (ON/OFF) of the corresponding modulator only. Modulators with numbers displayed are active. Pressing [ENT] loads that information into memory.

3.2.1.4 Active Prime Demodulators Menu

This menu displays the current prime demodulators that are active in the system. Pressing the keys [1] through [8] will toggle the active status of the corresponding demodulator only. Demodulators with numbers displayed are active. Pressing [ENT] loads that information into memory.

3.2.1.5 Active Backup Modulators Menu

This menu displays the current backup modulators that are active in the system. Pressing the keys [1] or [2] will toggle the active status of the corresponding backup modulator only. Modulators with numbers displayed are active. Pressing [ENT] loads that information into memory.

3.2.1.6 Active Backup Demodulators Menu

This menu displays the current backup demodulators that are active in the system. Pressing the keys [1] or [2] will toggle the active status of the corresponding backup demodulator only. Demodulators with numbers displayed are active. Pressing [ENT] loads that information into memory.

3.2.1.7 Modem Addresses Menu

This menu displays the current addresses of the prime and backup modems, and channel units, if applicable. Addresses of 1 through 255 are valid. Entering a new address and pressing [ENT] loads the address into memory. If no address is entered for an active modem, an M:N fault results.

Never use the global address "0". The configurations of the prime modems may become corrupted.

Note: Pressing [ENT] while in this menu will increment the prime modem number, while [NEXT] will transfer the user out of that address subsection to the next menu.

For example, after assigning address 2 to prime modem 2 and pressing [ENT], an address may be assigned to prime modem 3. Pressing [NEXT] then will allow the user to skip prime modems 3 through 8, and go directly to the backup modem menu, and assign an address to backup modem 1.

3.2.2 Modem Setup

To enter, change, or view the modem setup configuration, enter the MODEM SETUP menu by pressing F2. The MODEM SETUP functions are as follows:

INTERFACE	Interface type is selected and displayed for each modem.
DOWNLINK	Downlink assignment (1 through 4, or 1 through 7) is selected and displayed for demodulators. (Refer to Appendix C.)
MOD PRIORITY	The prime modulator priorities are selected and displayed.
DEMOD PRIORITY	The prime demodulator priorities are selected and displayed.
DEMOD DELAY	The prime demodulator online delay is selected and displayed.
MOD DELAY	The prime modulator online delay is selected and displayed.

Note: When using modem switch firmware, mod and demod priorities are combined into modem priority, and mod and demod delays are combined into modem delay, since the mod and demod switch simultaneously.

In the MODEM SETUP menu, the operator can select prime or backup modems by pressing [F1] or [F2]. It is recommended that the prime modems be configured first, since the switch increments the number of the prime modem displayed as each previous set of parameters is entered.

For example, after configuring prime modem 1, the switch will ask for the configuration for prime modem 2, etc.

The operator can view the modem configuration parameters by using the [NEXT] and [PREV] keys. A flashing cursor will be displayed over the selected parameter. To enter data or change a parameter, the operator uses the keypad to enter the data. When all data or changes for that parameter are correct, press [ENT] to load the information into memory. The following sections describe each parameter in detail.

Note: [ENT] or [NEXT] may be used to get from one frame to the next in this menu, but only [ENT] will enter data.

3.2.2.1 Interface Type Menu

This menu displays the current interface type for each prime and backup modem. Selections 1 through 9 are labeled:

Screen 1	1. 15D (For both DS-1 and G.703 interfaces) 2. V.35 3. RS449 (For both RS-422/449 and MIL-STD-188-114/RS-449 interfaces)
Screen 2	4. DCTN (Modified RS-422 interface) 5. IDR (for 1:N AS/0895) 6. OTHER
Screen 3	7. IBS 8. D&I (for “loomed” D&I systems. Read paragraph below.) 9. IDR 2:N (for 2:N AS/1877)

The operator enters the number associated with the interface type, and presses [ENT] to load the selected interface information into memory. Selections may only be made from the displayed options. If no interface type is entered for an active modem, an M:N fault results.

The OTHER interface type applies to ASYNC interfaces (AS/1695), or installations with dual 1:4 systems, or similar configurations having identical interfaces. Normally, the switch treats the two 1:4 systems with the same interface type as a single 2:8, but when OTHER interface type is selected for one of the 1:4 systems, the switch considers the interfaces different, and treats each 1:4 system as a separate system.

The “loomed” D&I system requires special firmware in the switch, special switch interfaces (AS/2152), additional breakout panels, and special cabling. The advantage of the “loomed” system is that during switching, there is no interruption of the data stream (T1 or E1). The only data that is affected is the data of the failed unit.

Note: Interface type is the only setup parameter for backup modems.

Note: Although the last three options do not exist with modem switch firmware, IBS and IDR 2:N can be chosen by selecting option 6 (OTHER).

3.2.2.2 Downlink Selection Menu

This menu displays the current downlink number (1 through 4, or 1 through 7) for each demodulator. When the operator enters the number of the downlink selected and presses [ENT], that information is loaded into memory. If no downlink is selected for an active demodulator, an M:N fault results.

Note: Hardware connections for uplink and downlink must be identical to the setup selection. Any difference causes erroneous switch operation.

Refer to Appendix C for more information about the 7 downlink/1 backup option.

3.2.2.3 Modulator Priority Menu

This menu displays the current priority level for this prime modulator.

- "1" indicates high priority.
- "2" indicates medium priority.
- "3" indicates low priority.

When the operator enters "1", "2", or "3" and presses [ENT], the information is loaded into memory. If nothing is entered, the priority will be low.

The backup algorithm uses priority levels to make backup decisions. When a backup modulator is online for a faulted prime with a lower priority than a newly faulted modulator, that backup modem becomes available for use to backup the newly faulted unit having the higher priority.

3.2.2.4 Demodulator Priority Menu

This menu displays the current priority level for this prime demodulator.

- "1" indicates high priority.
- "2" indicates medium priority.
- "3" indicates low priority.

When the operator enters "1", "2", or "3" and presses [ENT], the information is loaded into memory. If nothing is entered, the priority will be low.

The backup algorithm uses priority levels to make backup decisions. When a backup demodulator is online for a faulted prime with a lower priority than a newly faulted prime, that backup modem becomes available for use to backup the newly faulted unit having the higher priority.

3.2.2.5 Demodulator Delay

This menu displays the current online delay for this prime demodulator, and allows the operator to enter a new parameter. The DEMOD DELAY is the time allowed for the prime demodulator to clear its faulted state. At the end of this delay, if the prime is no longer faulted, it will be restored to online status. If the prime is still faulted, the backup demodulator is committed to that channel and will be unavailable for any other faulted prime having the same or lower priority.

The operator selects “1”, “2”, or “3”:

- “1” for no time delay.
- “2” for manual.
- “3” for automatic delay selection (2 times the sweep period).

Entering “1” or “3” and pressing [ENT] loads the information into memory. Entering “2” and pressing [ENT] allows the operator to enter from 0 to 127.5 seconds, in 0.5 second increments. When [ENT] is pressed again, the delay data is loaded into memory.

If nothing is entered, the switch automatically defaults to “3” (automatic).

3.2.2.6 Modulator Delay

The Modulator Delay menu displays the current online delay for this prime modulator, and allows the operator to enter a new parameter. The MOD DELAY is the time allowed for the prime modulator to clear its faulted state. At the end of this delay, if the prime is no longer faulted, it is restored to online status. If the prime is still faulted, the backup modulator is committed to that channel, and will be unavailable for any other faulted prime having the same or lower priority.

The operator selects “1” or “2”:

- “1” for no time delay.
- “2” for manual.

Entering “1” and pressing [ENT] loads the information into memory. Entering “2” and pressing [ENT] allows the operator to enter from 0 to 127.5 seconds, in 0.5 second increments. When [ENT] is pressed again, the delay data is loaded into memory.

If nothing is entered, the switch defaults to 1 (none).

Note: In certain applications, the MOD/DEMOD DELAY and PRIORITY settings are replaced by MODEM DELAY and PRIORITY settings. This occurs when modem switch firmware is used instead of independent mod/demod.

3.2.3 Modem Configuration

3.2.3.1 Prime and Backup Modem Configuration

The operator must be sure that the prime modems have all parameters properly configured for operation *prior* to configuration loading or verifying. The only required parameters for a backup modem are the data rate and code rate assignments in the modem's utility menu.

To communicate with the modems, the switch must have the modem addresses entered into the system configuration. The serial interface type, baud rate, and parity of the switch modem control interface is fixed, and therefore cannot be programmed by the operator. For interface information, refer to Section 4.1.5.

The modems must be set to RS-485 interface, 9600 baud, and even parity. Each modem in the switch system must have its own unique address. The interface type, baud rate, parity, and addresses are selected on the M&C card in the modem. (See the appropriate section of the modem installation and operation manual.)

3.2.3.2 Modem Configuration Menu

To load the modem configurations, press [F1] (LOAD) in the MODEM CONFIGURATION menu, and proceed as follows:

1. To load the configuration of an individual prime or backup modem, use the [F1] (SELECT) menu. If [F1] (SELECT) is pressed, the menu presents options of PRIME (F1) and BACKUP (F2). After the selection of prime or backup, the last menu will require entry of the prime or backup modem number. The switch automatically loads the configuration of the modem selected.

2. To load the configuration of all active modems, use the [F2] (ALL) menu. If [F2] (ALL) is pressed, the menu requires that [ENT] be pressed to begin the loading of all active modem configurations.

The switch displays "OK" or "ERROR", showing the result of the configuration loading process. An "ERROR" response results in an M:N fault.

3.2.3.3 Modem Verification

To verify the modem configurations, press [F2] (VERIFY) in the MODEM CONFIGURATION menu, and proceed as follows:

1. To verify the configuration of an individual prime or backup modem, use the [F1] (SELECT) menu. If F1 (SELECT) is pressed, the menu presents options of PRIME (F1) and BACKUP (F2). After the selection of prime or backup, the last menu will require entry of the prime or backup modem number. The switch automatically verifies the configuration of the modem selected.

2. To verify the configuration of all the active modems, use the [F2] (ALL) menu. If F2 (ALL) is pressed, the menu requires that [ENT] be pressed to begin the verifying of all active modem configurations.

The switch displays “OK” or “ERROR”, showing the result of the configuration loading process. An “ERROR” response results in an M:N fault.

Note: When any change is made in the prime or backup modem configuration, the operator must reload that modem’s configuration into the switch. If this is not done, a configuration verify error will be flagged in the M:N fault menu.

3.2.4 Faults

When any fault LED(s) is lighted, an operational fault condition exists. However, LEDs are only a summary visual alarm. The operator should use the FAULT menu to determine the exact cause of the fault and takes remedial action, if necessary.

The FAULT menu provides fault information. Use the [1], [2], [3], [4], [NEXT], and [PREV] keys to reveal the nature of any fault indicated by a front panel red LED.

The following sections list all possible fault messages that could appear in each category.

Refer to Section 5.2 for a list of possible causes, and for the fault isolation procedures.

3.2.4.1 Modulator Operation Fault

The fault menu displays MOD fault(s) when a modulator backup switching operation failure occurs. The messages will be as follows:

`BK-UP FAULT MOD X`
(Where: X = 1 to 8.)

3.2.4.2 Demodulator Operation Fault

The fault menu displays DEMOD fault(s) when a demodulator backup switching operation failure occurs. The messages will be either of the following:

`BK-UP FAULT DMD X`
(Where: X = 1 to 8.)

`ALL DMDS D/L X FAULTED`
(Where: X = 1 to 7.)

3.2.4.3 M:N Faults

The fault menu displays M:N fault(s) when a communication, configuration, setup, and/or power supply failure occurs. The messages will be any of the following:

MODEM X COMM FAILURE	(Where X = 1 to 8.)
MODEM BX COMM FAILURE	(Where X = 1 to 2.)
CONFIG VERIFY ERROR M (or D) X	(Where X = 1 to 8.)
CONFIG VERIFY ERROR BM (or BD) X	(Where X = 1 to 2.)
BK-UP M (or D) X NOT COMPATIBLE	(Where X = 1 to 2.)
PRIME M (or D) X NOT COMPATIBLE	(Where X = 1 to 8.)
NO ADDRESS FOR PRIME X	(Where X = 1 to 8.)
NO ADDRESS FOR BK-UP X	(Where X = 1 to 2.)
NO INTERFACE FOR PRIME X	(Where X = 1 to 8.)
NO INTERFACE FOR BK-UP X	(Where X = 1 to 2.)
NO D/L FOR DMD X	(Where X = 1 to 8.)
NO CONFIG FOR PRIME M (or D) X	(Where X = 1 to 8.)
NO CONFIG FOR BK-UP M (or D) X	(Where X = 1 to 2.)
+12V FAILURE	
-12V FAILURE	
+5V FAILURE	
POWER SUPPLY 1 FAULT	
POWER SUPPLY 2 FAULT	

3.2.4.4 Battery Faults

The fault menu displays a BATTERY fault when an M&C battery failure (low voltage) occurs in the switch. The message will be as follows:

`M&C BATTERY FAULT`

3.2.5 Operational Modes

The MODE menu selects the mode of operation. At power-up, the switch defaults to the BYPASS mode unless:

- It was in a different mode prior to loss of power.
- The battery-backed memory was maintained.

The following modes of operation are available:

BYPASS	All switching is halted. No change will take place until the switch is returned to the AUTO, LOCAL, or REMOTE mode. No interruptions will occur in the data flow of any modem already backed-up as a result of changing modes.
AUTOMATIC	The M&C controls all switching.
LOCAL	The on-site operator controls all switching.
REMOTE	In REMOTE mode, all switching is controlled by a remote controller via the remote interface. The on-site operator cannot select this mode of operation.

3.2.5.1 Bypass Mode

The BYPASS mode is recommended for configuration functions. It is the default operating mode at power-up, if the switch was not programmed for a different mode prior to loss of power, or if the battery-backed memory was not maintained. The switch is not capable of performing any switching functions in the BYPASS mode. All configuration and communication functions continue to operate, but no new backup operation can take place. Any backup operation performed prior to selecting BYPASS will remain in effect.

To enter the BYPASS mode, press [3] + [ENT] while in the MODE menu.

3.2.5.2 Auto Mode

The AUTO mode is the normal operating mode for the switch. Refer to the flowcharts in Figures 3-3 and 3-4. If the switch was in this mode when power loss occurred, it will return to this mode when power is restored. All previous backup status will be lost, but if there are faults present when power is restored, the switch will backup those faulted modulators and/or demodulators accordingly. Because the switch is communicating with the prime and backup modems in this mode, response to keypad input and remote communication may be delayed.

To enter the AUTO mode, press [1] + [ENT] while in the MODE menu.

In the AUTO mode, the switch monitors the prime and backup modulator and demodulator fault inputs, awaiting a failure. When no faults are present, the switch will place the backup modulator(s) and demodulator(s) in the “Hot Standby” mode for the highest priority prime(s), and a dash (-) will be displayed in the status display. In this mode, the switch programs the backup modulator(s) and demodulator(s) for the highest priority, lowest numbered prime modulator(s) and demodulator(s), and connects the downlink IF to the backup demodulator(s). This action prepares the backup modulator(s) and demodulator(s) for a minimal delay during the backing up of high priority channels.

When a fault does occur, the switch takes action according to the backup algorithm. The backup algorithm selects the highest priority, lowest numbered faulted channel for backup, and will take a lower priority channel backup offline, even if that channel is still faulted, to back up a higher priority channel.

When a demodulator backup is required, the switch performs the following steps:

1. It verifies the configuration of the backup demodulator, and re-programs it, if necessary.

2. If more than one demodulator is faulted, the switch selects the demodulator with the highest priority. If more than one faulted demodulator is set to the highest priority, the switch selects the demodulator with the lowest channel number.

3. The switch implements the sweep delay (it is not programmable by the user). This delay is two times the sweep period of the demodulator. At the end of the sweep delay or when the backup demodulator locks, the switch performs one of the following operations:

    a. If the backup demodulator fails to lock, the switch makes the back-up demodulator available for other faulted channels.

    b. If the backup demodulator locks, the switch commits the backup demodulator to the faulted prime and starts the demodulator delay timer. An asterisk (*) will be displayed in the status display if modem switch firmware is installed. (Continue to Step 4.)

4. At the end of the demodulator delay, the switch again checks the fault status of the prime demodulator.

    a. If the prime demodulator still shows a fault, the switch places the backup demodulator online for the faulted prime, and an arrow will be displayed in the status display. The backup will then be available only to failed primes having higher priority.

    b. If the prime demodulator locks during the demodulator delay, the backup demodulator is made available for other faulted primes.

When a modulator backup is required, the switch performs the following steps:

1. It verifies the configuration of the backup modulator and re-programs it, if necessary.

2. If more than one modulator is faulted, the switch selects the modulator with the highest priority. If two or more faulted modulators are set to the highest priority, the switch selects the modulator with the lowest channel number.

3. It implements a 500 millisecond delay (not programmable by the user). At the end of the delay, the switch performs one of the following operations:

    a. If the prime modulator is not faulted, the switch makes the backup modulator available for other faulted channels.

    b. If the backup modulator is not faulted, and the prime remains faulted, the switch commits the backup modulator to the faulted prime, and starts the modulator delay timer. An asterisk (*) is displayed in the status display if modem switch firmware is used. (Continue to Step 4.)

4. At the end of the modulator delay, the switch again checks the fault status of the prime modulator.

    a. If the prime modulator is still faulted, the switch places the backup modulator online for the faulted prime, and an arrow is displayed in the status display. The backup is then available only to failed primes having higher priority.

    b. If the prime modulator clears its fault during the modulator delay, the prime modulator is restored to service. The backup modulator is made available for other faulted primes.

When a modem backup is required, the switch performs both demodulator and modulator procedures simultaneously. However, the switch will not place the backup modem online until the backup demodulator locks and the modem online delay timer times-out.

The switch continually verifies the configurations of all active modulators and demodulators. If the switch fails to verify any configuration, an M:N fault results.

Changing from any mode to another mode (including AUTO) does not change the backup status unless a new fault occurs.

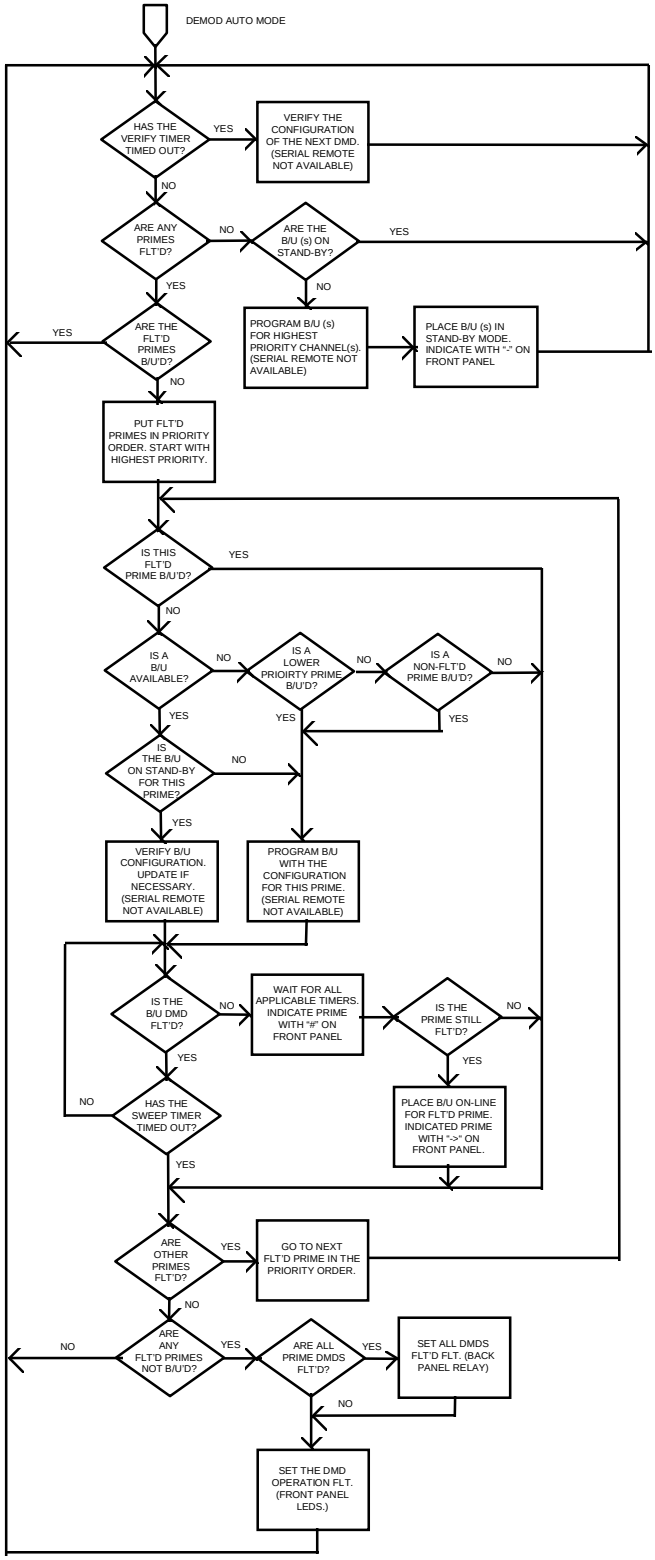

Figure 3-3. SMS-758 Switching Algorithm Flow Chart (Demodulator and Modem)

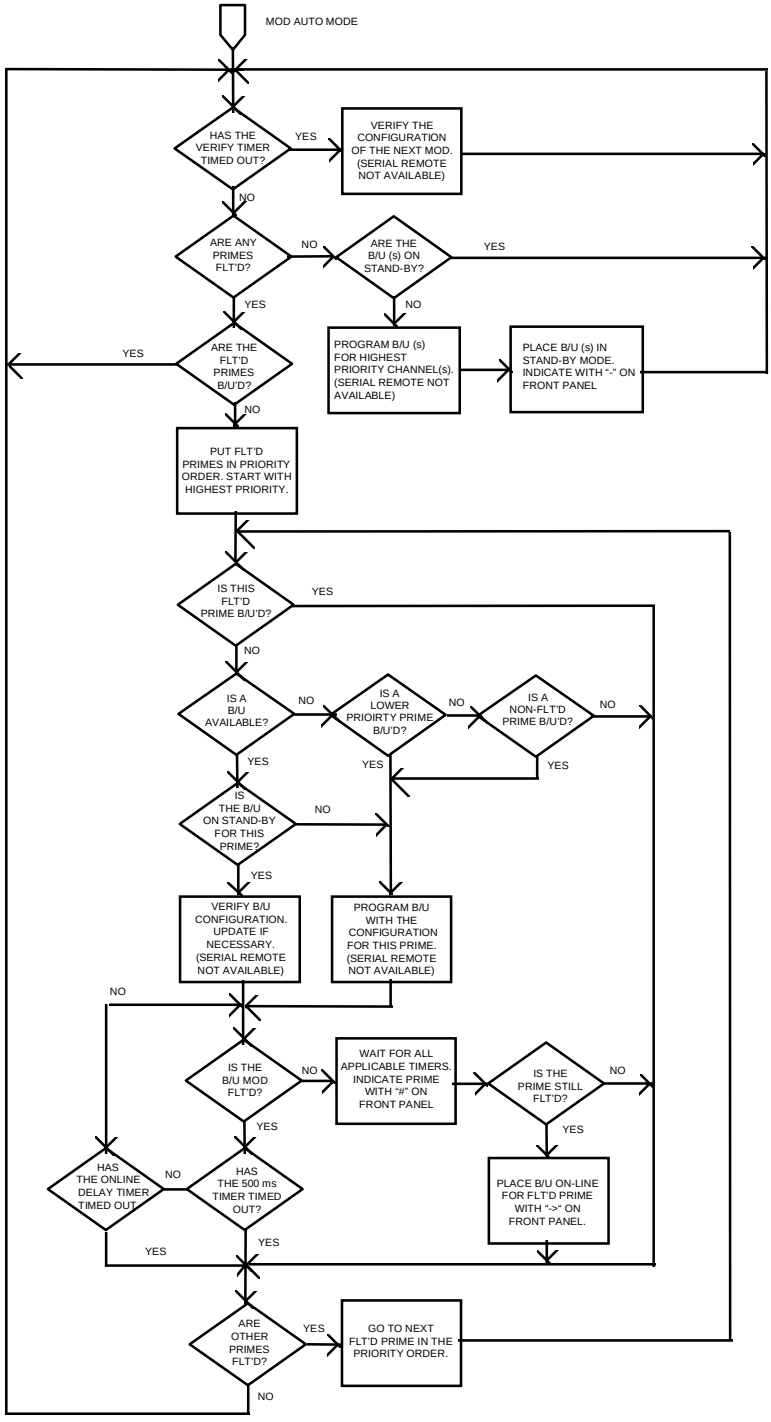

Figure 3-4. SMS-758 Switching Algorithm Flow Chart (Modulator)

3.2.5.3 Local Mode

In this operating mode, the switch responds to keypad input affecting setup, configuration, fault inquiries, and backup online status. If the switch is in this mode when power loss occurs, it will return to this mode when power is restored. However, the current backup status will be lost. This mode can also be used for configuration functions.

To enter the LOCAL mode, press [2] + [ENT] while in the MODE menu.

To change the backup status from local mode, proceed as follows:

1. Press [F1] or [F2] to select modulator or demodulator. (If the switch is a modem switch rather than an independent modulator/demodulator switch, press [ENT] to continue.)

2. Select the backup modem number (“1” or “2”), and press [ENT].

3. Select the prime modem number from 0 to 8. (“0” takes the backup modulator or demodulator offline. “1” to “8” selects that prime for backup.) Press [ENT].

The switch performs the selected function and displays the online and fault status. When the switch is in LOCAL mode, exercise care when changing the online status. The switch performs the selected function regardless of fault status or modulator and demodulator compatibility.

3.2.5.4 Remote Mode

In this operating mode, the switch responds to serial remote interface or relay-remote input. The switch can receive a full range of commands from the serial remote interface user, and a limited number from the relay-remote interface. If the switch was in this mode prior to loss of power, it returns to this mode when power is restored. However, current backup status will be lost.

This mode can be entered only from the serial remote interface or relay-remote interface.

For details of the Remote Interface Specification, refer to Sections 4.2 and 4.3, and Appendixes A and B.

3.2.6 Status Menu

The STATUS display follows the MODE menu. It provides the following information:

- Identifies the active modulators and demodulators, both prime and backup.
- Shows backup online status.
- Shows the fault status of all active prime and backup modulators and demodulators.

The STATUS menu displays only the active modulators and demodulators. If any modulator or demodulator is faulted, an “F” alternates with the modem number on the display.

The display shows online backup modulators and demodulators, with an arrow pointing to the number of the prime being backed-up.

“Hot Standby” mode is identified by a dash between the backup modulator/demodulator and the prime modulator/demodulator.

An asterisk is displayed while the backup modulator/demodulator is in the process of backing up a prime modulator/demodulator if modem switch firmware is installed (5.x.x).

In all modes except BYPASS, the STATUS display returns after approximately three minutes without keypad activity.

Refer to Figure 3-2 for details of the menu hierarchy and displays.

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Chapter 4.
THEORY OF OPERATION

4.1 Monitor and Control

A sophisticated microcontroller performs the monitor and control functions of the switch. The module, called the “Monitor and Control” (M&C), plugs into slot 5 of the switch chassis (refer to Figure 4-1 for a drawing of the M&C, and Figure 1-3 for the location in the chassis).

The M&C gathers status and provides extensive fault monitoring. The M&C monitors the switch configuration and updates other modules within the switch, as required. Switch configuration parameters are stored in battery-backed RAM to provide total recovery after a power-down.

A local front panel interface and a remote communications interface provide user access to all switch functions.

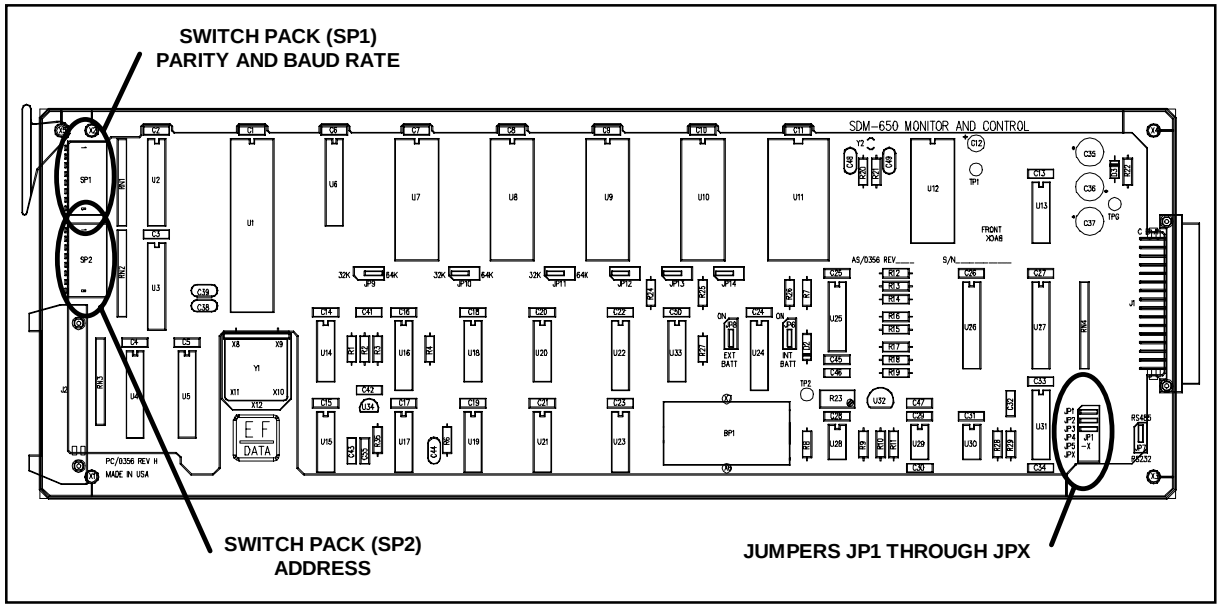

Figure 4-1. Monitor and Control

4.1.1 Theory of Operation

The M&C module uses an Intel 80C31 microcontroller operating at 5.5295 MHz.

The microsystem supports:

- 128K bytes of Read-Only Memory (ROM) for code.
- 64K bytes of Random-Access Memory (RAM) for data.

Of the 64K bytes, only 8K is used for RAM, and the remaining 56K is used for memory-mapped I/O.

Memory-mapped I/O includes:

- Real time clock/memory.
- 8-channel analog-to-digital converter.
- External buffered bus structure for overall switch control and status gathering.

The 80C31 microcontroller supports a serial asynchronous communications channel (RS-232C), with a maximum baud rate of 9600 bit/s using the 5.5295 MHz reference.

A rechargeable battery maintains the system real time clock and switch configuration through power-down situations. Memory is maintained up to 30 days without power. A full battery charge is attained after the switch is powered ON for 48 hours.

4.1.2 M&C Serial Interface

The M&C communicates with the address decoder/driver through an RS-232C interface.

To set the M&C for RS-232C operation:

1. Remove JP1, JP2, and JP3. Install JP4, JP5, and JPX.
2. Install JP7 at RS-232 location.

Note: The M&C should always be set up this way, even when using external RS-485 communications.

4.1.3 Remote Baud Rate

The eight position switch pack, SP1, on the M&C module programs the external remote serial communications baud rate and parity. Set the switches to ON (nearer the PCB) or OFF (away from the PCB) to select parity and baud rate.

SP1 switch position 1 (SP1-1) sets the parity:

- "OFF" for even parity
- "ON" for odd parity

SP1 switch positions 2, 3, and 4 (SP1-2, SP1-3, and SP1-4) set the baud rate as follows:

Baud	SP1-2	SP1-3	SP1-4
110	ON	ON	ON
150	ON	ON	OFF
300	ON	OFF	ON
600	ON	OFF	OFF
1200	OFF	ON	ON
2400	OFF	ON	OFF
4800	OFF	OFF	ON
9600	OFF	OFF	OFF

4.1.4 Remote Address

The switch connects to an RS-485 remote communication link. To communicate on this link, each unit must have a unique address between 1 and 255. (0 cannot be a device address, as it is the global address for all devices.) To set an address, use the 8-position switch pack, SP2, on the M&C module.

Addresses are binary coded numbers:

- Switch position 1 (SP2-1) is the most significant bit.
- Switch position 8 (SP2-8) is the least significant bit.

To turn ON any switch, move it to the position closer to the PCB. For example:

Address	SP2-1	SP2-2	SP2-3	SP2-4	SP2-5	SP2-6	SP2-7	SP2-8
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
5	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON
9	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
17	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
33	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
65	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
129	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
255	ON	ON	ON	ON	ON	ON	ON	ON

4.1.5 External Remote Serial Interface Selection

An RS-485 or RS-232C communications link on the address decoder/driver module provides remote serial interface for all switch functions.

The RS-485 interface allows up to 32 devices to operate on a common communication link. Each device must have a discrete address (there are 255 available discrete addresses). RS-232C communication is only possible with a single device. Before the configuration setup, the M&C is jumpered for RS-232C communication, but the switch will still communicate via RS-485. See Figure 4-1 for locations of the switches and jumpers.

Use M&C module switch pack SP1 switch 5 (SP1-5) to configure each switch for external remote interface type, either RS-485 or RS-232C. The ON position (nearer the PCB) selects RS-232C interface, and OFF selects RS-485.

4.1.6 Battery

A rechargeable battery on the M&C module allows it to retain configuration and status information for up to 30 days without prime power. M&C module jumper JP6 connects battery power from the backup RAM. During normal operation, this jumper should be in the ON position. Refer to Figure 4-1 for jumper location. Should the switch be powered down, the M&C microcontroller performs the following sequence:

1. Upon power-up, the M&C microcontroller checks the battery-backed RAM for valid data. If valid data has been retained, the M&C implements the RAM-stored switch configuration.

2. If the battery-backed RAM fails the valid data test, the switch defaults to the bypass mode, and no configuration is loaded.

To clear the memory, JP6 must be set OFF, and the leads of capacitor C12 must be shorted. JP6 must then be set ON again, so the memory can retain a new configuration.

Note: The external battery option (JP8) is not supported in the SMS-758 chassis, and must be OFF.

4.1.7 Error Response Function

This is a switch function for indicating an error message when a command cannot be carried out because local processing is using the modem control bus, local keyboard control, and so forth.

The functions for the error response switches, SW1-6, -7, and -8 are described in Table 4-1. Table 4-2 lists the different software versions required for each switch function.

Table 4-1. Error Response Switch Options

Switch Position	Switch Function	Description
SP1-6	ER6_BUSY enable ON = Enabled OFF = Disabled	Selects whether the switch will return an ER6_BUSY response if it cannot process the received remote command. A response will not be returned if this switch is OFF.
SP1-7	ER6_BUSY wait ON = Immediate response OFF = 2 second response	Selects the time the switch attempts to process the command. ER6_BUSY enable determines if ER6_BUSY will be returned or not. In the immediate response mode (ON), this will be less than 320 ms from the command response received by the switch.
SP1-8	WAIT for Modem response ON = 2 seconds OFF = 4 seconds	Selects the time the switch will wait for a modem to respond to a remote command.

Table 4-2. Software Versions for Response Switch

	Software Versions	
Switch Function	Modem Switch	Mod/Demod Switch
ER6_BUSY enable	≥ 5.00	≥ 6.00
ER6_BUSY wait	≥ 5.09	≥ 6.11
WAIT for modem response	≥ 5.10	≥ 6.12

4.1.8 External I/O Interrupt Arbitration

The SMS-758 switch does not use the external I/O interrupt arbitration function. JP12, JP13, and JP14 must be in the "LEFT" position to disable this function.

4.2 Modem Control Interface Specification

The modem control interface is an RS-485 serial communication link which allows the switch to maintain control of backup modems, and verify the configuration of the prime and backup modems. (See Section 2.4.3 for details of connector position and pinout.)

The RS-485 interface permits up to 32 devices to operate on a common communication link. However, only modems and channel units may be connected to this communication link, besides this switch. External remote communication to the modems and switch is accomplished through the external remote interface. Refer to Section 4.1.5 for more information.

The user cannot configure the parameters of the RS-485 interface. The baud is fixed at 9600 and parity is even. All devices communicating with the switch must have their remote control interfaces configured to those parameters. Each modem and channel unit must have a unique address. Refer to the Installation and Operation Manuals for each device for details of remote interface specification and configuration.

4.3 Relay-Remote Interface Specification

This section defines the protocol and word/command structure of the relay-remote interface.

The relay-remote input (J6) allows the user to execute a limited number of mode and online commands (refer to Section 2.4.5 for connector location and pinout). These commands are a series of 4-bit words.

The switch has a 4-line parallel interface with pull-up resistors (10KΩ to +5V). Thus, open inputs are logic high, and logic low inputs can be generated by connecting to pin 25 of J6. The inputs can also be driven directly from TTL or CMOS family devices.

The M:N switch recognizes a word 100 msec after the change of state is detected on the parallel interface. The words must be held for 200 msec, and should not be sent faster than 500 msec, or slower than 10 second intervals.

The word can be repeated any number of times, but the switch only detects it the first time it is sent. The following section describes the commands that can be executed.

4.3.1 Command Structure

A command to the switch consists of three or four words sent on the four parallel lines, in Non-Return-to-Zero (NRZ) or Return-to-Zero (RZ) format.

The switch recognizes each word by changes of state at the relay-remote inputs. After debounce, the switch identifies the word. If all words are valid and the EXECUTE word is received, the switch performs the command.

The command words START and EXECUTE are defined in Table 4-3. Target words are defined in Table 4-4. The six command functions are defined in Table 4-5.

A valid command structure consists of words in the following order:

1. The START word begins all messages.

2. The COMMAND word follows the start word.

3. If the command affects the online or offline status of a prime modulator or demodulator, the next 4-bit word must be the TARGET word. The format for the target word is the BCD number for the prime modulator or demodulator. The target word is not sent if the backup is to be taken offline, or AUTO or REMOTE mode is selected.

4. The EXECUTE word follows the target (or command) word.

The command words must be sent to the switch with no more than 10 seconds between words for the switch to recognize a command. If the interval exceeds 10 seconds, the M&C resets the word buffer, and waits for the next START word.

If an incorrect word is sent, begin the message sequence again with the START word. This word restarts the message sequence.

Table 4-6 shows some relay-remote command examples.

Table 4-3. Relay-Remote Command Words

	Input Lines			
Command Word	**REM3**	**REM2**	**REM1**	**REM0**
START	C	C	C	C
AUTO	N	N	C	N
REMOTE	N	N	N	C
B/U MOD 1	C	C	N	C
B/U MOD 2	C	C	C	N
B/U DEMOD 1	C	N	N	C
B/U DEMOD 2	C	N	C	N
EXECUTE	C	C	N	N
C = Change of state. N = No change of state.				

Table 4-4. Modem Target Words

	Input Lines			
Target Modem	**REM3**	**REM2**	**REM1**	**REM0**
1	N	N	N	C
2	N	N	C	N
3	N	N	C	C
4	N	C	N	N
5	N	C	N	C
6	N	C	C	N
7	N	C	C	C
8	C	N	N	N
C = Change of state. N = No change of state.				

Table 4-5. Relay-Remote Command Functions

Function	Description
AUTO	Executed only from REMOTE mode. This function places the switch in the automatic mode of operation.
REMOTE	Executed from any operating mode other than REMOTE; must be executed before any other relay-remote function. This function places the switch in the remote mode of operation.
BACKUP MOD 1	Executed only from REMOTE mode. This function is used to place backup modulator 1 online when it precedes a target word, or offline when it precedes EXECUTE.
BACKUP MOD 2	Executed only from REMOTE mode. This function is used to place backup modulator 2 online when it precedes a target word, or offline when it precedes EXECUTE.
BACKUP DEMOD 1	Executed only from REMOTE mode. This function is used to place backup demodulator 1 online when it precedes a target word, or offline when it precedes EXECUTE.
BACKUP DEMOD 2	Executed only from REMOTE mode. This function is used to place backup demodulator 2 online when it precedes a target word, or offline when it precedes EXECUTE.

Table 4-6. Relay-Remote Command Examples

	Input Lines				
Command Words	**Rem3**	**Rem2**	**Rem1**	**Rem0**	**Comments**
START	C	C	C	C	Places the M:N in the remote mode.
REMOTE	N	N	N	C	
EXECUTE	C	C	N	N	
START	C	C	C	C	Places B/U modulator 1 online for prime 2.
B/U MOD 1	C	C	N	C	
TARGET PRIME 2	N	N	C	N	
EXECUTE	C	C	N	N	
START	C	C	C	C	Places B/U modulator 2 online for prime 6.
B/U MOD 2	C	C	C	N	
TARGET PRIME 6	N	C	C	N	
EXECUTE	C	C	N	N	
START	C	C	C	C	Places B/U demodulator 1 online for prime 5.
B/U DEMOD 1	C	N	N	C	
TARGET PRIME 5	N	C	N	C	
EXECUTE	C	C	N	N	
START	C	C	C	C	Place B/U demod 2 offline. (No target word.)
B/U DEMOD 2	C	N	C	N	
EXECUTE	C	C	N	N	
START	C	C	C	C	Places the M:N in the auto mode.
AUTO	N	N	C	N	
EXECUTE	C	C	N	N	
C = Change of state. N = No change of state.					
Mod = Modulator. Demod = Demodulator.					

4.4 Fault Interface Specification

This section defines the protocol and format structure for monitoring the fault status interface of the switch.

The relay-remote/fault rear panel connector (J6) provides interface for fault status information. (See Section 2.4.5 for connector location and pin-out information.)

Three non-latching relays with form C contacts show:

- Controller status
- M:N status
- Demodulator signal status

These contacts report summary status. To determine the exact fault, the user must make further inquiry, as described in Section 3.2.4.

4.4.1 Controller fault

A controller fault is a catastrophic failure that renders the switch non-functional. A timer on the M&C periodically sets a monostable multivibrator which controls the fault relay. The controller fault relay NC and COM contacts close when one of the following occurs:

- No power is applied to the switch.
- M&C fails to set the monostable.

During normal operation (when no fault occurs), the relay NC and COM contacts are open, and the NO and COM contacts are closed.

4.4.2 M:N Fault

An M:N fault is any failure of backup operation, communication, configuration, and/or setup that may (or may not) render the switch non-functional.

During normal operation or when power is OFF, the relay is de-energized (COM to NC). When any failure occurs, the relay energizes (COM to NO). It remains energized until the failure is eliminated.

4.4.3 Demodulator Signal Fault

A demodulator signal fault is the failure of all active demodulators on the indicated downlink to acquire and lock to their signals. The fault alarm indicates a possible down converter system failure, causing loss of IF to the demodulators.

During normal operation or power-down, the relay is de-energized (COM to NC). When all demodulators indicate loss of carrier, the relay energizes (COM to NO). The relay remains energized until the failure is eliminated.

4.5 Online Status Specification

This section defines the protocol and format for reporting the online status of the switch.

The M&C commands the online telemetry module to report online status for all active prime modulators and demodulators. The status is reported as form-C relay contacts to the online status connectors (J4 and J5) on the rear panel. (See Section 2.4.4 for connector locations and pinouts.)

4.5.1 Modulator Online Status

The active modulator's online status is indicated by form-C relay contacts. When the prime is online or power is OFF, the relay is de-energized (COM to NC). When a backup modulator goes online for that prime, the relay energizes (COM to NO).

4.5.2 Demodulator Online Status

The active demodulator's online status is indicated by form-C relay contacts. When the prime is online or power is OFF, the relay is de-energized (COM to NC). When a backup demodulator is online for that prime, the relay is energized (COM to NO).

4.6 Interface Switches

The prime interface switch module can plug into any prime interface switch module slot (A1 through A8) on the left side of the lower rear panel. The backup interface switch module can plug into A9 or A10 (on the right side).

When the prime interface switch module (or the M:N switch itself) is powered down or in the default position, all signals are routed between the terminal equipment and the prime modem.

Modulator and/or demodulator signals can be independently switched to either of the two backup modem interface switch modules, if the independent mod/demod firmware is used. If modem switch firmware is used, then both the modulator and demodulator switch to the backup when either the prime modulator or demodulator indicates a fault.

4.6.1 RS-422/449 and MIL-STD-188-114/RS-449 Interface Switch

The RS-422/449 and MIL-STD-188-114/RS-449 interface switch module switches all interface signals by relay.

The prime interface switch module (Figure 4-2) has two 37-pin female D connectors.

- Prime modem interface (J1) on the left is a DTE interface.
- Terminal equipment interface (J2) on the right is a DCE interface.

The backup interface switch module (Figure 4-3) has one 37-pin female D connector.

The backup modem interface (J1) is a DTE interface.

A buffered set of transmit clock (TT) and master clock (MC) signals are switched to the “hot standby” backup modulator or demodulator, or to the offline prime modulator and demodulator when a backup operation occurs.

The fault lines from the modem connector are routed through the interface switch modules to the M&C.

4.6.1.1 Specification

Circuits Supported	SD, ST, TT, RD, RT, DM, RR, CS, RS, MC.
Switching Format	Modulator and demodulator signals switch individually with dry contacts.
Contact Arrangement	Modulator signals: 10 poles. Demodulator signals: 10 poles.

4.6.1.2 Connector Pinouts

A 37-pin female D connector provides interface for the RS-422/449 and MIL-STD-188-114/RS-449 interface.

Screw locks provide mechanical security for the mating connector.

Signal Function	Name	Pin #
Signal Ground	SG	1,19,20,37
Send Data	SD-A	4
SD-B	22	
Send Timing	ST-A	5
ST-B	23	
Receive Data	RD-A	6
RD-B	24	
Request To Send	RS-A	7
RS-B	25	
Receiver Timing	RT-A	8
RT-B	26	
Clear To Send	CS-A	9
CS-B	27	
Data Mode	DM-A	11
DM-B	29	
Receiver Ready	RR-A	13
RR-B	31	
Terminal Timing	TT-A	17
TT-B	35	
Master Clock	MC-A	16
MC-B	34	
Modulator Fault	MF	3
Demodulator Fault	DF	21

Note: MF and DF inputs are only on the prime and backup modem interface connectors, not the terrestrial data connector.

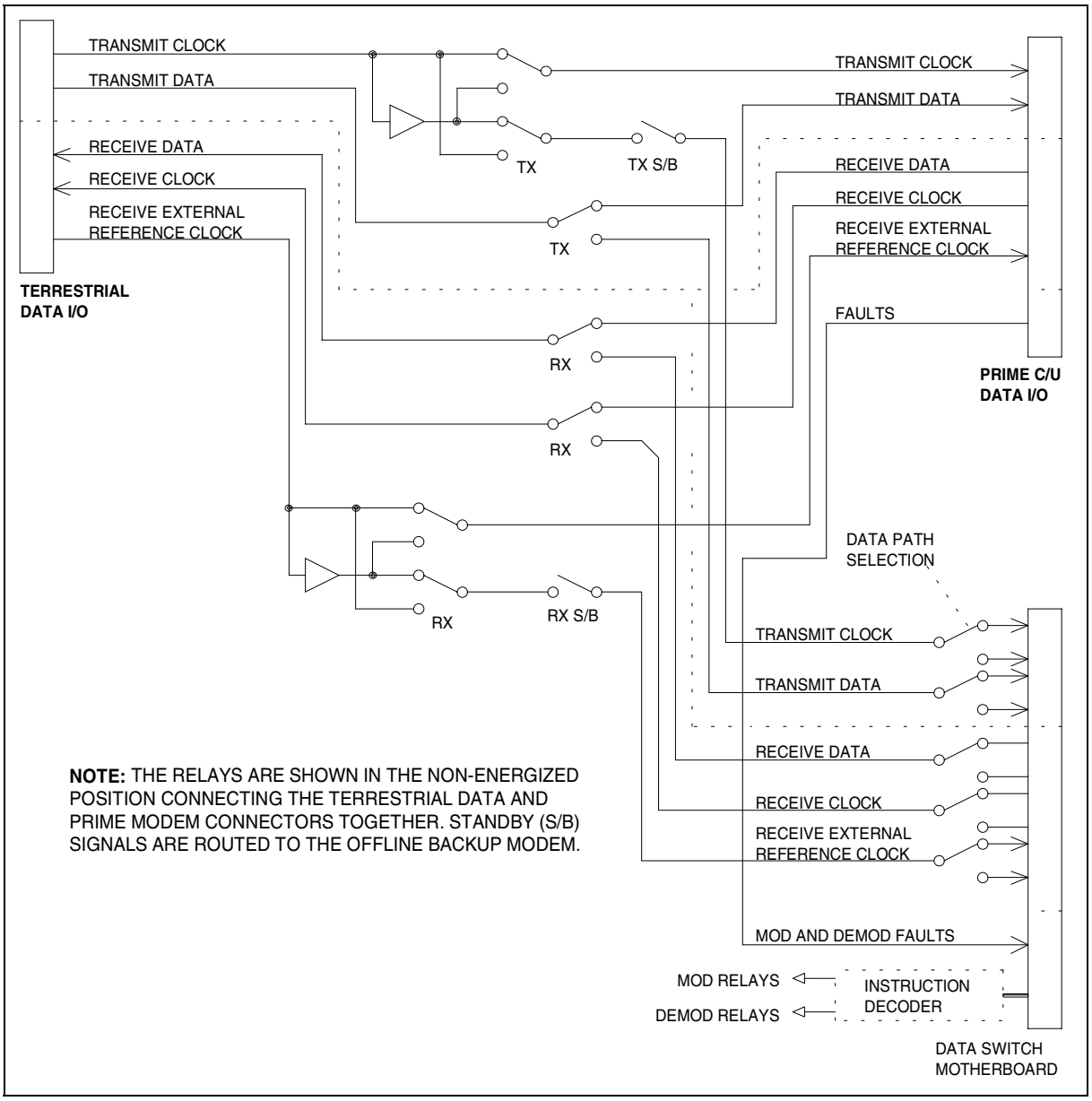

Figure 4-2. Prime RS-422/449 and MIL-STD-188-114/RS-449 Interface Switch

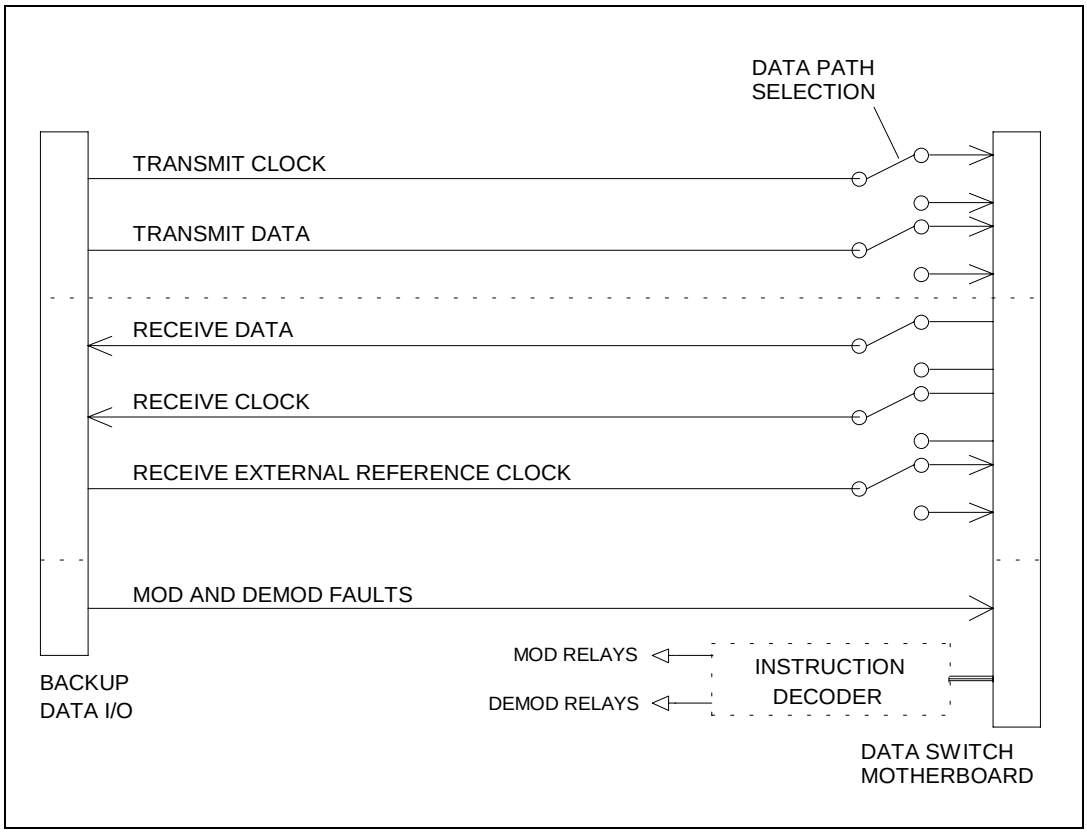

Figure 4-3. Backup RS-422/449 and MIL-STD-188-114/RS-449 Interface Switch

4.6.2 V.35 Interface Switch

The V.35 interface switch module switches all interface signals by relay. The prime interface switch module (Figure 4-4) has two 34-pin female block connectors.

- J1 (top) for terminal equipment is a DCE interface.
- J2 (bottom) for prime modem is a DTE interface.

The backup interface switch module (Figure 4-5) has one 34-pin female block connector. The backup modem (J1) is a DTE interface. The prime interface switch module can plug into any interface switch module slot (A1 through A8) on the left side of the lower rear panel. The backup interface switch module can plug into A9 or A10, on the right side.

The prime interface switch module can plug into any prime interface switch module slot (A1 through A8) on the left side of the lower rear panel. The backup interface switch module can plug into A9 or A10 (on the right side).

When the prime interface switch module (or the M:N switch itself) is powered down or in the default position, all signals are routed between the terminal equipment and the prime modem.

Modulator and/or demodulator signals can be independently switched to either of the two backup modem interface switch modules, if the independent mod/demod firmware is used. If modem switch firmware is used, then both the modulator and demodulator switch to the backup when either the prime modulator or demodulator indicates a fault.

A buffered set of transmit clock (SCTE) and master clock (MC) signals is switched to the “hot standby” backup modulator or demodulator, or to the offline prime modulator and demodulator when a backup operation occurs.

The fault lines from the modem connector are routed through the interface switch modules to the M&C.

4.6.2.1 Specification

Circuits Supported	SD, SCT, SCTE, RD, SCR, MC, CTS, RTS, DSR, RLSD.
Switching Format	Modulator and demodulator signals switched individually with dry contacts.
Contact Arrangement	Modulator signals: 8 poles Demodulator signals: 8 poles

4.6.2.2 Connector Pinouts

The V.35 interface is an industry standard 34-pin block connector.

Screw locks provide mechanical security for the mating connector.

Signal Function	Name	Pin #
Signal Ground	SG	A,B
Transmit Data	SD-A	P
SD-B	S	
Serial Clock Transmit	SCT-A	Y
SCT-B	a (AA)	
Receive Data	RD-A	R
RD-B	T	
Request To Send	RTS	C
Serial Clock Receive	SCR-A	V
SCR-B	X	
Clear To Send	CTS	D
Data Set Ready	DSR	E
Rcv. Line Signal Det.	RLSD	F
Serial Clock Transmit Ext	SCTE-A	U
SCTE-B	W	
Master Clock	MC-A	c (CC)
MC-B	d (DD)	
Modulator Fault	MF	m (MM)
Demodulator Fault	DF	n (NN)

Note: MF and DF inputs are only on the prime and backup modem interface connectors, not the terrestrial data connector.

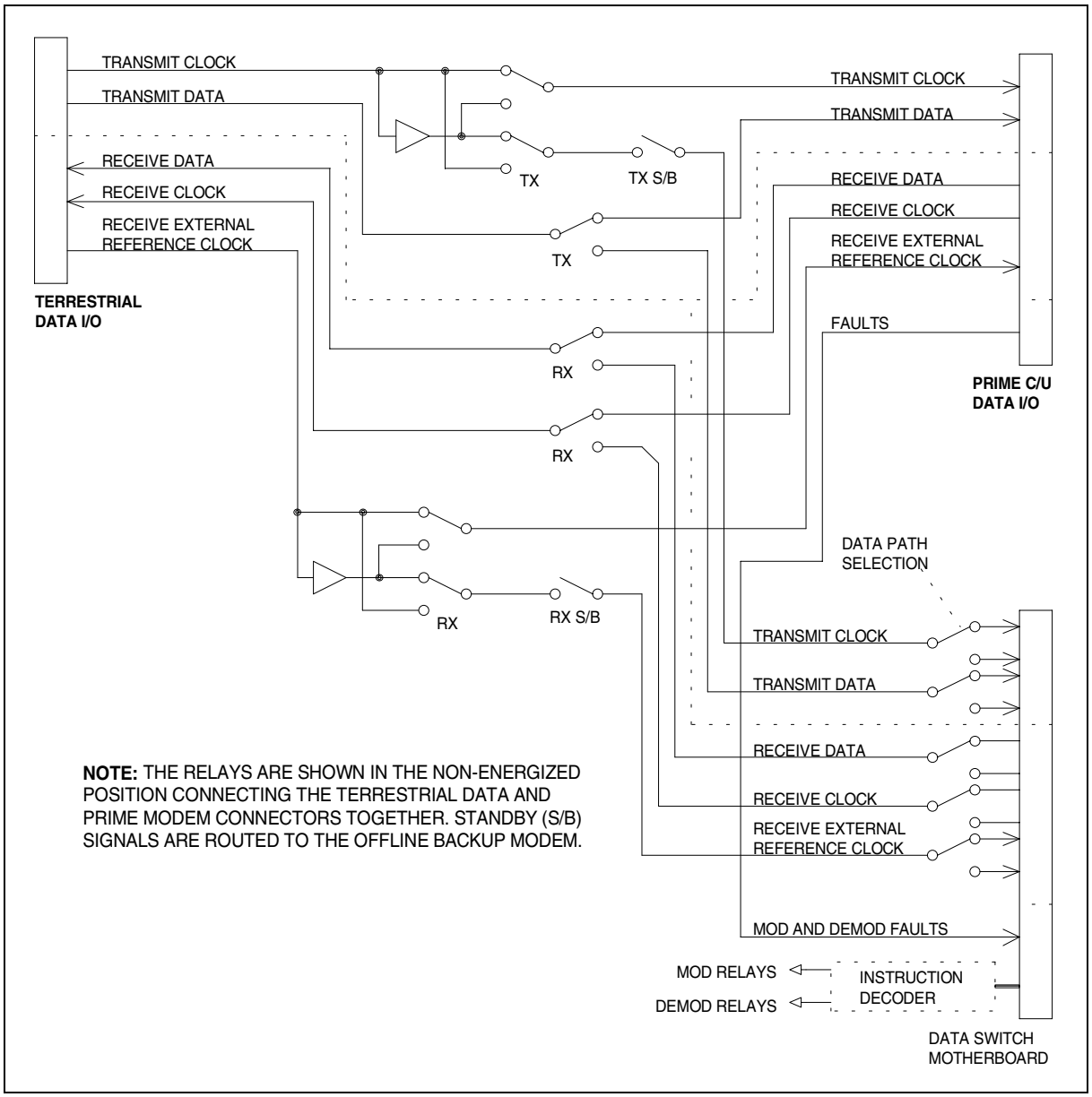

Figure 4-4. Prime V.35 Interface Switch

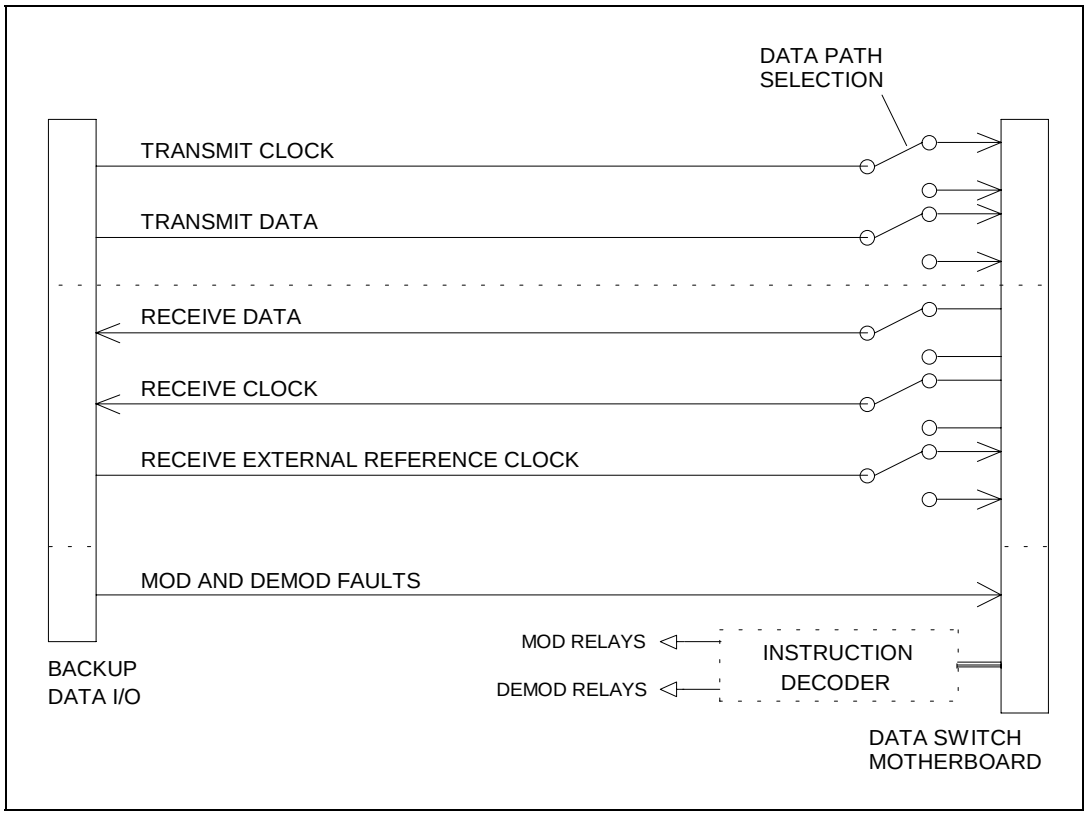

Figure 4-5. Backup V.35 Interface Switch

4.6.3 V.35/RS-232 Interface Switch

The V.35/RS-232 interface switch module switches all interface signals by relay. Interface types can be changed between V.35 and RS-232 by the SPDT toggle switch located on the back of the daughter card. Both the prime and backup interfaces must be in V.35 mode or RS-232 mode in order to operate correctly.

The prime interface switch module (Figure 4-6) has two 25-pin D connectors:

- J1 (top) for terminal equipment is a DCE interface.
- J2 (bottom) for the prime modem is a DTE interface.

The backup interface switch module (Figure 4-7) has one 25-pin D connector. The backup modem (J1) is a DTE interface.

The prime interface switch module can plug into any of the interface switch module slots (A1 through A8) on the left side of the lower rear panel. The backup interface can plug into either A9 or A10.

When the prime interface switch module (or the M:N switch itself) is powered down or in the default position, all signals are routed between the terminal equipment and the prime modem.

Modulator and/or demodulator signals can be independently switched to either of the two backup modem interface switch modules, if the independent mod/demod firmware is used. If modem switch firmware is used, then both the modulator and demodulator switch to the backup when either the prime modulator or demodulator indicates a fault.

A buffered set of transmit clock (SCTE) and master clock (MC) signals is switched to the “hot standby” backup modulator or demodulator, or the offline prime modulator and demodulator when a backup operation occurs.

The fault lines from the modem connector are routed through the interface switch modules to the M&C.

4.6.3.1 Electrical Specifications

V.35	
Circuit Supported	SD, SCT, SCTE, RD, SCR, DSR, DSR, RLSD
Switching Format	Modulator and demodulator signals individually with dry contacts
Contact Arrangement	Mod Signals: 8 poles Demod Signals: 8 poles
Amplitude (RD, SCR, SCT, SD, SCTE)	0.55V peak ± 20% differential into 100Ω
Amplitude (CTS, DSR, RLSD)	10 ± 5V into 5000 ± 2000Ω
Impedance (RD, SCR, SCT)	100 ± 20Ω
Impedance (SD, SCTE)	100 ± 10Ω
Impedance (RTS)	5000 ± 2000Ω, < 2500 pF
DC Offset (RD, SCR, SCT)	± 0.6V max., 1000Ω termination to ground
Polarity (SD, SCT, SCTE, RD, SCR)	True when B positive wrt A False when A positive wrt B
Polarity (RTS, SCT, DSR, RLSD)	True when < -3V wrt GND False when > +3V wrt GND
Phasing (SCTE, SCR)	False-to-true transition, nominally in center of data bit
Symmetry (SCR, SCTE, SCT)	50%, ± 5%
Frequency	± 100 PPM

4.6.3.2 Connector Pinouts

4.6.3.2.1 V.35 Option

The V.35 interface has been converted from the 34-pin block connector (refer to Figure 4-4) to a 25-pin D connector (refer to Figure 4-6) that is accessible from the back panel. Screw locks are provided for mechanical security of the mating connector.

Pin # (25-Pin)	Pin # (34-Pin Block)	Signal Name
1	A	Ground
7	B	Ground
14	P	Send Data A
2	S	Send Data B
25	U	Serial Clock Transmit External A
24	W	Serial Clock Transmit External B
18	Y	Serial Clock Transmit A
15	a (AA)	Serial Clock Transmit B
16	R	Receive Data A
3	T	Receive Data B
19	V	Serial Clock Receive A
17	X	Serial Clock Receive B
4	C	Request to Send
5	D	Clear to Send
6	E	Data Set Ready
8	F	Receive Line Signal Detect
22	c (CC)	External Reference Clock A
23	d (DD)	External Reference Clock B
20	m (MM)	Modulator fault
21	n (NN)	Demodulator fault
9, 10, 11, 12, and 13		No connection in 25-pin connector
H, J, M, N, Z, b (BB), e (EE), f (FF), h (HH), j (JJ), k (KK), and l (LL)		No connection in 34-pin block

4.6.3.2.2 RS-232 Option

When the switch is in the RS-232 position, the 25-pin D connector now provides the interface for RS-232 mode of operation. Screw locks are provided for mechanical security of the mating connector.

Pin #	Signal Name	Direction	Circuit
1	Ground		AA
7	Ground		AB
2	Transmitted Data	IN	BA
15	Transmission Signal Element Timing	OUT	DB
3	Received Data	OUT	BB
4	Request to Send	IN	CA
17	Receiver Signal Element Timing	OUT	DD
5	Clear to Send	OUT	CB
18	Carrier Present	OUT	
6	Data Set Ready	OUT	CC
8	Receive Line Signal Detect	OUT	CF
9	External Reference Clock	IN	
11	Demodulator Fault		
24	Transmit Signal Element Timing	IN	DA
25	Modulator Fault		
10, 12, 13, 14, 16, 19, 21, 22, 23	No connection		

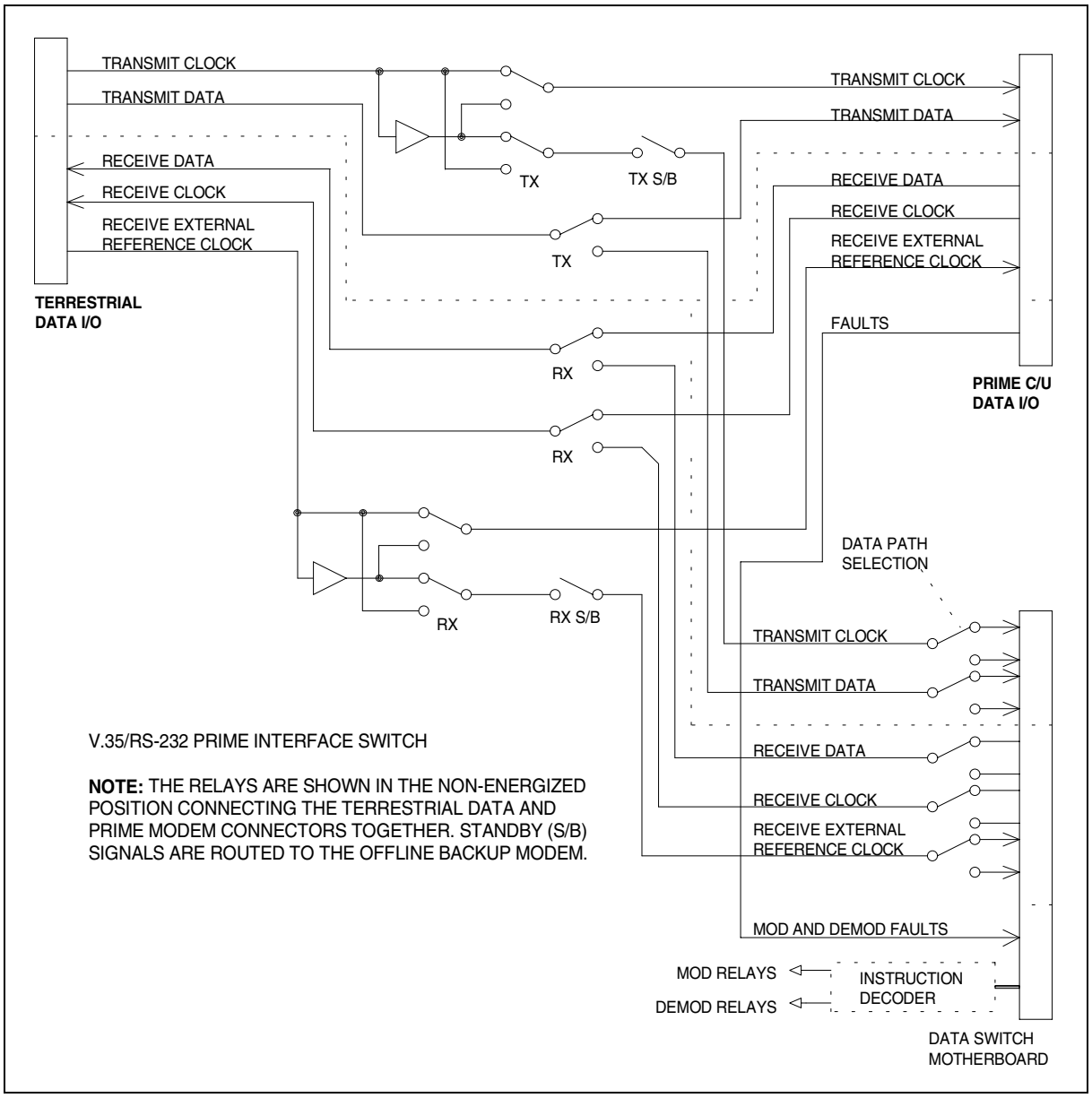

Figure 4-6. Prime V.35/RS-232 Interface Switch

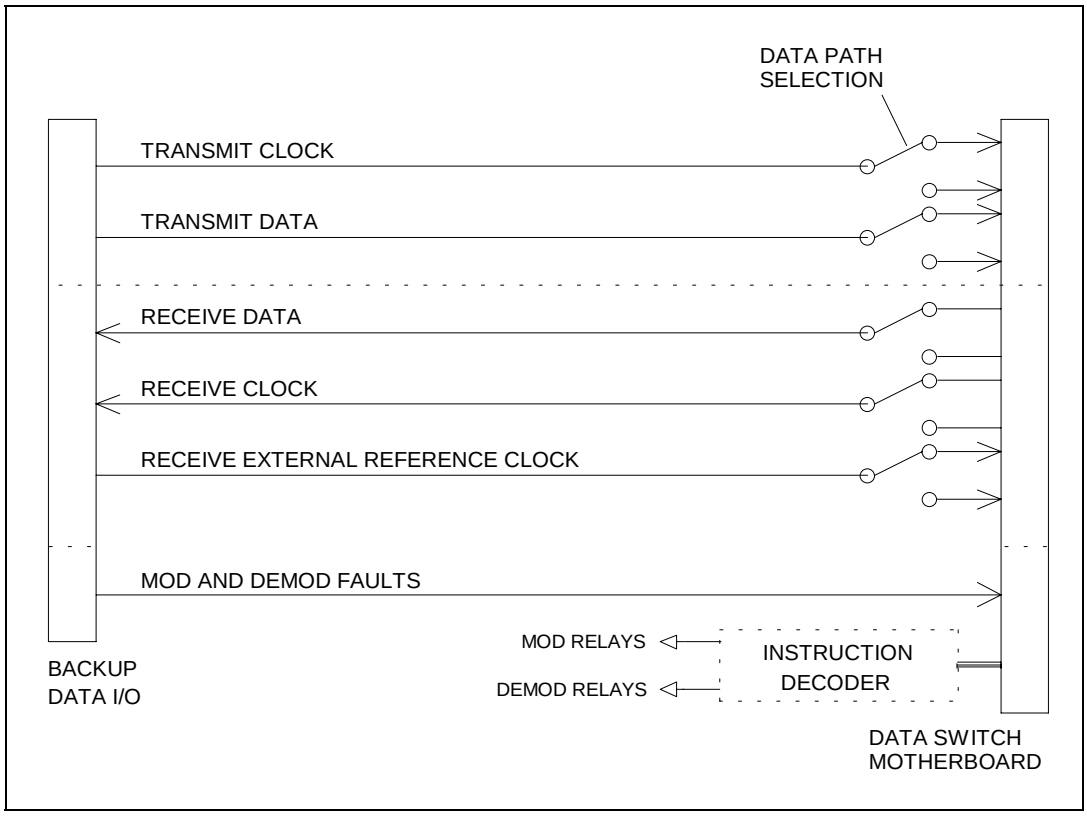

Figure 4-7. Backup V.35/RS-232 Interface Switch

4.6.4 DS-1 and G.703 Interface Switch

The DS-1 and G.703 interface switch module switches all interface signals by relay.

The prime interface switch module (Figure 4-8) that is most commonly used for DS-1 has two 15-pin female D connectors.

- Terminal equipment interface J1 (top) is a DCE interface.
- Prime modem interface J2 (bottom) is a DTE interface.

The backup interface switch module (Figure 4-9) has one 15-pin female D connector. The backup modem interface J1 is a DTE interface.

There are two optional G.703 interfaces with the following connectors:

- Two BNC connectors for SD and RD, each for the prime modem and terrestrial data connections, and a 15-pin female D connector for modem mod and demod faults. The backup has two BNC connectors for SD and RD, and a 15-pin female D connector for modem mod and demod faults.

- Two 25-pin female D connectors on the prime, and one on the backup.

The prime interface switch module can plug into any prime interface switch module slot (A1 through A8) on the left side of the lower rear panel. The backup interface switch module can plug into A9 or A10 (on the right side).

When the prime interface switch module (or the M:N switch itself) is powered down or in the default position, all signals are routed between the terminal equipment and the prime modem.

Modulator and/or demodulator signals can be independently switched to either of the two backup modem interface switch modules, if the independent mod/demod firmware is used. If modem switch firmware is used, then both the modulator and demodulator switch to the backup when either the prime modulator or demodulator indicates a fault.

A buffered set of transmit data (SD) and master clock (MC) signals is switched to the “hot standby” backup modulator or demodulator, or to the offline prime modulator and demodulator when a backup operation occurs.

The fault lines from the modem connector are routed through the interface switch modules to the M&C.

4.6.4.1 Specification

Circuits Supported	SD, RD, MC.
Switching Format	Modulator and demodulator signals switched individually with dry contacts.
Contact Arrangement	Modulator signals: 2 poles. Demodulator signals: 4 poles.

4.6.4.2 Connector Pinouts

The DS-1 and G.703 interface uses a 15-pin female D connector accessible from the switch rear panel.

Screw locks provide mechanical security for the mating connector.

Signal Function	Name	Pin #
Shields	-	2,4
Send Data	SD-A	1
SD-B	9	
Receive Data	RD-A	3
RD-B	11	
Master Clock	MC-A	7
MC-B	8	
Modulator Fault	MF	14
Demodulator Fault	DF	15

Note: MF and DF inputs are only on the prime and backup modem interface connectors, not the terrestrial data connector.

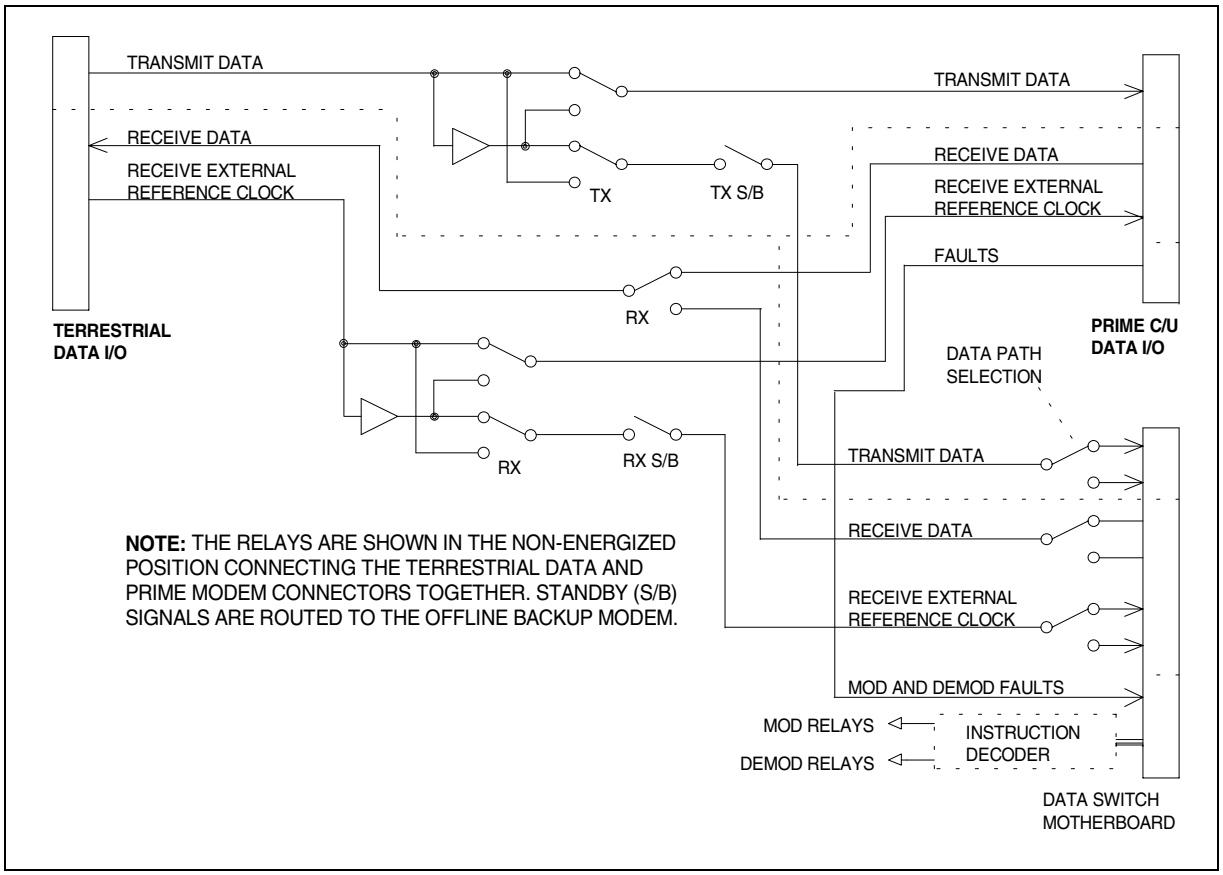

Figure 4-8. Prime DS-1 and G.703 Interface Switch

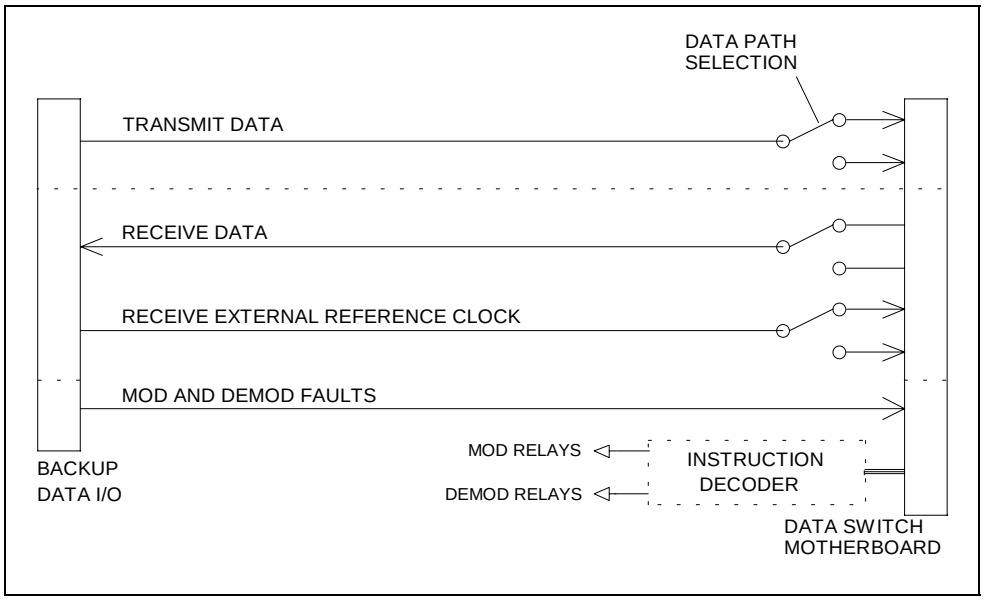

Figure 4-9. Backup DS-1 and G.703 Interface Switch

4.6.5 IDR Interface Switch

This section covers the 1:N AS/0895 prime and AS/0896 backup interfaces. Refer to Section 4.6.5 for information on the 2:N AS/1877 prime and AS/1879 backup interfaces.

The IDR interface switch module switches all interface signals by relay. The prime interface switch module (Figure 4-10) has two 50-pin female D connectors.

- Terminal equipment interface J1 (top) is a DCE interface.
- Prime modem interface J2 (bottom) is a DTE interface.

The backup interface switch module (Figure 4-11) has one 50-pin female D connector.

The backup modem interface J1 is a DTE interface.

The prime interface switch module can plug into any prime interface switch module slot (A1 through A8) on the left side of the lower rear panel.

Note: The AS/0896 backup interface switch module can only plug into slot A9.

When the prime interface switch module (or the M:N switch itself) is powered down or in the default position, all signals are routed between the terminal equipment and the prime modem.

Modulator and/or demodulator signals can be independently switched to the backup modem interface switch module, if the independent mod/demod firmware is used. If modem switch firmware is used, then both the modulator and demodulator switch to the backup when either the prime modulator or demodulator indicates a fault.

A buffered set of transmit data (SD) and reference clock (EXC) signals is switched to the “hot standby” backup modulator or demodulator, or to the offline prime modulator and demodulator when a backup operation occurs.

The fault lines from the modem connector are routed through the interface switch modules to the M&C.

Note: The Prime IDR 45MB Interface Switch has buffers for operation from 10 MB to 45 MB.

4.6.5.1 Specification

Circuits Supported	SD, RD, EXC, TXD, TXC, TXO, RXD, RXC, RXO, BWO 1-4, BWI 1-4, A1I, A1O, A2I, A2O, AND DEMOD FAULT.
Switching Format	All signals switched with dry contacts.
Contact Arrangement	Modulator signals: 16 poles. Demodulator signals: 26 poles. Ref. Clock: 2 poles. Spares: 2 poles. Demodulator signals: 26 poles. Ref. Clock: 2 poles. Spares: 2 poles.

4.6.5.2 Connector Pinouts

The IDR interface uses a 50-pin female D connector.

Screw locks provide mechanical security of the mating connector.

Signal Function	Name	Pin #
Ground	-	1, 2
Send Data	SD-A SD-B	34 18
Receive Data	RD-A RD-B	36 20
Reference Clock	EXC-A EXC-B	35 19
8 KBPS TX Data	TXD-A TXD-B	37 38
8 KHz TX Clock Out	TXC-A TXC-B	21 22
1 KHz TX Octet In	TXO-A TXO-B	4 5
8 KBPS RX Data	RXD-A RXD-B	39 40
8 KHz RX Clock Out	RXC-A RXC-B	23 24
1 KHz RX Octet Out	RXO-A RXO-B	6 7
Backward Alarm 1 Out	BWO1-C BWO1-NC BWO1-NO	8 25 41
Backward Alarm 2 Out	BWO2-C BWO2-NC BWO2-NO	9 26 42
Backward Alarm 3 Out	BWO3-C BWO3-NC BWO3-NO	10 27 43
Backward Alarm 4 Out	BWO4-C BWO4-NC BWO4-NO	11 28 44

Backward Alarm 1 In	BWI1	12
Backward Alarm 2 In	BWI2	13
Backward Alarm 3 In	BWI3	14
Backward Alarm 4 In	BWI4	15
ADPCM 1 Audio In	A1I-A A1I-B	45 29
ADPCM 1 Audio Out	A1O-A A1O-B	46 30
ADPCM 2 Audio In	A2I-A A2I-B	47 31
ADPCM 2 Audio Out	A2O-A A2O-B	48 32
Demod Fault Relay	DF-C DF-NO	16 50
Modulator Fault	MF	49
Demodulator Fault	DF	33
Deferred Maintenance Alarm	DMA	17

Note: MF and DF inputs are only on the prime and backup modem interface connectors, not on the terrestrial data connector.

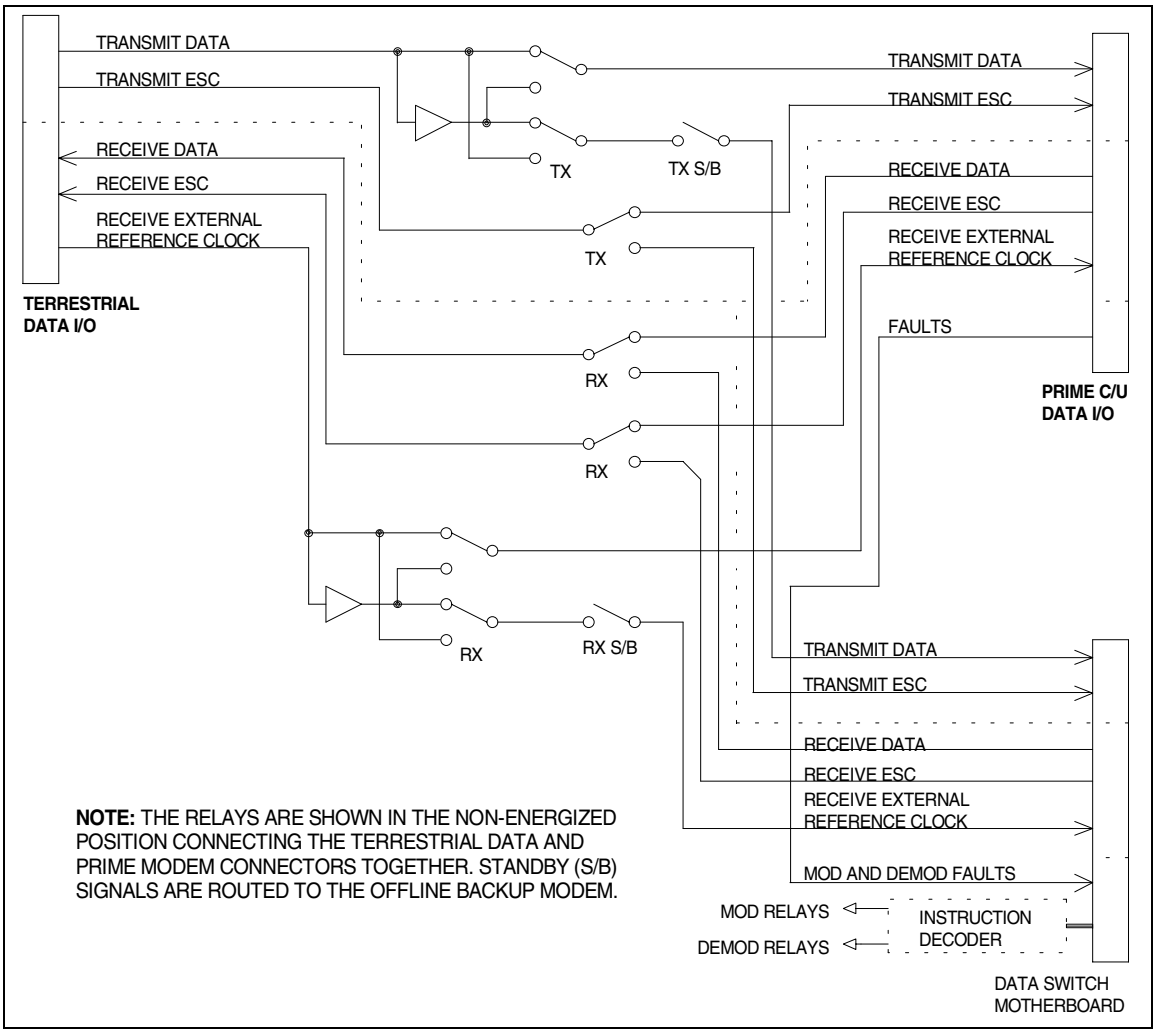

Figure 4-10. Prime IDR Interface Switch

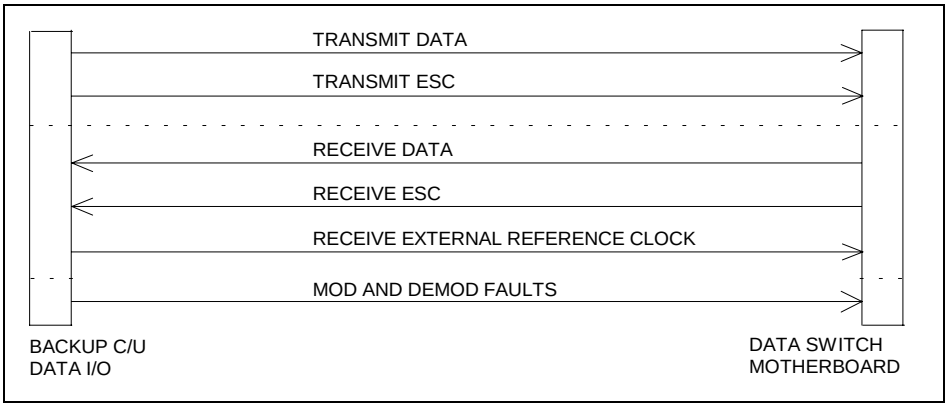

Figure 4-11. Backup IDR Interface Switch

4.6.6 2:N IDR Interface Switch (1877 and 1879)

The 2:N IDR interface switch module switches all interface signals by relay. The prime interface switch module (Figure 4-12) has two 50-pin female D connectors.

- Terminal equipment interface J1 (top) is a DCE interface.
- Prime modem interface J2 (bottom) is a DTE interface.

The backup interface switch module (Figure 4-13) has one 50-pin female D connector.

The backup modem interface J1 is a DTE interface.

Note: This interface module can only be used in the SMS-758 or SMS-658A. Also, this interface can not be used in conjunction with the AS/895 or AS/896 IDR Interface Switch modules.

The prime interface switch module can plug into any prime interface switch module slot (A1 through A8) on the left side of the lower rear panel. The backup interface switch module can plug into A9 or A10 (on the right side).

When the prime interface switch module (or the M:N switch itself) is powered down or in the default position, all signals are routed between the terminal equipment and the prime modem.

Modulator and/or demodulator signals can be independently switched to either of the two backup modem interface switch modules, if the independent mod/demod firmware is used. If modem switch firmware is used, then both the modulator and demodulator switch to the backup when either the prime modulator or demodulator indicates a fault.

A buffered set of transmit data (SD) and reference clock (EXC) signals is switched to the "hot standby" backup modulator or demodulator, or to the offline prime modulator and demodulator when a backup operation occurs. The fault lines from the modem connector are routed through the interface switch modules to the M&C.

4.6.6.1 Specification

Circuits Supported	SD, RD, EXC, TXD, TXC, TXO, RXD, RXC, RXO, BWO 1 through 4, BWI 1 through 4, A1I, A1O, A2I, A2O, DEMOD FAULT, DMA.
Switching Format	All signals switched with dry contacts.
Contact Arrangement	Modulator signals: 16 poles. Demodulator signals: 27 poles. Ref. Clock: 2 poles.

4.6.6.2 Operation

When configuring modem setup on the front panel, it is recommended to select #9 - IDR 2:N for the interface selection.

Note: The 1877 and 1879 interface will not work when #5 - IDR is selected in the modem setup configuration. This interface cannot be used in conjunction with any interface switch modules that only support 1 backup. These include the AS/0895 and AS/0896 IDR modules. Check the rear of the switch and verify that none of the interface switch modules are the AS/0895 or AS/0896 modules.

4.6.6.3 Connector Pinouts

The 2:N IDR interface uses a 50-pin female D connector.

Screw locks provide mechanical security of the mating connector.

Signal Function	Name	Pin #
Ground	-	1, 2
Send Data	SD-A SD-B	34 18
Receive Data	RD-A RD-B	36 20
Reference Clock	EXC-A EXC-B	35 19
8 KBPS TX Data	TXD-A TXD-B	37 38
8 KHz TX Clock Out	TXC-A TXC-B	21 22
1 KHz TX Octet In	TXO-A TXO-B	4 5
8 KBPS RX Data	RXD-A RXD-B	39 40
8 KHz RX Clock Out	RXC-A RXC-B	23 24
1 KHz RX Octet Out	RXO-A RXO-B	6 7
Backward Alarm 1 Out	BWO1-C BWO1-NC BWO1-NO	8 25 41
Backward Alarm 2 Out	BWO2-C BWO2-NC BWO2-NO	9 26 42
Backward Alarm 3 Out	BWO3-C BWO3-NC BWO3-NO	10 27 43
Backward Alarm 4 Out	BWO4-C BWO4-NC BWO4-NO	11 28 44
Backward Alarm 1 In	BWI1	12
Backward Alarm 2 In	BWI2	13

Backward Alarm 3 In	BWI3	14
Backward Alarm 4 In	BWI4	15
ADPCM 1 Audio In	A1I-A A1I-B	45 29
ADPCM 1 Audio Out	A1O-A A1O-B	46 30
ADPCM 2 Audio In	A2I-A A2I-B	47 31
ADPCM 2 Audio Out	A2O-A A2O-B	48 32
Demod Fault Relay	DF-C DF-NO	16 50
Modulator Fault	MF	49
Demodulator Fault	DF	33
Deferred Maintenance Alarm	DMA	17

Note: MF and DF inputs are only on the prime and backup modem interface connectors, not on the terrestrial data connector.

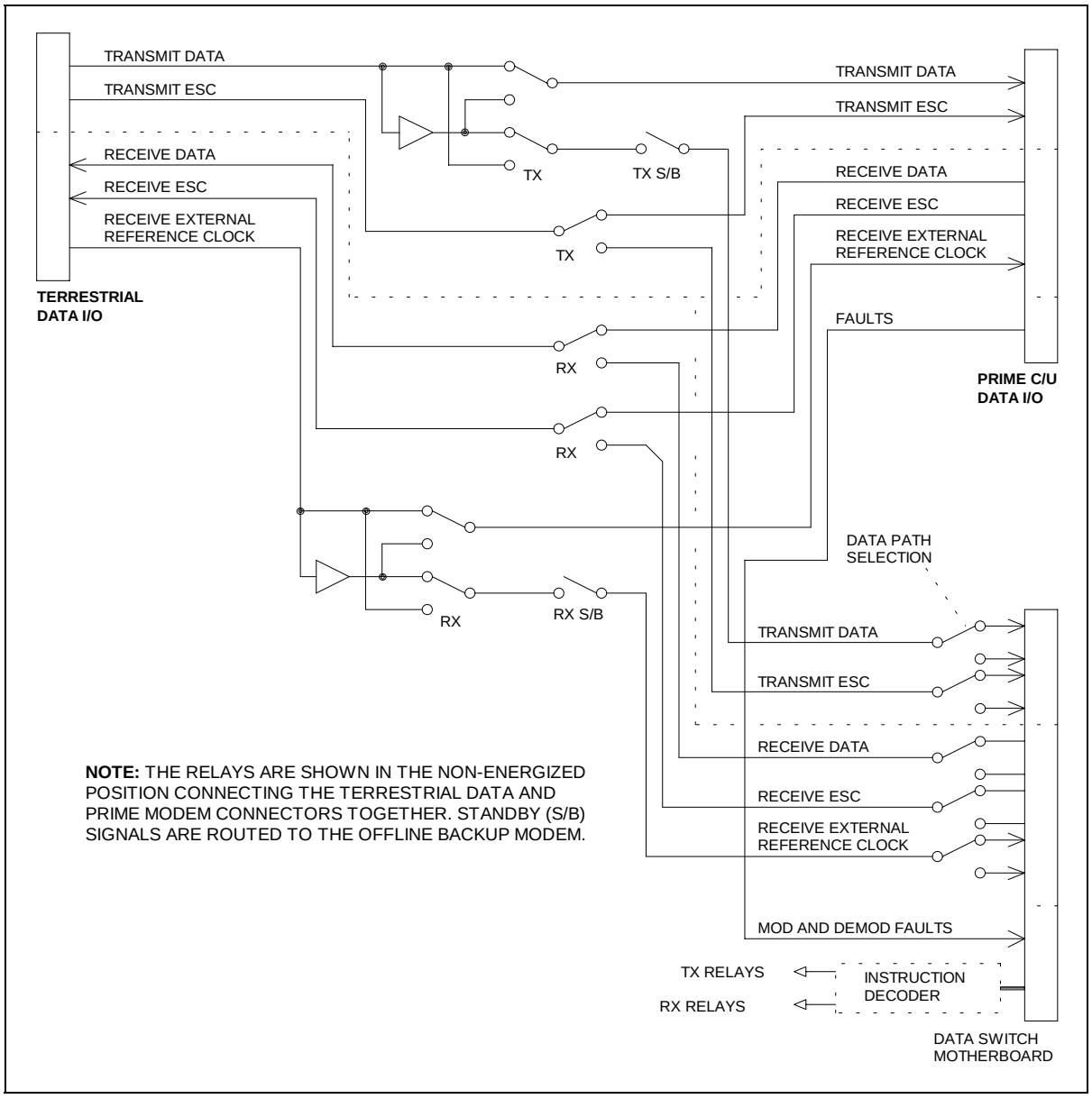

Figure 4-12. Prime 2:N IDR Interface Switch (1877)

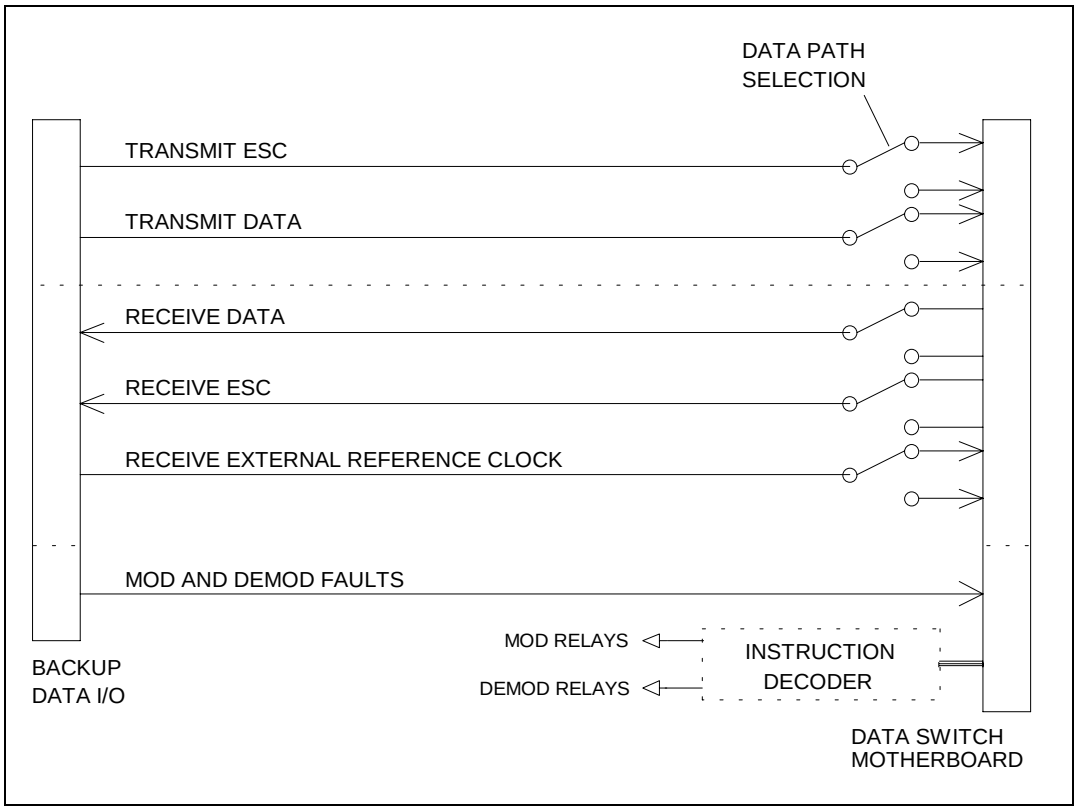

Figure 4-13. Backup 2:N IDR Interface Switch (1879)

4.6.7 2:N IBS/ASYNC Interface Switch (1694 and 1695)

The 2:N IBS/ASYNC interface switch module switches all interface signals by relay. The prime interface switch module (Figure 4-14) has two 50-pin female D connectors.

- Terminal equipment interface J1 (top) is a DCE interface.
- Prime modem interface J2 (bottom) is a DTE interface.

The backup interface switch module (Figure 4-15) has one 50-pin female D connector.

- The backup modem interface J1 is a DTE interface.

The prime interface switch module can plug into any of the interface switch module slots (A1 through A8) on the left side of the lower rear panel. The backup interface can plug into either A9 or A10.

Note: This interface module can only be used in the SMS-758 or SMS-658A. Also, this interface cannot be used in conjunction with the AS/0895 or AS/0896 1:N IDR Interface Switch modules.

When the prime interface switch module (or the M:N switch itself) is powered down or in the default position, all signals are routed between the terminal equipment and the prime modem.

Modulator and/or demodulator signals can be independently switched to either of the two backup modem interface switch modules, if the independent mod/demod firmware is used. If modem switch firmware is used, then both the modulator and demodulator switch to the backup when either the prime modulator or demodulator indicates a fault.

A buffered set of transmit data (SD) or transmit clock (SCTE) and reference clock (EXC) signals is switched to the “hot standby” backup modulator or demodulator, or to the offline prime modulator and demodulator when a backup operation occurs.

The fault lines from the modem connector are routed through the interface switch modules to the M&C.

4.6.7.1 Specification

Circuits Supported	SD, RD, EXC, SCTE, RXD, SCR, SCT, TXD PRIMARY FAULT, SECONDARY FAULT, RTS, CTS, RLSD, RR, DSR.
Switching Format	All signals switched with dry contacts.
Contact Arrangement	Modulator signals: 12 poles. Demodulator signals: 18 poles. Ref. Clock: 2 poles.

4.6.7.2 Operation

When configuring the modem setup on the front panel, use the terrestrial type (G.703 15-pin D, V.35 34-pin, RS-422 37-pin D) for the interface selection. Refer to Figures 4-16 and 4-17 for diagrams, and Tables 4-7 and 4-8 for jumper tables describing how to set the jumpers for using each interface type.

Note: This interface cannot be used in conjunction with any Interface switch modules that only support 1 backup. These include the AS/0895 and AS/0896 IDR modules. Please check the rear of the switch and verify none of the interface switch modules are the AS/0895 or AS/0896 assembly.

4.6.7.3 Connector Pinouts

The 2:N IBS interface uses a 50-pin female D connector. Screw locks provide mechanical security of the mating connector.

Signal Function	Name	Pin #
Ground	GND	1, 2
T1/E1 Send Data	T1E1_SD-A T1E1_SD-B	34 18
T1/E1 Receive Data	T1E1_RD-A T1E1_RD-B	36 20
External Clock IN	EXC-A EXC-B	35 19
RS422/V.35 Send Data	SD-A SD-B	37 38
RS422/V.35 Receive Data	RD-A RD-B	39 40
ESC TX Data	TXESCDAT	5
ESC RX Data	RXESCDAT	7
RS422/V.35 Receive Timing	SCR/RTA SCR/RTB	23 24
RS422/V.35 Transmit Timing	SCT/STA SCT/STB	21 22
RS422/V.35 Terminal Timing	SCTE/TTA SCTE/TTB	12 13
RS422 Transmit Octet	R422TXOA R422TXOB	14 15
RS422 Receive Octet	R422RXOA R422RXOB	8 9
RS422/V.35 Request to Send	RTSA RTSB	45 29
V.35 Data Set Ready	V.35_DSR	41
RS422/V.35 Clear To Send	CTSA CTSB	47 31
RS422/V.35 Data Set Ready	DSR/DMA DSR/DMB	48 32
RS422/V.35 Receiver Ready	RR/RLSDA RR/RLSDB	46 30

Primary Alarm Out	PRI_COM PRI_NO PRI_NC	10 43 27
Secondary Alarm Out	SEC_COM SEC_CO SEC_NO	11 44 28
Modulator Fault	MF	49
Demodulator Fault	DF	33

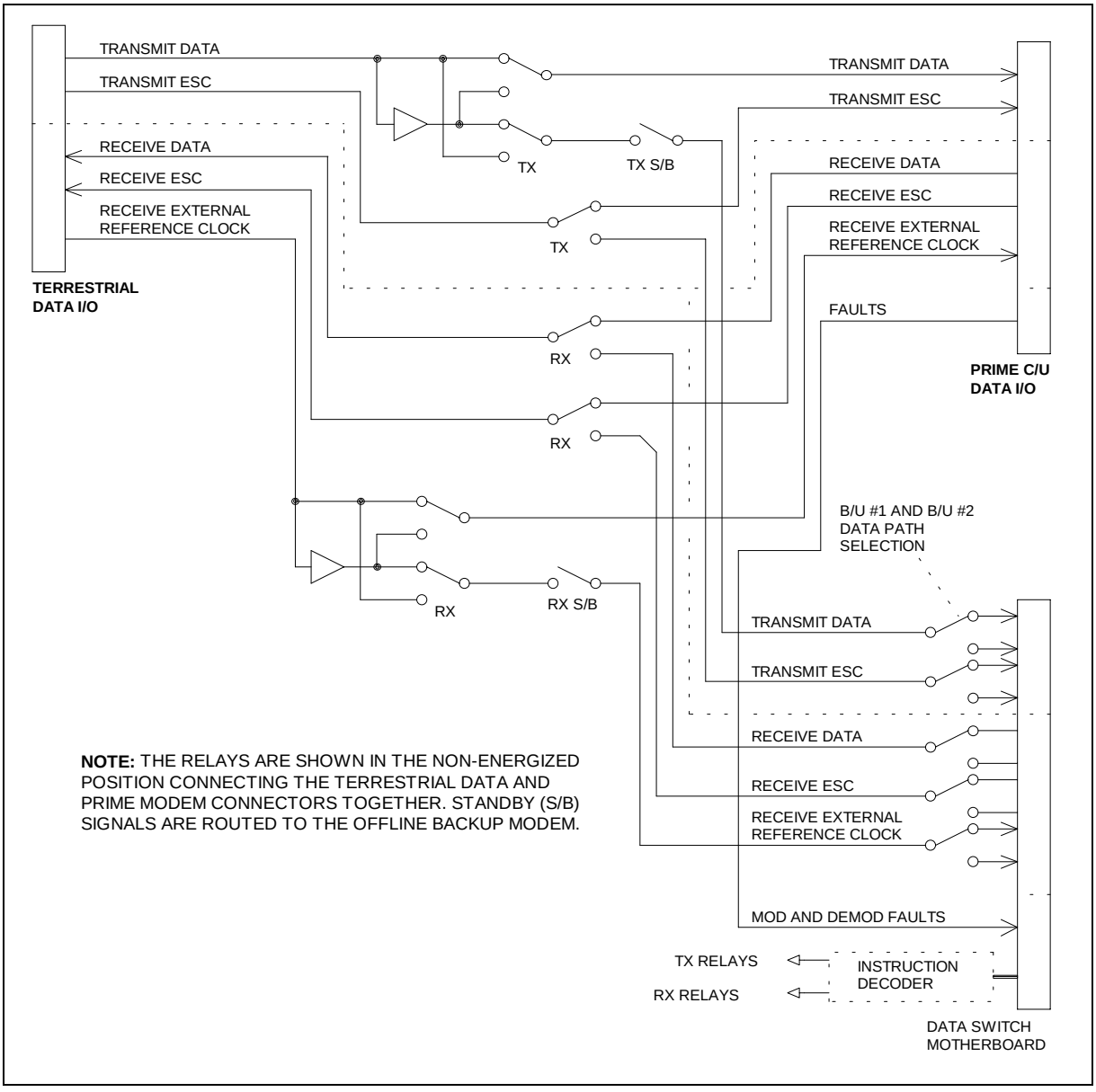

Figure 4-14. Prime 2:N IBS Interface Switch (1695)

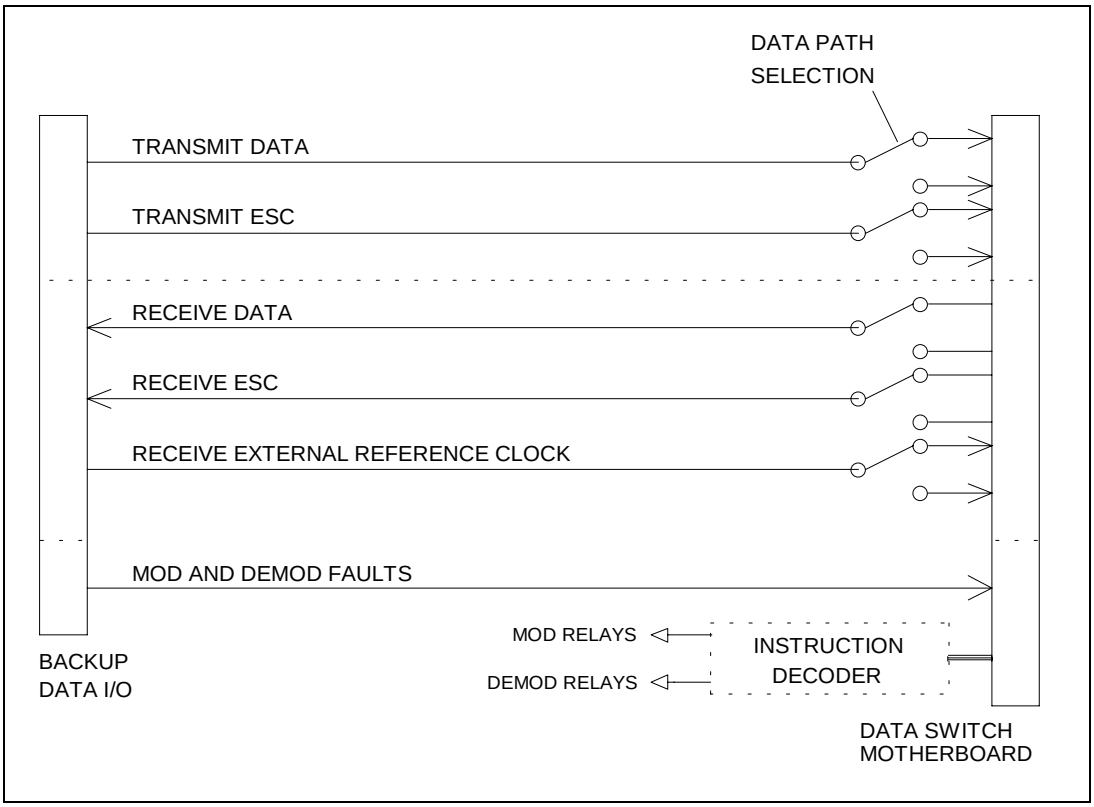

Figure 4-15. Backup 2:N IBS Interface Switch (1694)

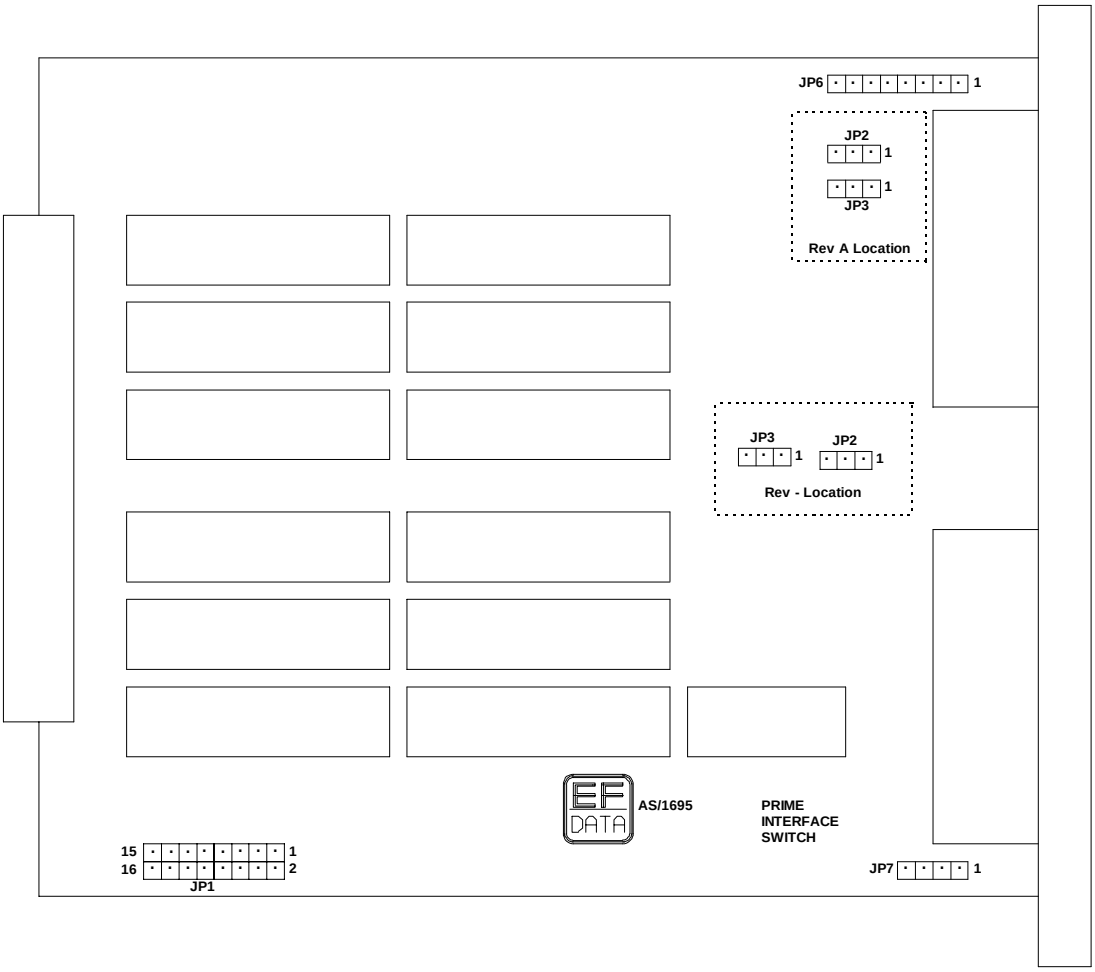

Figure 4-16. Prime IBS Jumper Diagram

Table 4-7. Prime IBS Jumpers

Operation	Jumper	Pins	Comments
Normal	JP1	5 through 6 7 through 8 13 through 14 15 through 16	Independent RST and CTS
Special	JP1	1 through 2 3 through 4 9 through 10 11 through 12	CTS, tied to RTS, TXD of ESC on CTS lines
V.35, RS-422	JP2 and JP3	1 thorugh 2	
G.703	JP2 and JP3	2 through 3	
V.35, RS-422	JP6	Remove all jumpers	
G.703	JP6	1 through 2 3 through 4 5 through 6 7 through 8	
V.35, RS-422	JP7	Remove all jumpers	
G.703	JP7	1 through 2 3 through 4	

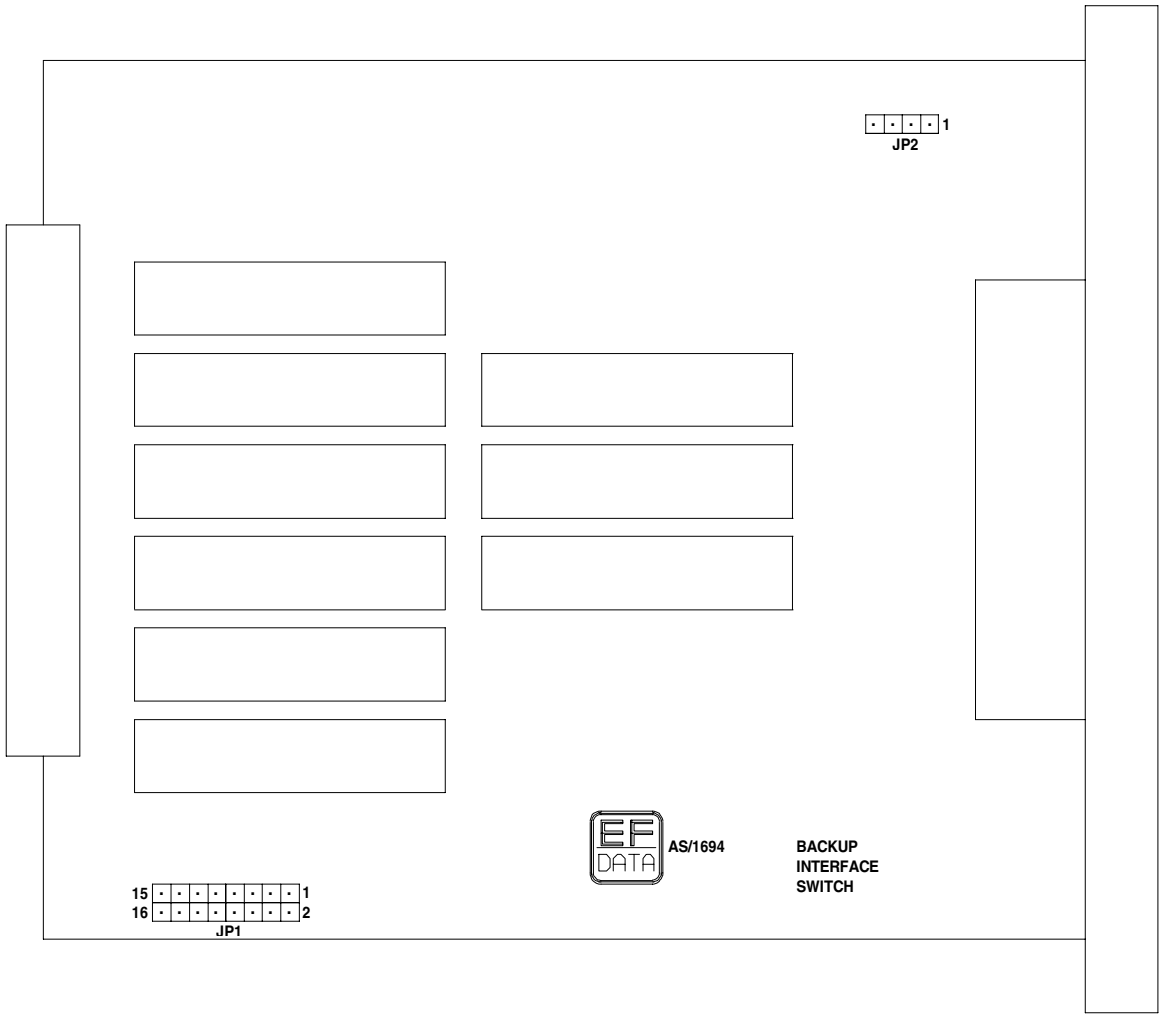

Figure 4-17. Backup IBS Jumper Diagram

Table 4-8. Backup IBS Jumpers

Operation	Jumper	Pins	Comments
Normal	JP1	5 through 6 7 through 8 13 through 14 15 through 16	Independent RST and CTS
Special	JP1	1 through 2 3 through 4 9 through 10 11 through 12	CTS, tied to RTS, TXD of ESC on CTS lines
G.703	JP2	1 through 2 3 through 4	
RS-422, V.35	JP2	No connections No connections	

4.7 Address Decoder/Driver

The address decoder/driver is a 10.5" x 3.5" module (Figure 4-18) that fits in slot 4 of the front upper section of the switch chassis. Its functions include address decoding of the external address bus, external data bus buffering, serial communications interface, modem fault interface, and fault outputs.

4.7.1 Specifications

Address Decoding	2K bytes of address bus decoded to 24 discrete channels.	
Data Bus Buffering	8 bits to all peripheral devices.	
Communication Interface	Remote interface:	RS-485 or RS-232C. 255 addresses, 110 to 9600 baud.
	Relay-remote interface:	4 lines (parallel).
	Modem Control Interface:	RS-485. 255 addresses, 9600 baud. (Dual ACIAs on the AS/1048 module enable simultaneous communication on both Remote and Modem control interfaces.)
Modem Fault Interface	10 lines for muxed modulator and demodulator faults.	
Fault Outputs	Controller Fault: System Fault: Demod Signal Fault:	Form C. Form C. Form C.

4.7.2 Theory of Operation

The address decoder/driver interfaces the M&C data bus, address bus, control lines, and serial interface. Addresses of the peripheral devices, both on and off of this board, are latched and decoded to select each device. The data bus is bidirectionally buffered to and from the M&C board. The data bus and decoded address lines are buffered off this board as output to the other modules.

The address decoder/driver formats the serial data communication to and from the M&C. All interface drivers and receivers for external communication are on this module.

The fault lines from the interface switch modules are routed to this board. The M&C reads the faults at regular intervals to update its own registers.

The M:N summary, demodulator signal, and controller fault relays are on this board. The M:N summary and demodulator signal fault relays are controlled by the M&C directly. The controller fault is controlled by a "watchdog" timer. The "watchdog" timer must be reset at regular intervals by the M&C, or the controller fault will set.

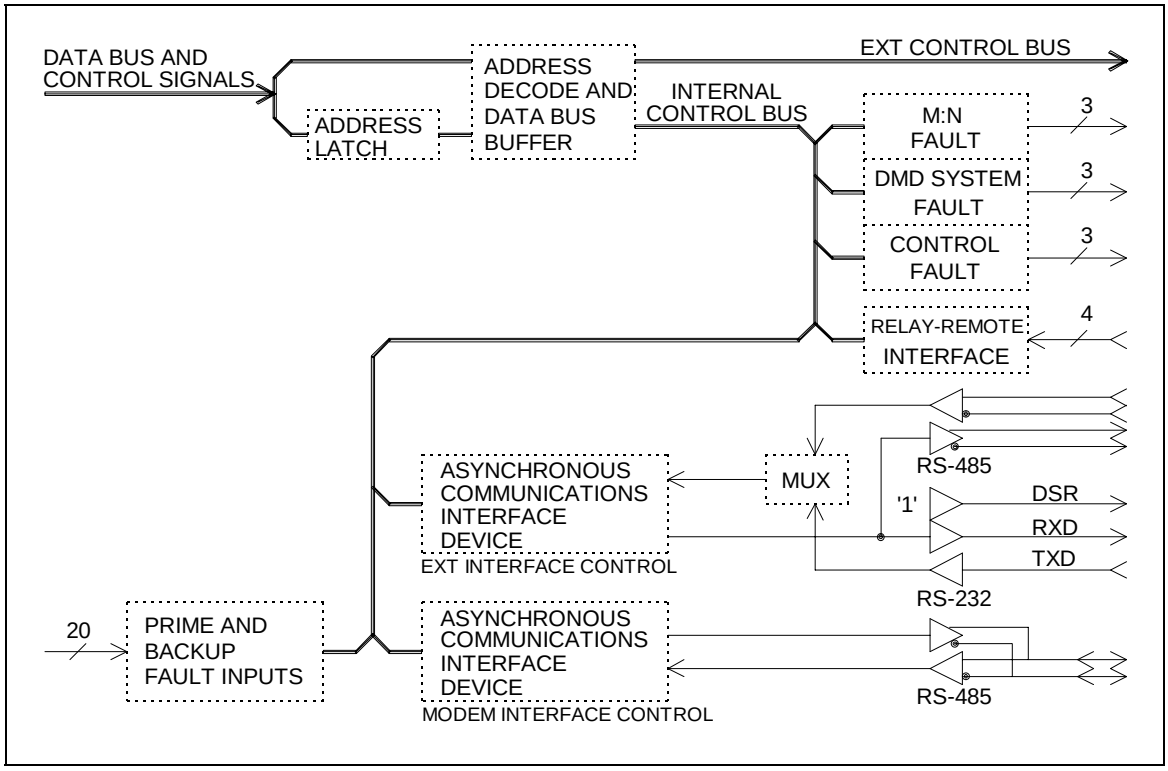

Figure 4-18. Address Decoder Driver (AS/1048)

4.8 IF Switch Driver

The IF switch driver (Figure 4-19) is a 10.5” x 3.5” module that fits in slot 3 of the upper front section of the switch chassis. It controls activation of the baseball switches on the IF switch card. Refer to Figure 4-20 for a block diagram of the IF switch driver board.

4.8.1 Specifications

Power source	+5V +12V

4.8.2 Theory of Operation

The M&C uses the address decoder/driver with an 8-bit data bus and 1 device select line to control the switch driver. The switch driver decodes commands from the M&C card, and activates the appropriate baseball switches on the IF switch accordingly.

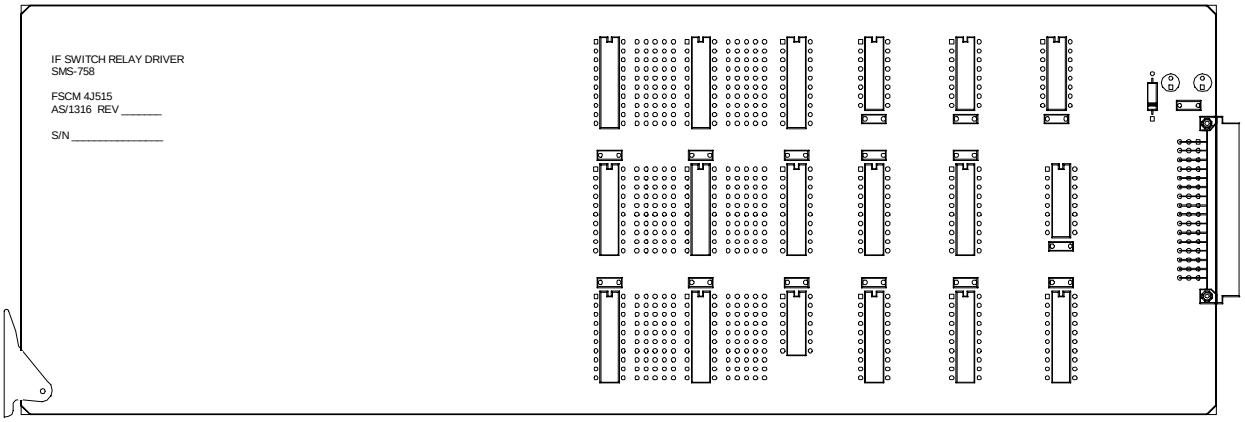

Figure 4-19. Switch Driver Board

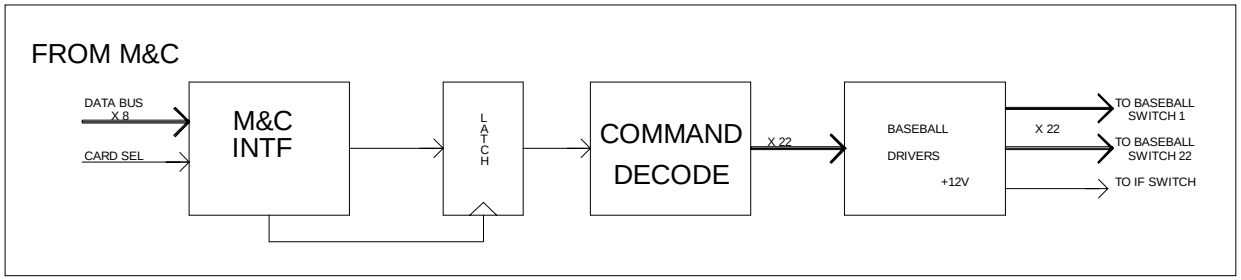

Figure 4-20. IF Switch Driver Block Diagram

4.9 IF Switch

The IF switch is a 14" x 5" module that fits in the upper rear section of the switch chassis. The IF switch isolates the backup modulator's IF outputs, and connects the backup modulator's output in place of any of the prime modulators when a fault is detected. The IF switch also connects the IF backup demodulator's inputs to one of the downlink inputs. Refer to Figure 4-21 for a block diagram of the IF switch board.

4.9.1 Specifications

Power source	+12V
Isolation	>60 dB
Balance	± 0.25 dB
Loss	<1 dB

4.9.2 Theory of Operation

The IF switch contains 22 baseball switches that comprise the IF switching matrix. Each baseball switch is controlled separately by the M&C card via the switch driver card.

The modulator section of the switching matrix contains 16 of the switches that control the backup modulator outputs, to switch to any of the eight prime modulator outputs if a fault is detected by the M&C card. The operator can also manually select a backup modulator to switch in for any of the prime modulators via the front panel (refer to Section 3.2.5.3).

The demodulator section of the switching matrix contains the remaining six switches. They connect the IF backup demodulator inputs to any of four or seven downlink inputs for use when any of the prime demodulators are faulted. The operator can also manually select a backup demodulator to be online for any of the prime demodulators via the front panel.

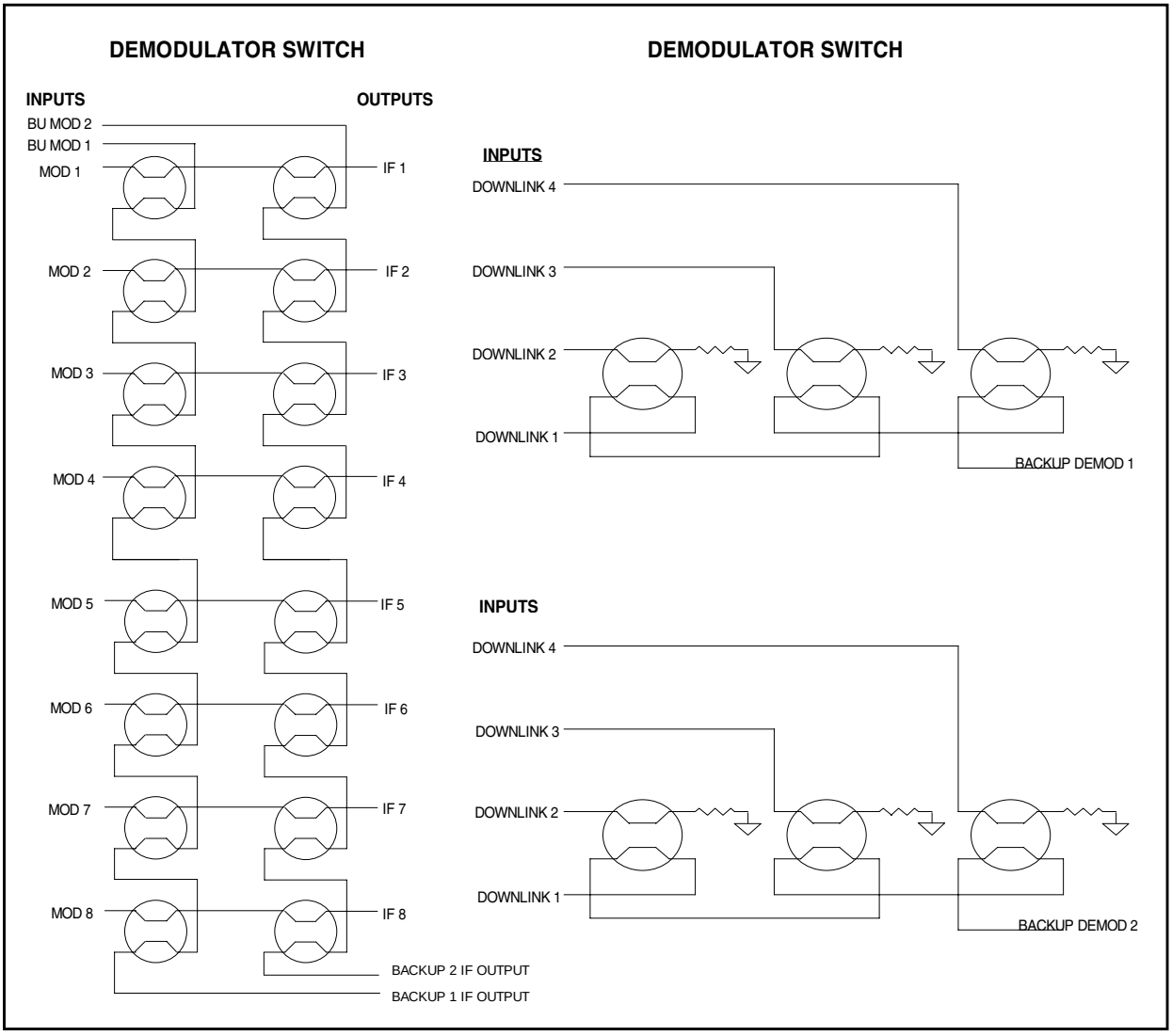

Figure 4-21. IF Switch Block Diagram

4.10 Online Telemetry

The online telemetry (Figure 4-22) is a 10.5” x 3.5” module that fits in slot 6 of the upper front section of the switch chassis. It reports the online status of each prime modulator and demodulator. Refer to Figure 4-23 for a block diagram of the online telemetry module.

4.10.1 Specifications

Number of Channels	8 modulator and 8 demodulator.
Switching Format	Form C contacts.

4.10.2 Theory of Operation

The M&C controls the online telemetry module through the address decoder/driver with an 8-bit data bus and 2 device select lines. Sixteen SPDT relays (Form C) can be switched to indicate the online status of eight prime modulators and eight prime demodulators.

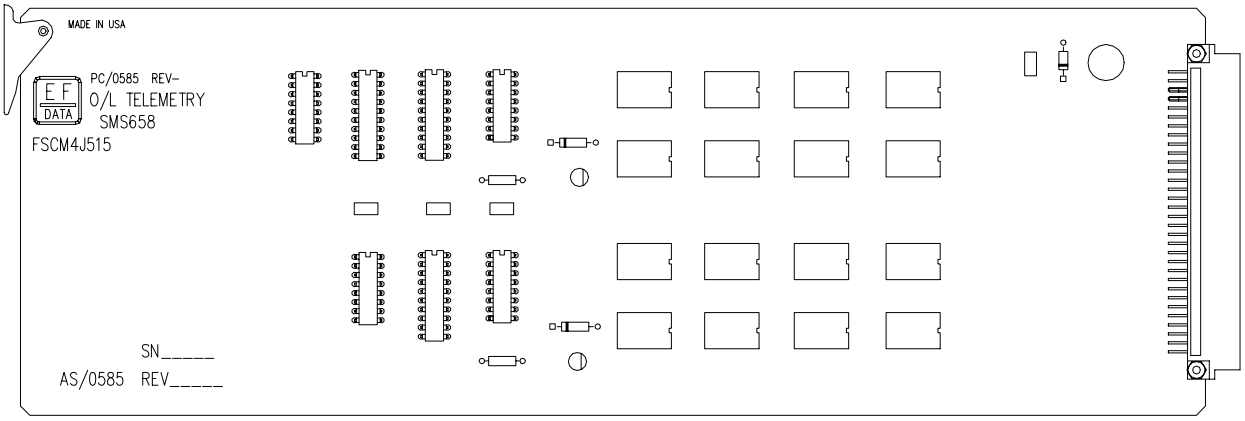

Figure 4-22. Online Telemetry

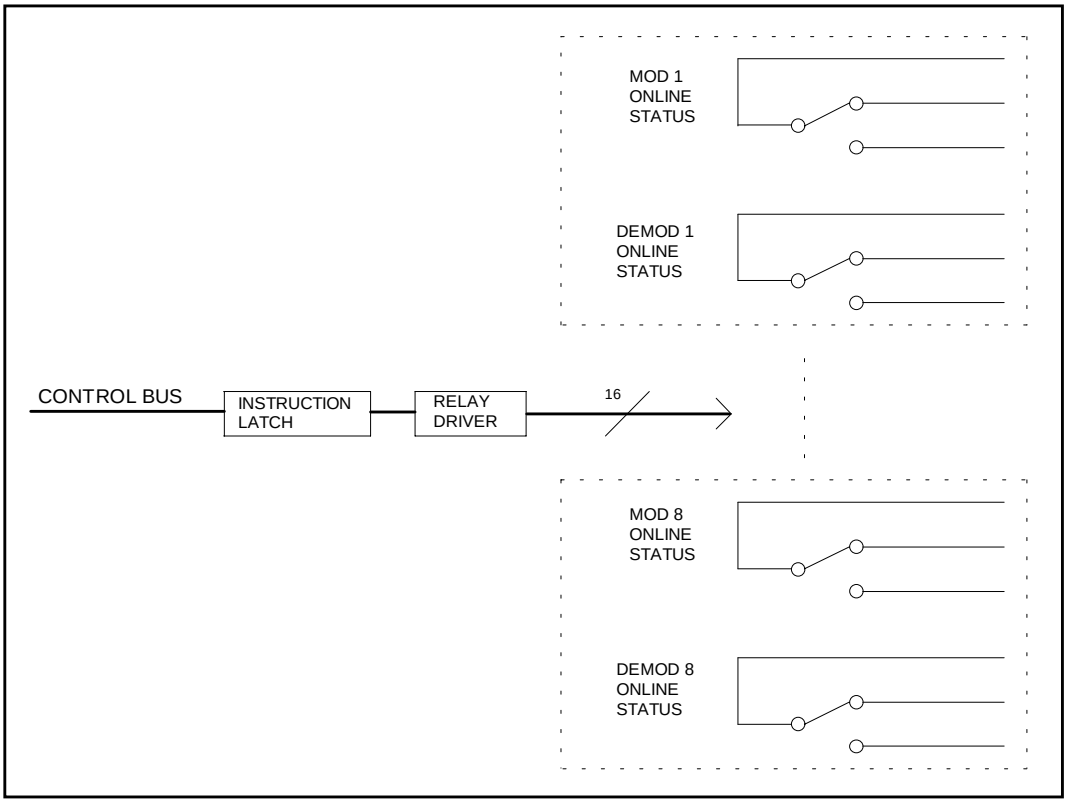

Figure 4-23. Online Telemetry Block Diagram

4.11 Power Supply

The power supply modules fit in slots 1 or 7 of the upper front section of the switch chassis.

In slot 7, the supply is inverted.

The supplies are enclosed in a 10.5” x 3.5” x 2.5” metal frame that encloses the power supply assembly, provides power switch access, and secures in the chassis.

To turn ON the power supply, press the switch toward the “1” symbol on the front of the frame, or so the red part of the switch is visible.

The switch is fully functional with only one power supply turned ON, but an M:N fault will indicate that the other power supply is faulted.

The frame can accommodate many different manufacturer’s power supplies, thus providing for different power input specifications.

4.11.1 Specifications

120 VAC and 220 VAC Operation	
Input voltage	90 to 264 VAC. Automatic selection for 110 or 220 V operation.
Input Frequency	47 to 63 Hz.
Output Voltages and Current Capacity	+5V at 5A, +12V at 0.5A, -12V at 0.5A.

-48 VDC Operation is optional, and specifications will be provided upon request.

Chapter 5. MAINTENANCE

5.1 Fault Descriptions

The FAULT menu, [NEXT], and [PREV] keys allow the operator to determine the cause of any switch faults indicated by a red LED.

The following sections describe the faults and their probable causes.

5.1.1 Modulator Operation Fault

A MOD fault occurs when a modulator backup operation fails. The cause of the failure can be one of the following:

- More failed modulators than available backups.
- No compatible backup available.
- All backups in use and/or faulted.

5.1.2 Demodulator Operation Fault

A DEMOD fault occurs when a demodulator backup operation fails. The cause of the failure can be one of the following:

- More failed demodulators than available backups.
- No compatible backup available.
- All backups in use.
- All demodulators on a downlink faulted.

5.1.3 M:N Faults

An M:N fault occurs when a communication, configuration, setup, and/or power supply failure occurs. The cause of the failure can be one of the following:

- Modem communication failure due to incorrect:
  - Address
  - Baud rate
  - Parity
  - Interface connection.
- Failure to verify configuration data.
- Missing configuration data.
- A backup modulator or demodulator that is not compatible with any prime.
- A prime modulator or demodulator that is not compatible with any backup.
- A missing modem address specification.
- A missing modem interface specification.
- A missing demodulator downlink specification.
- High or low +12V power supply.
- High or low -12V power supply.
- High or low +5V power supply.
- One of the power supplies is turned OFF or is inoperable.

5.1.4 Battery Faults

A BATTERY fault LED indicates that an M&C battery failure has occurred. A low battery alarm indicates that the battery voltage is below its specified level, and that the battery should be recharged or replaced. It does not necessarily indicate that memory data will be lost if power is turned OFF, but it does indicate that data in the memory is suspect, and should be checked.

After the battery is recharged or replaced, the switch may need to be reconfigured.

5.2 Fault Isolation

The following tables list the procedures for clearing fault indications in the fault menu or the remote interface (remote interface messages are listed in parentheses).

The tables list the fault messages on the left and the procedures on the right. To clear the fault or to determine why the fault remains, be sure to perform the steps in the order listed.

5.2.1 Modulator Operation

Faults	Procedures
BK-UP FAULT MOD X (MOF_BU_OP_FLT_x)	If no M:N faults exist: Verify that the switch is in AUTO mode. Verify that a backup modulator is available to backup all of the faulted prime modulators. Verify that the data cable between the switch and the modem is connected to the correct connectors. If an M:N fault exists: Check M:N faults for communication, configuration, and compatibility faults. If there are faulted primes that are not backed up, the modulator operation fault display will remain ON.

5.2.2 Demodulator Operation

Faults	Procedures
BK-UP FAULT DMD X (DOF_BU_OP_FLT_x)	If no M:N faults exist: Verify that the switch is in AUTO mode. Verify that a backup demodulator is available to backup all of the faulted prime demodulators. Verify that the data cable between the switch and the modem is connected to the correct connectors. Verify that the IF cable between the switch demodulator output and the modem IF input is connected to the correct connectors. If an M:N fault exists: Check M:N faults for communication, configuration, and compatibility faults.
ALL DMDS D/L X FAULTED (DL_FLT_y)	Verify that the downlink assignments for the demodulator are programmed in the modem configuration and properly connected behind the patch panel. Verify that the IF cables between the switch demodulator outputs and the modem IF inputs are connected to the correct connectors. Verify that the IF cables between the down converter equipment and the switch downlink inputs are connected to the correct connectors. If there are faulted primes that are not backed up, or the downlink signal is interrupted, the demodulator operation fault display will remain ON.

5.2.3 M:N Operation

Faults	Procedures
MODEM (B)X COMM FAILURE (COM_FLT_(B)x)	Verify that the modem baud rate is set to 9600. Verify that the modem interface type is RS-485. Verify that the modem parity is even. Verify that the modem address is correctly entered in the switch system configuration. Verify that the modem control interface cable between the switch and modems is connected to the correct connectors. Verify that the M&C in the switch is set to RS-232.
CONFIG VERIFY ERROR M (or D) (B)X (MOD_CONFIG_FLT_(B)x) (DMD_CONFIG_FLT_(B)x)	Check the configuration of the indicated modem. If modem configuration has been changed, update configuration data in switch memory.
PRIME (or BK-UP) M (or D) X NOT COMPATIBLE (MOD_COMPAT_FLT_(B)x) (DMD_COMPAT_FLT_(B)x)	Check the Data Rate/Code Rate of the indicated modem, and verify that the utility menu data in the switch corresponds to the modem setting. If not, update the utility menu. Check the selected modem. Verify that the interface type selected in the modem setup menu is compatible with the backup (or prime) modem.
NO ADDRESS FOR PRIME (or BK-UP) X (NO_ADX_(B)x)	Enter the address for the indicated modem in the system setup menu of the switch.
NO INTERFACE FOR PRIME (or BK-UP) X (NO_INTFC_(B)x)	Enter the interface type for the indicated modem in the modem setup menu of the switch.
NO D/L FOR DMD X (NO_DL_x)	Enter the downlink assignment for the indicated demodulator in the modem setup menu.
NO CONFIG FOR PRIME (or BK-UP) M (or D) X (NO_MOD_CONFIG_(B)x) (NO_DMD_CONFIG_(B)x)	Load the configuration for the indicated modem in the configuration menu.
+12V FAILURE, -12V FAILURE, +5V FAILURE (+12V_FLT, -12V_FLT, +5V_FLT)	Check the power supplies and modules for proper insertion into the motherboard connectors. The voltage limit comparators are not user adjustable. Consult the factory if the voltage failure alarm continues to be displayed.
POWER SUPPLY 1 (or 2) FAULT (PS_1(2)_FLT)	Check the power supplies for proper insertion into the motherboard connector. Verify that the power switch on the indicated power is in the ON position. Verify that the power cord for the indicated power supply is plugged into the chassis. Check the fuse of the indicated power supply. The power supplies are not user serviceable. Contact EFData if a power supply failure is suspected.

5.2.4 Battery

Faults	Procedures
M&C BATTERY FAULT (M&C_BAT_FLT)	Check the position of the internal battery jumper on the M&C board. Check the battery for bent or displaced leads. The NiCad battery on the M&C board is rechargeable and may require up to 48 hrs. to fully charge.

5.3 Module Replacement

Most modules in the switch are designed for easy replacement.

Before removing or inserting any module, turn OFF both power supplies. This equipment contains parts and assemblies sensitive to damage by ESD. Use ESD precautionary procedures when touching, removing, or inserting printed circuit boards.

Note: All digital and IF signals will be routed to the prime modems when the switch power is OFF. If any prime modem(s) is faulted and backed up, then the backup modulator and/or demodulator will go offline, possibly interrupting service when power is lost.

The following sections describe the procedure for removal and replacement of the modules. Refer to Figure 1-3 for module locations.

5.3.1 Power Supply

The power supply modules are located in the upper front section of the switch, in slots 1 and 7.

1. Turn OFF the power switch. The second power supply can remain ON.
2. Each power supply module is secured in the chassis with one #6 screw. Remove the screw, and pull the handle on the front of the module to remove the power supply.
3. Insert the new power supply in the slot (invert the power supply for slot 7), and press it in place until fully seated.
4. Install the #6 screw to secure the power supply in place.
5. Turn ON power switch.

5.3.2 IF Switch

The IF switch module is located in the upper rear section of the switch.

1. Turn OFF both power supplies.
2. Remove all hex nuts on the rear of the switch.
3. Remove the upper two screws that hold the upper section to the side panels.
4. Loosen the lower two screws on the upper section to allow the section to rotate.
5. Disconnect the cable to J29 on the IF switch module.
6. Carefully remove the module from the inside of the upper rear section.

5.3.3 Switch Driver

The switch driver module is located in slot 3 of the upper front section of the switch.

1. Turn OFF both power supplies.
2. Rotate the card ejector to extract the module.

5.3.4 Address Decoder/Driver

The address decoder/driver module is located in slot 4 of the upper front section of the switch.

1. Turn OFF both power supplies.
2. Rotate the card ejector to extract the module.

5.3.5 M&C

The M&C module is located in slot 5 of the upper front section of the switch.

1. Turn OFF both power supplies.
2. Disconnect the front panel ribbon connector from the M&C module.
3. Rotate the card ejector to extract the module.

If the battery switch (JP6) is OFF, the switch may require that the setup and configuration procedures be repeated.

If the battery switch is ON, the configuration of the switch will be maintained and can be transferred to another switch.

5.3.6 Online Telemetry

The online telemetry module is located in slot 6 of the upper front section of the switch.

1. Turn OFF both power supplies.
2. Rotate the card ejector to extract the module.

5.3.7 Interface Switches

The interface switch modules are located in slots A1 through A10 of the lower rear section of the switch.

1. Turn OFF both power supplies.
2. Unscrew the two captive fasteners, and pull the module out of its slot.

5.4 Repacking for Shipment

5.4.1 Return Instructions

Refer to the preface for more information.

5.4.2 Repacking Instructions

The switch and manual are shipped packaged in pre-formed reusable foam inside a cardboard carton. Any subsequent shipment of the switch must be done in the original carton or other suitable container to maintain the warranty.

Refer to the following procedure for repacking instructions:

1. Place the switch in the original cardboard carton.

2. Place the foam packing material around the switch.

3. Check the equipment against the packing list to be shipped with the equipment to ensure that the shipment is complete. Include both power cords, but do not include the manual with the shipment.

4. Tape the top seams of the carton.

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Appendix A. REMOTE CONTROL OPERATION: MODEM SWITCH

This appendix defines the protocol and command structure for the "modem switch" style of remote control and status monitoring of the EFData SMS-758 switch. With modem switch software, when the switch detects either a modulator or demodulator failure on the prime modem, both the modulator and demodulator functions will be switched to the backup modem.

- Firmware number: FW/0713-33J
- Software version: 5.10

A.1 General

Remote controls and status information are transferred via an RS-485 (optional RS-232C) serial communications link. For RS-232C communication, switch SP1-5 on the M&C module must be turned ON.

Commands and data are transferred on the remote control communications link as US ASCII-encoded character strings.

The remote communications link is operated in a half-duplex mode. Communications on the remote link are initiated by a remote controller or terminal.

The switch never transmits data on the link unless it is commanded to do so.

A.2 Message Structure

The ASCII character format used requires 11 bits/character:

- 1 start bit
- 7 information bits
- 1 parity bit (odd/even)
- 2 stop bits

Messages on the remote link fall into the categories of commands and responses. Commands are messages which are transmitted to a satellite modem switch, while responses are messages returned by a satellite modem switch in response to a command.

The general message structure is as follows:

- Start Character
- Device Address
- Command/Response
- End of Message Character

A.2.1 Start Character

A single character precedes all messages transmitted on the remote link. This character flags the start of a message. This character is:

- "<" for commands
- ">" for responses

A.2.2 Device Address

The device address is the address of the one switch which is designated to receive a transmitted command, or which is responding to a command.

Valid device addresses are 1 to 3 characters long, and in the range of 1 to 255. Address 0 is reserved as a global address which simultaneously addresses all devices on a given communications link. Devices do not acknowledge global commands.

Each switch which is connected to a common remote communications link must be assigned its own unique address. Addresses are hardware (dipswitch) selectable at the modem switch, and must be in the range of 1 to 255.

Note: "add" is used to indicate a valid 1 to 3 character device address in the range between 1 and 255.

A.2.3 Command/Responses

The command/response portion of the message contains a variable length character sequence which conveys command and response data.

If a satellite modem switch receives a message addressed to it which does not match the established protocol or cannot be implemented, a negative acknowledgment message is sent in response. This message is:

- `>add/?ER1_PARITY ERROR"cr""lf"]`
  (Error message for received parity errors.)
- `>add/?ER2_INVALID PARAMETER"cr""lf"]`
  (Error message for a recognized command which cannot be implemented or has parameters which are out of range.)
- `>add/?ER3_UNRECOGNIZABLE COMMAND"cr""lf"]`
  (Error message for unrecognizable command or bad command syntax.)
- `>add/?ER4_SWITCH NOT IN REMOTE MODE"cr""lf"]`
  (Switch not in remote error; use the MODE command to go to remote mode.)
- `>add/?ER5_HARD CODED PARAMETER"cr""lf"]`
  (Error message indicating that the parameter is hardware dependent and may not be changed remotely.)
- `>add/?ER6_BUSY"cr""lf"]`
  (Error message indicating that the command sent cannot be carried out because local processing is utilizing the modem control bus, local keyboard control, etc.)

Note: The user must select the time-out error message by selecting SW6 to be open. The default will be closed (the bit will read low), and only responses will be returned to the uplink. The user may select the immediate busy response by closing SW7. If SW7 is open, the system will wait two seconds for the modem communication to become unbusy.

A.2.4 End Character

Each message is ended with a single character which signals the end of the message:

- "cr" Carriage return character for commands.
- "]" End bracket for responses.

A.3 Configuration Commands/Responses

A.3.1 Modulator Configuration Commands/Responses

A.3.1.1 Prime Modulator Active

Command: <add/MA_x_yyy"cr"
Response: >add/MA_x_yyy"cr"

Status Only: <add/MA_x"cr"
Response: >add/MA_x_yyy"cr""lf"]

Where:
x = 1 to 8 (prime modulator number).
yyy = YES or NO.

A.3.1.2 BackupModulator Active

Command: <add/MA_Bx_yyy"cr"
Response: >add/MA_Bx_yyy"cr""lf"]

Status Only: <add/MA_Bx"cr"
Response: >add/MA_Bx_yyy"cr""lf"]

Where:
x = 1 or 2 (backup modulator number).
yyy = YES or NO.

A.3.2 Demodulator Configuration Commands/Responses

A.3.2.1 Prime Demodulator Active

Command: <add/DA_x_yyy"cr"
Response: >add/DA_x_yyy"cr"

Status Only: <add/DA_x"cr"
Response: >add/DA_x_yyy"cr""lf"]

Where:
x = 1 to 8 (prime demodulator number).
yyy = YES or NO.

A.3.2.2 Prime Demodulator Transponder

Command: <add/DT_x_y"cr"
Response: >add/DT_x_y"cr""lf"]

Status Only: <add/DT_x"cr"
Response: >add/DT_x_y"cr""lf"]

Where:
x = 1 to 8 (prime demodulator number).
y = 1, 2, 3, or 4 (transponder number, four transponders option).
y = 1, 2, 3, 4, 5, 6, or 7 (transponder number, seven transponders option).

Note: See the "DTO_" command for the definition of downlink transponder option.

A.3.2.3 Backup Demodulator Active

Command: <add/DA_Bx_yyy"cr"
Response: >add/DA_Bx_yyy"cr""lf"]

Status Only: <add/DA_Bx"cr"
Response: >add/DA_Bx_yyy"cr""lf"]

Where:
x = 1 or 2 (backup demodulator number).
yyy = YES or NO.

Note: Backup number 2 cannot be active if the downlink transponders option is specified to be "7". See the "DTO_" command.

A.3.3 Modem Configuration Commands/Responses

A.3.3.1 Prime Modem Address

Address "0" may be used to clear the address field of modem "x".

Command: <add/ADD_x_yyy"cr"
Response: >add/ADD_x_yyy"cr""lf"]

Status Only: <add/ADD_x"cr"
Response: >add/ADD_x_yyy"cr""lf"]

Where:
x = 1 to 8 (prime modem number).
yyy = 1 to 255 (prime modem address).

A.3.3.2 Backup Modem Address

Address “0” may be used to clear the address field of modem “x”.

Command: `<add/ADD_Bx_yyy”cr”`
Response: `>add/ADD_Bx_yyy”cr””lf”]`

Status Only: `<add/ADD_Bx”cr”`
Response: `>add/ADD_Bx_yyy”cr””lf”]`

Where:
x = 1 to 8 (backup modem number).
yyy = 1 to 255 (backup modem address).

A.3.3.3 Prime Modem Interface Type

Command: `<add/INT_x_y”cr”`
Response: `>add/INT_x_y”cr””lf”]`

Status Only: `<add/INT_x”cr”`
Response: `>add/INT_x_y”cr””lf”]`

Where:

x = 1 to 8 (prime modem number).

y = 1 (for 15 D), 2 (for V.35), 3 (for RS422), 4 (for DCTN), 5 (for IDR), or 6 (for OTHER).

A.3.3.4 Backup Modem Interface Type

Command: `<add/INT_Bx_y”cr”`
Response: `>add/INT_Bx_y”cr””lf”]`

Status Only: `<add/INT_Bx”cr”`
Response: `>add/INT_Bx_y”cr””lf”]`

Where:
x = 1 or 2 (backup modem number).
y = 1 (for DS1), 2 (for V.35), or 3 (for RS-422).

A.3.3.5 Modem Priority

Command: <add/MP_x_y″cr″
Response: >add/MP_x_y″cr″″lf″]

Status Only: <add/MP_x″cr″
Response: >add/MP_x_y″cr″″lf″]

Where:
x = 1 to 8 (prime modem number).
y = 1, 2, or 3 (1 is high priority, 2 is medium priority, and 3 is low priority).

A.3.3.6 Modem Online Delay

Command: <add/MD_x_yyy.y″cr″
Response: >add/MD_x_yyy.y″cr″″lf]

Status Only: <add/MD_y″cr″
Response: >add/MD_x_yyy.y″cr″″lf]

Where:
x = 1 to 8 (prime modem number).
yyy.y = .5 to 127 (time in increments of .5 seconds), AUTO, or NONE.

A.3.4 Status Commands/Responses

A.3.4.1 Configuration Status

A.3.4.1.1 Prime Modulator Configuration Status

The Prime Modulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the modulator selected.

Command: <add/MCS_x″cr″
Response: >add/MCS_x″cr″

MA_yyy″cr″	Mod Active (YES/NO)
MP_y″cr″	Modem Priority (1, 2, or 3)
MD_yyy.y″cr″	Modem Online Delay
ADD_yyy″cr″	Modem Address
INT_y″cr″″lf″]	Modem Interface Type

Where: x = 1 to 8 (prime modulator number).

A.3.4.1.2 Backup Modulator Configuration Status

The Backup Modulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the modulator selected.

Command:	<add/MCS_Bx″cr″	
Response:	>add/MCS_Bx″cr″	
	MA_yyy″cr″	Mod Active (YES/NO)
	ADD_yyy″cr″	Modem Address
	INT_y″cr″″lf″]	Modem Interface Type

Where: x = 1 or 2 (backup modem number).

A.3.4.1.3 Prime Demodulator Configuration Status

The Prime Demodulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the demodulator selected.

Command:	<add/DCS_x″cr″	
Response:	>add/DCS_x″cr″	
	DA_yyy″cr″	Demod Active (YES/NO)
	MP_y″cr″	Modem Priority (1, 2, or 3)
	DT_y″cr″	Demod Transponder
	MD_yyy.y″cr″	Modem Delay
	ADD_yyy″cr″	Modem Address
	INT_y″cr″″lf″]	Modem Interface Type

Where: x = 1 to 8 (prime demodulator number).

A.3.4.1.4 Backup Demodulator Configuration Status

The Backup Demodulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the modulator selected.

Command:	<add/DCS_Bx″cr″	
Response:	>add/DCS_Bx″cr″	
	DA_yyy″cr″	Demod Active (YES/NO)
	ADD_yyy″cr″	Modem Address
	INT_y″cr″″lf″]	Modem Interface Type

Where: x = 1 or 2 (backup demodulator number).

A.3.4.2 Modulator Status

The modulator status is returned as a block of data which provides basic status information of all “active” modulators. B1 and B2 are the backup modulators.

Command: <add/MS_”cr”
Response: >add/MS_”cr”
MOD_1_yyy”cr”
MOD_2_yyy”cr”
MOD_3_yyy”cr”
MOD_4_yyy”cr”
MOD_5_yyy”cr”
MOD_6_yyy”cr”
MOD_7_yyy”cr”
MOD_8_yyy”cr”
MOD_B1_yyy”cr”
MOD_B2_yyy”cr””lf”]

Where: yyy = OK or FLT.

A.3.4.3 Demodulator Status

The demodulator status is returned as a block of data which provides basic status information of all “active” demodulators. B1 and B2 are the backup demodulators.

Command: <add/DS_”cr”
Response: >add/DS_”cr”
DMD_1_yyy”cr”
DMD_2_yyy”cr”
DMD_3_yyy”cr”
DMD_4_yyy”cr”
DMD_5_yyy”cr”
DMD_6_yyy”cr”
DMD_7_yyy”cr”
DMD_8_yyy”cr”
DMD_B1_yyy”cr”
DMD_B2_yyy”cr””lf”]

Where: yyy = OK or FLT.

A.3.4.4 Prime Modem Fault Status

Command: <add/MFS_x”cr”
Response: >add/MFS_x”cr”
MOD_xxx”cr” Mod Status (OK/FLT)
DMD_xxx”cr””lf”] Demod Status (OK/FLT)

Where: x = 1 to 8 (prime modem number).

A.3.4.5 Backup Modem Fault Status

Command: <add/MFS_Bx"cr"
Response: >add/MFS_Bx"cr"
MOD_yyy"cr" Mod Status (OK/FLT)
DMD_yyy"cr""lf"] Demod Status (OK/FLT)

Where: x = 1 or 2 (backup modem number).

A.3.4.6 Firmware Version Status

Command: <add/VER_"cr"
Response: >add/VER_x.xxx"cr""lf"]

Where: x.xxx = Firmware version number.

A.3.4.7 Equipment Type

This command returns the equipment type polled and the software version.

Command: <add/ET_"cr"
Response: >add/ET_xxx_yyy"cr""lf"]

Where: xxx = Equipment Type.

A.3.5 Operational Commands

A.3.5.1 Time of Day

Command: <add/TIME_hh:mmyy"cr"
Response: >add/TIME_hh:mmyy"cr""lf"]

Status Only: <add/TIME_"cr"
Response: >add/TIME_hh:mmyy"cr""lf"]

Where:
hh = hour.
mm = minute.
yy = AM or PM.

Example: Set switch 67 time to 10:45PM.

Command: <67/TIME_10:45PM"cr"
Response: >67/TIME_10:45PM"cr""lf"]

A.3.5.2 Date

Command: <add/DATE_mm/dd/yy"cr"
Response: >add/DATE_mm/dd/yy"cr""lf"]

Status Only: <add/DATE_"cr"
Response: >add/DATE_mm/dd/yy"cr""lf"]

Where:
mm = month.
dd = day.
yy = year.

Example: Set switch 235 date to 11/30/87.

Command: <235/DATE_11/30/87"cr"
Response: >235/DATE_11/30/87"cr""lf"]

A.3.5.3 Mode Command

The Mode Command directs the SMS-758 to enter the specified mode.

Command: <add/MODE_yyyyyy"cr"
Response: >add/MODE_yyyyyy"cr"

Status Only: <add/MODE_"cr"
Response: >add/MODE_yyyyyy"cr""lf"]

Where: yyyyyy = REMOTE, LOCAL, AUTO, or BYPASS.

A.3.5.4 Set Backup Modem Online/Offline

The Modem Online command puts the specified backup modem online for the specified prime modem.

Note: If "0" is used as the prime modem argument "x", the specified backup modem is offline or will be taken offline.

Command: <add/MOL_By_x"cr"
Response: >add/MOL_By_x"cr""lf"]

Status Only: <add/MOL_By"cr"
Response: >add/MOL_By_x"cr""lf]

Where:
y = 1 or 2 (backup modem number).
x = 0 to 8 (prime modem number).

A.3.5.5 Load Modem Configuration(s)

These commands tell the switch to poll the specified modems for configuration information (via the modem remote control serial communications link). Configurations received without error are loaded into the switches memory.

A.3.5.5.1 Load All Active Modems Configurations

This command loads all the active modems configurations and gives status of the load process (OK/FLT).

Command: <add/LMC_ALL"cr"
Response: >add/LMC_ALL"cr"
MOD_1_yyy"cr"
DMD_1_yyy"cr"
MOD_2_yyy"cr"
DMD_2_yyy"cr"
MOD_3_yyy"cr"
DMD_3_yyy"cr"
MOD_4_yyy"cr"
DMD_4_yyy"cr"
MOD_5_yyy"cr"
DMD_5_yyy"cr"
MOD_6_yyy"cr"
DMD_6_yyy"cr"
MOD_7_yyy"cr"
DMD_7_yyy"cr"
MOD_8_yyy"cr"
DMD_8_yyy"cr"
MOD_B1_yyy"cr"
DMD_B1_yyy"cr"
MOD_B2_yyy"cr"
DMD_B2_yyy"cr""lf"]

Where: yyy = OK or FLT.

Note: Response shown is for a system with all possible modulators and demodulators active. Only active modulator and demodulator configurations will be loaded and load status reported.

A.3.5.5.2 Load Prime Modem Configuration

Command: <add/LMC_x"cr"
Response: >add/LMC_x"cr"
MOD_x_yyy"cr"
DMD_x_yyy"cr""lf"]

Where:
x = 1 to 8 (prime modem number).
yyy = OK or FLT.

A.3.5.5.3 Load Backup Modem Configuration

Command: <add/LMC_Bx"cr"
Response: >add/LMC_Bx"cr"
MOD_Bx_yyy"cr"
DMD_Bx_yyy"cr""lf"]

Where:
x = 1 or 2 (backup modem number).
yyy = OK or FLT.

A.3.5.6 Verify Modem Configuration(s)

These commands tell the switch to poll the specified modem(s) for configuration information (via the modem remote control serial communications link). The received configuration(s) are compared to the last loaded configuration(s).

A.3.5.6.1 Verify All Active Modems Configurations

This command verifies all the active modems configurations and returns status.

Command: <add/VMC_ALL"cr"
Response: >add/VMC_ALL"cr"
MOD_1_yyy"cr"
DMD_1_yyy"cr"
MOD_2_yyy"cr"
DMD_2_yyy"cr"
MOD_3_yyy"cr"
DMD_3_yyy"cr"
MOD_4_yyy"cr"
DMD_4_yyy"cr"
MOD_5_yyy"cr"
DMD_5_yyy"cr"
MOD_6_yyy"cr"
DMD_6_yyy"cr"
MOD_7_yyy"cr"
DMD_7_yyy"cr"
MOD_8_yyy"cr"
DMD_8_yyy"cr"
MOD_B1_yyy"cr"
DMD_B1_yyy"cr"
MOD_B2_yyy"cr"
DMD_B2_yyy"cr""lf"]

Where: yyy = OK or FLT.

Note: Response shown is for a system with all possible modulators and demodulators active. Only active modulator and demodulator configurations will be verified and reported.

A.3.5.6.2 Verify Prime Modem Configuration

Command: `<add/VMC_x"cr"`
Response: `>add/VMC_x"cr"`
`MOD_x_yyy"cr"`
`DMD_x_yyy"cr""lf"]`

Where:
x = 1 to 8 (prime modem number).
yyy = OK or FLT.

A.3.5.6.3 Verify Backup Modem Configuration

Command: `<add/VMC_Bx"cr"`
Response: `>add/VMC_Bx"cr"`
`MOD_Bx_yyy"cr"`
`DMD_Bx_yyy"cr""lf"]`

Where:
x = 1 or 2 (backup modem number).
yyy = OK or FLT.

A.3.5.7 Operational Status Commands (Faults)

A.3.5.7.1 Modulator Operational Faults Status

Command: `<add/MOF_"cr"`
Response: `>add/MOF_"cr"`
`BU_OP_FLT_xxxxxxxx"cr""lf"]` Backup operation faults *(see Note)*

Where: x = 1 to 8 (prime mod number).

Note: Fault status data is only returned if fault conditions exist.

A.3.5.7.2 Demodulator Operational Faults Status

Command: `<add/DOF_"cr"`
Response: `>add/DOF_"cr"`
`BU_OP_FLT_xxxxxxxx"cr"` Backup operation faults *(see Note)*
`DL_FLT_yyy"cr""lf"]` All Demods on downlink "y" faulted *(see Note)*

Where:
x = 1 to 8 (prime demod number).
y = 1, 2, 3, or 4 (faulted downlink number).

Note: Fault status data is only returned if fault conditions exist.

A.3.5.7.3 M:N Switch Fault Status Summary

Command: <add/MNF_"cr"
Response: >add/MNF_"cr"

COM_FLT_xxxxxxxxByBy"cr"	Modem communications faults *(see Note)*
MOD_CONFIG_FLT_xxxxxxxxByBy"cr"	Mod configuration verify faults *(see Note)*
DMD_CONFIG_FLT_xxxxxxxxByBy"cr"	Demod configuration verify faults *(see Note)*
MOD_COMPAT_FLT_xxxxxxxxByBy"cr"	Mod compatibility fault *(see Note)*
DMD_COMPAT_FLT_xxxxxxxxByBy"cr"	Demod compatibility fault *(see Note)*
+12V_FLT"cr"	Power fault +12V *(see Note)*
-12V_FLT"cr"	Power fault -12V *(see Note)*
+5V_FLT"cr"	Power fault +5V *(see Note)*
PS1_FLT"cr"	Powers supply #1 fault *(see Note)*
PS2_FLT"cr"	Power supply #2 fault *(see Note)*
M&C_BAT_FLT"cr"	M&C battery fault *(see Note)*
ADX_BAT_FLT"cr"	Address Decoder/Driver battery fault *(see Note)*
PARAMETER(S)_MISSING"cr""lf"]	Missing parameter fault, use "MPF" command to determine faults *(see Note)*

Where:
x = 1 to 8 (prime modem number).
y = 1 or 2 (backup modem number).

Note: Fault status data is only returned if fault conditions exist.

A.3.5.7.4 Missing Parameter Faults

Command: <add/MPF_"cr"
Response: >add/MPF_"cr"

NO_MOD_CONFIG_xxxxxxxxByBy"cr"	No mod configuration loaded *(see Note)*
NO_DMD_CONFIG_xxxxxxxxByBy"cr"	No demod configuration loaded *(see Note)*
NO_ADX_xxxxxxxxByBy"cr"	No address specified for modem *(see Note)*
NO_INTFC_xxxxxxxxByBy"cr"	No interface specified for modem *(see Note)*
NO_DL_xxxxxxxx"cr""lf"]	No downlink specified for demod *(see Note)*

Where:
x = 1 to 8 (prime modem number).
y = 1 or 2 (backup modem number).

Note: Fault status data is only returned if fault conditions exist.

A.3.5.7.5 Bulk Consolidated Status Faults

This command causes all switch fault status to be returned. To reduce the length of the response, fault status is embedded into the bit structure of the characters that are returned. Faults are indicated by a binary 1 in the designated bit position.

Command: `<add/BCSF_"cr"`
Response: `>add/BCSF_"a""b""c"..."x""y""z""aa""ab""ac""ad""ae""cr""lf"]`

Character "a": Modulator fault status character 1.
- Bit 6 = 1 always.
- Bit 5 = Prime modulator #1 fault.
- Bit 4 = Prime modulator #2 fault.
- Bit 3 = Prime modulator #3 fault.
- Bit 2 = Prime modulator #4 fault.
- Bit 1 = Prime modulator #5 fault.
- Bit 0 = Prime modulator #6 fault.

Character "b": Modulator fault status character 2.
- Bit 6 = 1 always.
- Bit 5 = Prime modulator #7 fault.
- Bit 4 = Prime modulator #8 fault.
- Bit 3 = Backup modulator #1 fault.
- Bit 2 = Backup modulator #2 fault.
- Bit 1 = Reserved.
- Bit 0 = Reserved.

Character "c": Demodulator fault status character 1.
- Bit 6 = 1 always.
- Bit 5 = Prime demodulator #1 fault.
- Bit 4 = Prime demodulator #2 fault.
- Bit 3 = Prime demodulator #3 fault.
- Bit 2 = Prime demodulator #4 fault.
- Bit 1 = Prime demodulator #5 fault.
- Bit 0 = Prime demodulator #6 fault.

Character "d": Demodulator fault status character 2.
- Bit 6 = 1 always.
- Bit 5 = Prime demodulator #7 fault.
- Bit 4 = Prime demodulator #8 fault.
- Bit 3 = Backup demodulator #1 fault.
- Bit 2 = Backup demodulator #2 fault.
- Bit 1 = Reserved.
- Bit 0 = Reserved.

Character “e”: Modulator operational fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime modulator #1 backup operational fault.
Bit 4 = Prime modulator #2 backup operational fault.
Bit 3 = Prime modulator #3 backup operational fault.
Bit 2 = Prime modulator #4 backup operational fault.
Bit 1 = Prime modulator #5 backup operational fault.
Bit 0 = Prime modulator #6 backup operational fault.

Character “f”: Modulator operational fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime modulator #7 backup operational fault.
Bit 4 = Prime modulator #8 backup operational fault.
Bit 3 = Reserved.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “g”: Demodulator operational fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #1 backup operational fault.
Bit 4 = Prime demodulator #2 backup operational fault.
Bit 3 = Prime demodulator #3 backup operational fault.
Bit 2 = Prime demodulator #4 backup operational fault.
Bit 1 = Prime demodulator #5 backup operational fault.
Bit 0 = Prime demodulator #6 backup operational fault.

Character “h”: Demodulator operational fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #7 backup operational fault.
Bit 4 = Prime demodulator #8 backup operational fault.
Bit 3 = All demodulators on downlink #1 fault.
Bit 2 = All demodulators on downlink #2 fault.
Bit 1 = All demodulators on downlink #3 fault.
Bit 0 = All demodulators on downlink #4 fault.

Character “i”: Demodulator operational fault status character 3.
Bit 6 = 1 always.
Bit 5 = All demodulators on downlink #5 fault.
Bit 4 = All demodulators on downlink #6 fault.
Bit 3 = All demodulators on downlink #7 fault.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “j”: Modulator configuration verify fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime modulator #1 configuration verify fault.
Bit 4 = Prime modulator #2 configuration verify fault.
Bit 3 = Prime modulator #3 configuration verify fault.
Bit 2 = Prime modulator #4 configuration verify fault.
Bit 1 = Prime modulator #5 configuration verify fault.
Bit 0 = Prime modulator #6 configuration verify fault.

Character “k”: Modulator configuration verify fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime modulator #7 configuration verify fault.
Bit 4 = Prime modulator #8 configuration verify fault.
Bit 3 = Backup modulator #1 configuration verify fault.
Bit 2 = Backup modulator #2 configuration verify fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “l”: Demodulator configuration verify fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #1 configuration verify fault.
Bit 4 = Prime demodulator #2 configuration verify fault.
Bit 3 = Prime demodulator #3 configuration verify fault.
Bit 2 = Prime demodulator #4 configuration verify fault.
Bit 1 = Prime demodulator #5 configuration verify fault.
Bit 0 = Prime demodulator #6 configuration verify fault.

Character “m”: Demodulator configuration verify fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #7 configuration verify fault.
Bit 4 = Prime demodulator #8 configuration verify fault.
Bit 3 = Backup demodulator #1 configuration verify fault.
Bit 2 = Backup demodulator #2 configuration verify fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “n”: Modulator compatibility fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime modulator #1 compatibility fault.
Bit 4 = Prime modulator #2 compatibility fault.
Bit 3 = Prime modulator #3 compatibility fault.
Bit 2 = Prime modulator #4 compatibility fault.
Bit 1 = Prime modulator #5 compatibility fault.
Bit 0 = Prime modulator #6 compatibility fault.

Character “o”: Modulator compatibility fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime modulator #7 compatibility fault.
Bit 4 = Prime modulator #8 compatibility fault.
Bit 3 = Backup modulator #1 compatibility fault.
Bit 2 = Backup modulator #2 compatibility fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “p”: Demodulator compatibility fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #1 compatibility fault.
Bit 4 = Prime demodulator #2 compatibility fault.
Bit 3 = Prime demodulator #3 compatibility fault.
Bit 2 = Prime demodulator #4 compatibility fault.
Bit 1 = Prime demodulator #5 compatibility fault.
Bit 0 = Prime demodulator #6 compatibility fault.

Character “q”: Demodulator compatibility fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #7 compatibility fault.
Bit 4 = Prime demodulator #8 compatibility fault.
Bit 3 = Backup demodulator #1 compatibility fault.
Bit 2 = Backup demodulator #2 compatibility fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “r”: Common equipment fault status character 1.
Bit 6 = 1 always.
Bit 5 = +12 volt fault.
Bit 4 = -12 volt fault.
Bit 3 = +5 volt fault.
Bit 2 = Power supply #1 fault.
Bit 1 = Power supply #2 fault.
Bit 0 = M&C battery fault.

Character “s”: Common equipment fault status character 2.
Bit 6 = 1 always.
Bit 5 = Address/Decoder battery fault.
Bit 4 = Reserved.
Bit 3 = Reserved.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “t”: Missing parameters fault status character 1.
Bit 6 = 1 always.
Bit 5 = No configuration for prime modulator #1 fault.
Bit 4 = No configuration for prime modulator #2 fault.
Bit 3 = No configuration for prime modulator #3 fault.
Bit 2 = No configuration for prime modulator #4 fault.
Bit 1 = No configuration for prime modulator #5 fault.
Bit 0 = No configuration for prime modulator #6 fault.

Character “u”: Missing parameters fault status character 2.
Bit 6 = 1 always.
Bit 5 = No configuration for prime modulator #7 fault.
Bit 4 = No configuration for prime modulator #8 fault.
Bit 3 = No configuration for backup modulator #1 fault.
Bit 2 = No configuration for backup modulator #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “v”: Missing parameters fault status character 3.
Bit 6 = 1 always.
Bit 5 = No configuration for prime demodulator #1 fault.
Bit 4 = No configuration for prime demodulator #2 fault.
Bit 3 = No configuration for prime demodulator #3 fault.
Bit 2 = No configuration for prime demodulator #4 fault.
Bit 1 = No configuration for prime demodulator #5 fault.
Bit 0 = No configuration for prime demodulator #6 fault.

Character “w”: Missing parameters fault status character 4.
Bit 6 = 1 always.
Bit 5 = No configuration for prime demodulator #7 fault.
Bit 4 = No configuration for prime demodulator #8 fault.
Bit 3 = No configuration for backup demodulator #1 fault.
Bit 2 = No configuration for backup demodulator #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “x”: Missing parameters fault status character 5.
Bit 6 = 1 always.
Bit 5 = No address specified for prime modem #1 fault.
Bit 4 = No address specified for prime modem #2 fault.
Bit 3 = No address specified for prime modem #3 fault.
Bit 2 = No address specified for prime modem #4 fault.
Bit 1 = No address specified for prime modem #5 fault.
Bit 0 = No address specified for prime modem #6 fault.

Character “y”: Missing parameters fault status character 6.
Bit 6 = 1 always.
Bit 5 = No address specified for prime modem #7 fault.
Bit 4 = No address specified for prime modem #8 fault.
Bit 3 = No address specified for backup modem #1 fault.
Bit 2 = No address specified for backup modem #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “z”: Missing parameters fault status character 7.
Bit 6 = 1 always.
Bit 5 = No interface specified for prime modem #1 fault.
Bit 4 = No interface specified for prime modem #2 fault.
Bit 3 = No interface specified for prime modem #3 fault.
Bit 2 = No interface specified for prime modem #4 fault.
Bit 1 = No interface specified for prime modem #5 fault.
Bit 0 = No interface specified for prime modem #6 fault.

Character “aa”: Missing parameters fault status character 8.
Bit 6 = 1 always.
Bit 5 = No interface specified for prime modem #7 fault.
Bit 4 = No interface specified for prime modem #8 fault.
Bit 3 = No interface specified for backup modem #1 fault.
Bit 2 = No interface specified for backup modem #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “ab”: Missing parameters fault status character 9.
Bit 6 = 1 always.
Bit 5 = No downlink specified for prime modem #1 fault.
Bit 4 = No downlink specified for prime modem #2 fault.
Bit 3 = No downlink specified for prime modem #3 fault.
Bit 2 = No downlink specified for prime modem #4 fault.
Bit 1 = No downlink specified for prime modem #5 fault.
Bit 0 = No downlink specified for prime modem #6 fault.

Character “ac”: Missing parameters fault status character 10.
Bit 6 = 1 always.
Bit 5 = No downlink specified for prime modem #7 fault.
Bit 4 = No downlink specified for prime modem #8 fault.
Bit 3 = Reserved.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “ad”: Modem communications faults character 1.
Bit 6 = 1 always.
Bit 5 = Prime modem #1 communications fault.
Bit 4 = Prime modem #2 communications fault.
Bit 3 = Prime modem #3 communications fault.
Bit 2 = Prime modem #4 communications fault.
Bit 1 = Prime modem #5 communications fault.
Bit 0 = Prime modem #6 communications fault.

Character “ae”: Modem communications faults character 2.
Bit 6 = 1 always.
Bit 5 = Prime modem #7 communications fault.
Bit 4 = Prime modem #8 communications fault.
Bit 3 = Backup modem #1 communications fault.
Bit 2 = Backup modem #2 communications fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

A.3.5.8 Downlink Transponder Option

This command configures the SMS-758 for cabling options that support four or seven downlink transponders. When this option is set to “4”, two backup modems may be specified with four downlinks available to each backup modem. If this option is set to “7”, one backup modem (backup #1) may be specified with seven downlinks available to the backup modem.

Command: `<add/DTO_n”cr”`
Response: `>add/DTO_n”cr””lf”]`

Status Only: `<add/DTO_”cr”`
Response: `>add/DTO_n”cr””lf”]`

Where: n = 4 or 7 (maximum number of downlinks).

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Appendix B. REMOTE CONTROL OPERATION: INDEPENDENT MOD/DEMOD

This appendix defines the protocol and command structure for remote control and status monitoring of the EFData SMS-758 switch.

- Firmware number: FW/0713-36L
- Software version: 6.1.2

B.1 General

Remote controls and status information are transferred via an RS-485 (optional RS-232C) serial communications link. For RS-232C communication, switch SP1-5 on the M&C module must be turned ON.

Commands and data are transferred on the remote control communications link as US ASCII-encoded character strings.

The remote communications link is operated in a half-duplex mode. Communications on the remote link are initiated by a remote controller or terminal.

The switch never transmits data on the link unless it is commanded to do so.

B.2 Message Structure

The ASCII character format used requires 11 bits/character:

- 1 start bit
- 7 information bits
- 1 parity bit (odd/even)
- 2 stop bits

Messages on the remote link fall into the categories of commands and responses. Commands are messages which are transmitted to a modem protection switch, while responses are messages returned by a modem protection switch in response to a command.

The general message structure is as follows:

- Start Character
- Device Address
- Command/Response
- End of Message Character

B.2.1 Start Character

A single character precedes all messages transmitted on the remote link. This character flags the start of a message. This character is:

- "<" for commands
- ">" for responses

B.2.2 Device Address

The device address is the address of the one modem protection switch which is designated to receive a transmitted command, or which is responding to a command.

Valid device addresses are 1 to 3 characters long, and in the range of 1 to 255. Address 0 is reserved as a global address which simultaneously addresses all devices on a given communications link. Devices do not acknowledge global commands.

Each modem protection switch which is connected to a common remote communications link must be assigned its own unique address. Addresses are hardware (dipswitch) selectable at the modem switch, and must be in the range of 1 to 255.

Note: "add" is used to indicate a valid 1 to 3 character device address in the range between 1 and 255.

B.2.3 Command/Responses

The command/response portion of the message contains a variable length character sequence which conveys command and response data.

If a modem protection switch receives a message addressed to it which does not match the established protocol or cannot be implemented, a negative acknowledgment message is sent in response. This message is:

- `>add/?ER1_PARITY ERROR"cr""lf"]`
  (Error message for received parity errors.)
- `>add/?ER2_INVALID PARAMETER"cr""lf"]`
  (Error message for a recognized command which cannot be implemented or has parameters which are out of range.)
- `>add/?ER3_UNRECOGNIZABLE COMMAND"cr""lf"]`
  (Error message for unrecognizable command or bad command syntax.)
- `>add/?ER4_SWITCH NOT IN REMOTE MODE"cr""lf"]`
  (Switch not in remote error; use the MODE command to go to remote mode.)
- `>add/?ER5_HARD CODED PARAMETER"cr""lf"]`
  (Error message indicating that the parameter is hardware dependent and may not be changed remotely.)
- `>add/?ER6_BUSY"cr""lf"]`
  (Error message indicating that the command sent cannot be carried out because local processing is utilizing the modem control bus, local keyboard, etc.)

Note: The user must select the time-out error message by selecting SW6 to be open. The default will be closed (the bit will read low) and only responses will be returned to the uplink. The user may select the immediate busy response by closing SW7. If SW7 is open, the system will wait two seconds for the modem communication to become unbusy.

B.2.4 End Character

Each message is ended with a single character which signals the end of the message:

- "cr" Carriage return character for commands.
- "]" End bracket for responses.

B.3 Configuration Commands/Responses

B.3.1 Modulator Configuration Commands/Responses

B.3.1.1 Prime Modulator Active

Command: <add/MA_x_yyy"cr"
Response: >add/MA_x_yyy"cr"

Status Only: <add/MA_x"cr"
Response: >add/MA_x_yyy"cr""lf"]

Where:
x = 1 to 8 (prime modulator number).
yyy = YES or NO.

B.3.1.2 Prime Modulator Priority

Command: <add/MP_x_y"cr"
Response: >add/MP_x_y"cr""lf"]

Status Only: <add/MP_x"cr"
Response: >add/MP_x_y"cr""lf"]

Where:
x = 1 to 8.
y = 1, 2, or 3 (1 is high priority, 2 is medium priority, and 3 is low priority).

B.3.1.3 Prime Modulator Online Delay

Command: <add/MD_x_yyy.y"cr"
Response: >add/MD_x_yyy.y"cr""lf]

Status Only: <add/MD_y"cr"
Response: >add/MD_x_yyy.y"cr""lf]

Where:
x = 1 to 8 (prime modulator number).
yyy.y = .5 to 127 (time in increments of .5 seconds), or NONE.

B.3.1.4 Backup Modulator Active

Command: <add/MA_Bx_yyy"cr"
Response: >add/MA_Bx_yyy"cr""lf"]

Status Only: <add/MA_Bx"cr"
Response: >add/MA_Bx_yyy"cr""lf"]

Where:
x = 1 or 2 (backup modulator number).
yyy = YES or NO.

B.3.2 Demodulator Configuration Commands/Responses

B.3.2.1 Prime Demodulator Active

Command: <add/DA_x_yyy"cr"
Response: >add/DA_x_yyy"cr"

Status Only: <add/DA_x"cr"
Response: >add/DA_x_yyy"cr""lf"]

Where:
x = 1 to 8 (prime demodulator number).
yyy = YES or NO.

B.3.2.2 Prime Demodulator Priority

Command: <add/DP_x_y"cr"
Response: >add/DP_x_y"cr""lf"]

Status Only: <add/DP_x"cr"
Response: >add/DP_x_y"cr""lf"]

Where:
x = 1 to 8.
y = 1, 2, or 3 (1 is high priority, 2 is medium priority, and 3 is low priority).

B.3.2.3 Prime Demodulator Transponder

Command: <add/DT_x_y"cr"
Response: >add/DT_x_y"cr""lf"]

Status Only: <add/DT_x"cr"
Response: >add/DT_x_y"cr""lf"]

Where:
x = 1 to 8 (prime demodulator number).
y = 1, 2, 3 or 4 (transponder number, four transponders option).
y = 1, 2, 3, 4, 5, 6, or 7 (transponder number, seven transponders option).

Note: See the "DTO_" command for the definition of downlink transponder option.

B.3.2.4 Prime Demodulator Online Delay

Command: <add/DD_x_yyy.y"cr"
Response: >add/DD_x_yyy.y"cr""lf]

Status Only: <add/DD_y"cr"
Response: >add/DD_x_yyy.y"cr""lf]

Where:
x = 1 to 8 (prime demodulator number).
yyy.y = .5 to 127 (time in increments of .5 seconds), AUTO, or NONE.

B.3.2.5 Backup Demodulator Active

Command: <add/DA_Bx_yyy"cr"
Response: >add/DA_Bx_yyy"cr""lf"]

Status Only: <add/DA_Bx"cr"
Response: >add/DA_Bx_yyy"cr""lf"]

Where:
x = 1 or 2 (backup demodulator number).
yyy = YES or NO.

Note: Backup number two cannot be active if the downlink transponders option is specified to be "7". See the "DTO_" command.

B.3.3 Modem Configuration Commands/Responses

B.3.3.1 Prime Modem Address

Address “0” may be used to clear the address field of modem “x”.

Command: `<add/ADD_x_yyy”cr”`
Response: `>add/ADD_x_yyy”cr””lf”]`

Status Only: `<add/ADD_x”cr”`
Response: `>add/ADD_x_yyy”cr””lf”]`

Where:
x = 1 to 8 (prime modem number).
yyy = 1 to 255 (prime modem address).

B.3.3.2 Backup Modem Address

Address “0” may be used to clear the address field of modem “x”.

Command: `<add/ADD_Bx_yyy”cr”`
Response: `>add/ADD_Bx_yyy”cr””lf”]`

Status Only: `<add/ADD_Bx”cr”`
Response: `>add/ADD_Bx_yyy”cr””lf”]`

Where:
x = 1 to 8 (backup modem number).
yyy = 1 to 255 (backup modem address).

B.3.3.3 Prime Modem Interface Type

Command: `<add/INT_x_y”cr”`
Response: `>add/INT_x_y”cr””lf”]`

Status Only: `<add/INT_x”cr”`
Response: `>add/INT_x_y”cr””lf”]`

Where:

x = 1 to 8 (prime modem number).

y = 1 (for 15 D), 2 (for V.35), 3 (for RS-422), 4 (for DCTN), 7 (for IBS), 8 (for D&I), 5 (for IDR), 6 (for OTHER), or 9 (for IDR 2:N).

B.3.3.4 Backup Modem Interface Type

Command: <add/INT_Bx_y″cr″
Response: >add/INT_Bx_y″cr″″lf″]

Status Only: <add/INT_Bx″cr″
Response: >add/INT_Bx_y″cr″″lf″]

Where:

x = 1 or 2 (backup modem number).

y = 1 (for 15 D), 2 (for V.35), 3 (for RS-422), 4 (for DCTN), 5 (for IDR), 6 (for OTHER), 7 (for IBS), 8 (for D&I), or 9 (for IDR 2:N).

B.3.4 Status Commands/Responses

B.3.4.1 Configuration Status

B.3.4.1.1 Prime Modulator Configuration Status

The Modulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the modulator selected.

Command: <add/MCS_x″cr″
Response: >add/MCS_x″cr″

MA_yyy″cr″	mod active (YES/NO)
MP_y″cr″	mod priority (1, 2, or 3)
MD_yyy.y″cr″	mod online delay
ADD_yyy″cr″	modem address
INT_y″cr″″lf″]	modem interface type

Where: x = 1 to 8 (prime modulator number).

B.3.4.1.2 Backup Modulator Configuration Status

The Modulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the modulator selected.

Command: <add/MCS_Bx″cr″
Response: >add/MCS_Bx″cr″

MA_yyy″cr″	mod active (YES/NO)
ADD_yyy″cr″	modem address
INT_y″cr″″lf″]	modem interface type

Where: x = 1 or 2 (backup modem number).

B.3.4.1.3 Prime Demodulator Configuration Status

The Demodulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the demodulator selected.

Command:	<add/DCS_x″cr″	
Response:	>add/DCS_x″cr″	
	DA_yyy″cr″	demod active (YES/NO)
	DP_y″cr″	demod priority (1, 2, or 3)
	DT_y″cr″	demod transponder
	DD_yyy.y″cr″	demod delay
	ADD_yyy″cr″	modem address
	INT_y″cr″″lf″]	modem interface type

Where: x = 1 to 8 (prime demodulator number).

B.3.4.1.4 Backup Demodulator Configuration Status

The Demodulator Configuration Status command causes a block of data to be returned by the SMS-758. The block of data reflects the stored configuration of the modulator selected.

Command:	<add/DCS_Bx″cr″	
Response:	>add/DCS_Bx″cr″	
	DA_yyy″cr″	demod active (YES/NO)
	ADD_yyy″cr″	modem address
	INT_y″cr″″lf″]	modem interface type

Where: x = 1 or 2 (backup demodulator number).

B.3.4.2 Modulator Status

The modulator status is returned as a block of data which provides basic status information of all “active” modulators. B1 and B2 are the backup modulators.

Command: <add/MS_″cr″
Response: >add/MS_″cr″
MOD_1_yyy″cr″
MOD_2_yyy″cr″
MOD_3_yyy″cr″
MOD_4_yyy″cr″
MOD_5_yyy″cr″
MOD_6_yyy″cr″
MOD_7_yyy″cr″
MOD_8_yyy″cr″
MOD_B1_yyy″cr″
MOD_B2_yyy″cr″″lf″]

Where: yyy = OK or FLT.

B.3.4.3 Demodulator Status

The demodulator status is returned as a block of data which provides basic status information of all “active” demodulators. B1 and B2 are the backup demodulators.

Command: <add/DS_”cr”
Response: >add/DS_”cr”
DMD_1_yyy”cr”
DMD_2_yyy”cr”
DMD_3_yyy”cr”
DMD_4_yyy”cr”
DMD_5_yyy”cr”
DMD_6_yyy”cr”
DMD_7_yyy”cr”
DMD_8_yyy”cr”
DMD_B1_yyy”cr”
DMD_B2_yyy”cr””lf”]

Where: yyy = OK or FLT.

B.3.4.4 Prime Modem Fault Status

Command: <add/MFS_x”cr”
Response: >add/MFS_x”cr”

MOD_xxx”cr”	mod status (OK/FLT)
DMD_xxx”cr””lf”]	demod status (OK/FLT)

Where: x = 1 to 8 (prime modem number).

B.3.4.5 Backup Modem Fault Status

Command: <add/MFS_Bx”cr”
Response: >add/MFS_Bx”cr”

MOD_yyy”cr”	mod status (OK/FLT)
DMD_yyy”cr””lf”]	demod status (OK/FLT)

Where: x = 1 or 2 (backup modem number).

B.3.4.6 Firmware Version Status

Command: <add/VER_”cr”
Response: >add/VER_x.xxx”cr””lf”]

Where: x.xxx = Firmware version number.

B.3.4.7 Equipment Type

This command returns the equipment type polled and the software version.

Command: `<add/ET_"cr"`
Response: `>add/ET_xxx_yyy"cr""lf"]`

Where:
xxx = Equipment type.
yyy = Software version.

B.3.5 Operational Commands

B.3.5.1 Time of Day

Command: `<add/TIME_hh:mmyy"cr"`
Response: `>add/TIME_hh:mmyy"cr""lf"]`

Status Only: `<add/TIME_"cr"`
Response: `>add/TIME_hh:mmyy"cr""lf"]`

Where:
hh = hour.
mm = minute.
yy = AM or PM.

Example: Set switch 67 time to 10:45PM.

Command: `<67/TIME_10:45PM"cr"`
Response: `>67/TIME_10:45PM"cr""lf"]`

B.3.5.2 Date

Command: `<add/DATE_mm/dd/yy"cr"`
Response: `>add/DATE_mm/dd/yy"cr""lf"]`

Status Only: `<add/DATE_"cr"`
Response: `>add/DATE_mm/dd/yy"cr""lf"]`

Where:
mm = month.
dd = day.
yy = year.

Example: Set switch 235 date to 11/30/87.

Command: `<235/DATE_11/30/87"cr"`
Response: `>235/DATE_11/30/87"cr""lf"]`

B.3.5.3 Mode Command

The Mode command directs the SMS-758 to enter the specified mode.

Command: `<add/MODE_yyyyyy"cr"`
Response: `>add/MODE_yyyyyy"cr"`

Status Only: `<add/MODE_"cr"`
Response: `>add/MODE_yyyyyy"cr""lf"]`

Where: yyyyyy = REMOTE, LOCAL, AUTO, or BYPASS.

B.3.5.4 Set Backup Modulator Online/Offline

The modulator online command puts the specified backup modulator online for the specified prime modulator.

Note: If "0" is used as the prime modulator argument "x", the specified backup modulator is offline or will be taken offline.

Command: `<add/MOL_By_x"cr"`
Response: `>add/MOL_By_x"cr""lf"]`

Status Only: `<add/MOL_By"cr"`
Response: `>add/MOL_By_x"cr""lf]`

Where:
y = 1 or 2 (backup modulator number).
x = 0 to 8 (prime modulator number).

B.3.5.5 Set Backup Demodulator Online/Offline

The demodulator online command puts the specified backup demodulator online for the specified prime demodulator.

Note: If "0" is used as the prime demodulator argument "x", the specified backup demodulator is offline or will be taken offline.

Command: `<add/DOL_By_x"cr"`
Response: `>add/DOL_By_x"cr""lf"]`

Status Only: `<add/DOL_By"cr"`
Response: `>add/DOL_By_x"cr""lf"]`

Where:
y = 1 or 2 (backup demodulator number).
x = 0 to 8 (prime demodulator number).

B.3.5.6 Load Modem Configuration(s)

These commands tell the switch to poll the specified modems for configuration information (via the modem remote control serial communications link). Configurations received without error are loaded into the switches memory.

B.3.5.6.1 Load All Active Modems Configurations

This command loads all the active modems configurations and gives status of the load process (OK/FLT).

Command: <add/LMC_ALL"cr"
Response: >add/LMC_ALL"cr"
MOD_1_yyy"cr"
DMD_1_yyy"cr"
MOD_2_yyy"cr"
DMD_2_yyy"cr"
MOD_3_yyy"cr"
DMD_3_yyy"cr"
MOD_4_yyy"cr"
DMD_4_yyy"cr"
MOD_5_yyy"cr"
DMD_5_yyy"cr"
MOD_6_yyy"cr"
DMD_6_yyy"cr"
MOD_7_yyy"cr"
DMD_7_yyy"cr"
MOD_8_yyy"cr"
DMD_8_yyy"cr"
MOD_B1_yyy"cr"
DMD_B1_yyy"cr"
MOD_B2_yyy"cr"
DMD_B2_yyy"cr""lf"]

Where: yyy = OK or FLT.

Note: Response shown is for a system with all possible modulators and demodulators active. Only active modulator and demodulator configurations will be loaded, and load status reported.

B.3.5.6.2 Load Prime Modem Configuration

Command: <add/LMC_x"cr"
Response: >add/LMC_x"cr"
MOD_x_yyy"cr"
DMD_x_yyy"cr""lf"]

Where:
x = 1 to 8 (prime modem number).
yyy = OK or FLT.

B.3.5.6.3 Load Backup Modem Configuration

Command: <add/LMC_Bx"cr"
Response: >add/LMC_Bx"cr"
MOD_Bx_yyy"cr"
DMD_Bx_yyy"cr""lf"]

Where:
x = 1 or 2 (backup modem number).
yyy = OK or FLT.

B.3.5.7 Verify Modem Configuration(s)

These commands tell the switch to poll the specified modem(s) for configuration information (via the modem remote control serial communications link). The received configuration(s) are compared to the last loaded configuration(s).

B.3.5.7.1 Verify All Active Modems Configurations

This command verifies all the active modems configurations and returns status.

Command: <add/VMC_ALL"cr"
Response: >add/VMC_ALL"cr"
MOD_1_yyy"cr"
DMD_1_yyy"cr"
MOD_2_yyy"cr"
DMD_2_yyy"cr"
MOD_3_yyy"cr"
DMD_3_yyy"cr"
MOD_4_yyy"cr"
DMD_4_yyy"cr"
MOD_5_yyy"cr"
DMD_5_yyy"cr"
MOD_6_yyy"cr"
DMD_6_yyy"cr"
MOD_7_yyy"cr"
DMD_7_yyy"cr"
MOD_8_yyy"cr"
DMD_8_yyy"cr"
MOD_B1_yyy"cr"
DMD_B1_yyy"cr"
MOD_B2_yyy"cr"
DMD_B2_yyy"cr""lf"]

Where: yyy = OK or FLT.

Note: Response shown is for a system with all possible modulators and demodulators active. Only active modulator and demodulator configurations will be verified and reported.

B.3.5.7.2 Verify Prime Modem Configuration

Command: `<add/VMC_x"cr"`
Response: `>add/VMC_x"cr"`
`MOD_x_yyy"cr"`
`DMD_x_yyy"cr""lf"]`

Where:
x = 1 to 8 (prime modem number).
yyy = OK or FLT.

B.3.5.7.3 Verify Backup Modem Configuration

Command: `<add/VMC_Bx"cr"`
Response: `>add/VMC_Bx"cr"`
`MOD_Bx_yyy"cr"`
`DMD_Bx_yyy"cr""lf"]`

Where:
x = 1 or 2 (backup modem number).
yyy = OK or FLT.

B.3.5.8 Operational Status Commands (Faults)

B.3.5.8.1 Modulator Operational Faults Status

Command: `<add/MOF_"cr"`
Response: `>add/MOF_"cr"`
`BU_OP_FLT_xxxxxxxx"cr""lf"]` Backup operation faults *(see Note below)*

Where: x = 1 to 8 (prime mod number).

Note: Fault status data is only returned if fault conditions exist.

B.3.5.8.2 Demodulator Operational Faults Status

Command: `<add/DOF_"cr"`
Response: `>add/DOF_"cr"`
`BU_OP_FLT_xxxxxxxx"cr"` Backup operation faults *(see Note below)*
`DL_FLT_yyy"cr""lf"]` All Demods on downlink "y" faulted *(see Note below)*

Where:
x = 1 to 8 (prime demod number).
y = 1, 2, 3 (faulted downlink number).

Note: Fault status data is only returned if fault conditions exist.

B.3.5.8.3 M:N Switch Fault Status Summary

Command: <add/MNF_"cr"
Response: >add/MNF_"cr"

COM_FLT_xxxxxxxxByBy"cr"	Modem communications faults *(see Note)*
MOD_CONFIG_FLT_xxxxxxxxByBy"cr"	Mod configuration verify faults *(see Note)*
DMD_CONFIG_FLT_xxxxxxxxByBy"cr"	Demod configuration verify faults *(see Note)*
MOD_COMPAT_FLT_xxxxxxxxByBy"cr"	Mod compatibility fault *(see Note)*
DMD_COMPAT_FLT_xxxxxxxxByBy"cr"	Demod compatibility fault *(see Note)*
+12V_FLT"cr"	power fault +12V *(see Note)*
-12V_FLT"cr"	power fault -12V *(see Note)*
+5V_FLT"cr"	power fault +5V *(see Note)*
PS1_FLT"cr"	power supply #1 fault *(see Note)*
PS2_FLT"cr"	power supply #2 fault *(see Note)*
M&C_BAT_FLT"cr"	M&C battery fault *(see Note)*
PARAMETER(S)_MISSING"cr""lf"]	Missing parameter fault; use "MPF" command to determine faults *(see Note)*

Where:
x = 1 to 8 (prime modem number).
y = 1 or 2 (backup modem number).

Note: Fault status data is only returned if fault conditions exist.

B.3.5.8.4 Missing Parameter Faults

Command: <add/MPF_"cr"
Response: >add/MPF_"cr"

NO_MOD_CONFIG_xxxxxxxxByBy"cr"	No mod configuration loaded *(see Note)*
NO_DMD_CONFIG_xxxxxxxxByBy"cr"	No demod configuration loaded *(see Note)*
NO_ADX_xxxxxxxxByBy"cr"	No address specified for modem *(see Note)*
NO_INTFC_xxxxxxxxByBy"cr"	No interface specified for modem *(see Note)*
NO_DL_xxxxxxxx"cr""lf"]	No downlink specified for demod *(see Note)*

Where:
x = 1 to 8 (prime modem number).
y = 1 or 2 (backup modem number).

Note: Fault status data is only returned if fault conditions exist.

B.3.5.8.5 Bulk Consolidated Status Faults

This command causes all switch fault status to be returned. To reduce the length of the response, fault status is embedded into the bit structure of the characters that are returned. Faults are indicated by a binary 1 in the designated bit position.

Command: `<add/BCSF_"cr"`
Response: `>add/BCSF_"a""b""c"..."x""y""z""aa""ab""ac""ad""ae""cr""lf"]`

Character "a": Modulator fault status character 1.
- Bit 6 = 1 always.
- Bit 5 = Prime modulator #1 fault.
- Bit 4 = Prime modulator #2 fault.
- Bit 3 = Prime modulator #3 fault.
- Bit 2 = Prime modulator #4 fault.
- Bit 1 = Prime modulator #5 fault.
- Bit 0 = Prime modulator #6 fault.

Character "b": Modulator fault status character 2.
- Bit 6 = 1 always.
- Bit 5 = Prime modulator #7 fault.
- Bit 4 = Prime modulator #8 fault.
- Bit 3 = Backup modulator #1 fault.
- Bit 2 = Backup modulator #2 fault.
- Bit 1 = Reserved.
- Bit 0 = Reserved.

Character "c": Demodulator fault status character 1.
- Bit 6 = 1 always.
- Bit 5 = Prime demodulator #1 fault.
- Bit 4 = Prime demodulator #2 fault.
- Bit 3 = Prime demodulator #3 fault.
- Bit 2 = Prime demodulator #4 fault.
- Bit 1 = Prime demodulator #5 fault.
- Bit 0 = Prime demodulator #6 fault.

Character "d": Demodulator fault status character 2.
- Bit 6 = 1 always.
- Bit 5 = Prime demodulator #7 fault.
- Bit 4 = Prime demodulator #8 fault.
- Bit 3 = Backup demodulator #1 fault.
- Bit 2 = Backup demodulator #2 fault.
- Bit 1 = Reserved.
- Bit 0 = Reserved.

Character "e": Modulator operational fault status character 1.
- Bit 6 = 1 always.
- Bit 5 = Prime modulator #1 backup operational fault.
- Bit 4 = Prime modulator #2 backup operational fault.
- Bit 3 = Prime modulator #3 backup operational fault.
- Bit 2 = Prime modulator #4 backup operational fault.
- Bit 1 = Prime modulator #5 backup operational fault.
- Bit 0 = Prime modulator #6 backup operational fault.

Character “f”: Modulator operational fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime modulator #7 backup operational fault.
Bit 4 = Prime modulator #8 backup operational fault.
Bit 3 = Reserved.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “g”: Demodulator operational fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #1 backup operational fault.
Bit 4 = Prime demodulator #2 backup operational fault.
Bit 3 = Prime demodulator #3 backup operational fault.
Bit 2 = Prime demodulator #4 backup operational fault.
Bit 1 = Prime demodulator #5 backup operational fault.
Bit 0 = Prime demodulator #6 backup operational fault.

Character “h”: Demodulator operational fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #7 backup operational fault.
Bit 4 = Prime demodulator #8 backup operational fault.
Bit 3 = All demodulators on downlink #1 fault.
Bit 2 = All demodulators on downlink #2 fault.
Bit 1 = All demodulators on downlink #3 fault.
Bit 0 = All demodulators on downlink #4 fault.

Character “i”: Demodulator operational fault status character 3.
Bit 6 = 1 always.
Bit 5 = All demodulators on downlink #5 fault.
Bit 4 = All demodulators on downlink #6 fault.
Bit 3 = All demodulators on downlink #7 fault.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “j”: Modulator configuration verify fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime modulator #1 configuration verify fault.
Bit 4 = Prime modulator #2 configuration verify fault.
Bit 3 = Prime modulator #3 configuration verify fault.
Bit 2 = Prime modulator #4 configuration verify fault.
Bit 1 = Prime modulator #5 configuration verify fault.
Bit 0 = Prime modulator #6 configuration verify fault.

Character “k”: Modulator configuration verify fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime modulator #7 configuration verify fault.
Bit 4 = Prime modulator #8 configuration verify fault.
Bit 3 = Backup modulator #1 configuration verify fault.
Bit 2 = Backup modulator #2 configuration verify fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “l”: Demodulator configuration verify fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #1 configuration verify fault.
Bit 4 = Prime demodulator #2 configuration verify fault.
Bit 3 = Prime demodulator #3 configuration verify fault.
Bit 2 = Prime demodulator #4 configuration verify fault.
Bit 1 = Prime demodulator #5 configuration verify fault.
Bit 0 = Prime demodulator #6 configuration verify fault.

Character “m”: Demodulator configuration verify fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #7 configuration verify fault.
Bit 4 = Prime demodulator #8 configuration verify fault.
Bit 3 = Backup demodulator #1 configuration verify fault.
Bit 2 = Backup demodulator #2 configuration verify fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “n”: Modulator compatibility fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime modulator #1 compatibility fault.
Bit 4 = Prime modulator #2 compatibility fault.
Bit 3 = Prime modulator #3 compatibility fault.
Bit 2 = Prime modulator #4 compatibility fault.
Bit 1 = Prime modulator #5 compatibility fault.
Bit 0 = Prime modulator #6 compatibility fault.

Character “o”: Modulator compatibility fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime modulator #7 compatibility fault.
Bit 4 = Prime modulator #8 compatibility fault.
Bit 3 = Backup modulator #1 compatibility fault.
Bit 2 = Backup modulator #2 compatibility fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “p”: Demodulator compatibility fault status character 1.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #1 compatibility fault.
Bit 4 = Prime demodulator #2 compatibility fault.
Bit 3 = Prime demodulator #3 compatibility fault.
Bit 2 = Prime demodulator #4 compatibility fault.
Bit 1 = Prime demodulator #5 compatibility fault.
Bit 0 = Prime demodulator #6 compatibility fault.

Character “q”: Demodulator compatibility fault status character 2.
Bit 6 = 1 always.
Bit 5 = Prime demodulator #7 compatibility fault.
Bit 4 = Prime demodulator #8 compatibility fault.
Bit 3 = Backup demodulator #1 compatibility fault.
Bit 2 = Backup demodulator #2 compatibility fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “r”: Common equipment fault status character 1.
Bit 6 = 1 always.
Bit 5 = +12 volt fault.
Bit 4 = -12 volt fault.
Bit 3 = +5 volt fault.
Bit 2 = Power supply #1 fault.
Bit 1 = Power supply #2 fault.
Bit 0 = M&C battery fault.

Character “s”: Common equipment fault status character 2.
Bit 6 = 1 always.
Bit 5 = Address/Decoder battery fault.
Bit 4 = Reserved.
Bit 3 = Reserved.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “t”: Missing parameters fault status character 1.
Bit 6 = 1 always.
Bit 5 = No configuration for prime modulator #1 fault.
Bit 4 = No configuration for prime modulator #2 fault.
Bit 3 = No configuration for prime modulator #3 fault.
Bit 2 = No configuration for prime modulator #4 fault.
Bit 1 = No configuration for prime modulator #5 fault.
Bit 0 = No configuration for prime modulator #6 fault.

Character “u”: Missing parameters fault status character 2.
Bit 6 = 1 always.
Bit 5 = No configuration for prime modulator #7 fault.
Bit 4 = No configuration for prime modulator #8 fault.
Bit 3 = No configuration for backup modulator #1 fault.
Bit 2 = No configuration for backup modulator #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “v”: Missing parameters fault status character 3.
Bit 6 = 1 always.
Bit 5 = No configuration for prime demodulator #1 fault.
Bit 4 = No configuration for prime demodulator #2 fault.
Bit 3 = No configuration for prime demodulator #3 fault.
Bit 2 = No configuration for prime demodulator #4 fault.
Bit 1 = No configuration for prime demodulator #5 fault.
Bit 0 = No configuration for prime demodulator #6 fault.

Character “w”: Missing parameters fault status character 4.
Bit 6 = 1 always.
Bit 5 = No configuration for prime demodulator #7 fault.
Bit 4 = No configuration for prime demodulator #8 fault.
Bit 3 = No configuration for backup demodulator #1 fault.
Bit 2 = No configuration for backup demodulator #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “x”: Missing parameters fault status character 5.
Bit 6 = 1 always.
Bit 5 = No address specified for prime modem #1 fault.
Bit 4 = No address specified for prime modem #2 fault.
Bit 3 = No address specified for prime modem #3 fault.
Bit 2 = No address specified for prime modem #4 fault.
Bit 1 = No address specified for prime modem #5 fault.
Bit 0 = No address specified for prime modem #6 fault.

Character “y”: Missing parameters fault status character 6.
Bit 6 = 1 always.
Bit 5 = No address specified for prime modem #7 fault.
Bit 4 = No address specified for prime modem #8 fault.
Bit 3 = No address specified for backup modem #1 fault.
Bit 2 = No address specified for backup modem #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “z”: Missing parameters fault status character 7.
Bit 6 = 1 always.
Bit 5 = No interface specified for prime modem #1 fault.
Bit 4 = No interface specified for prime modem #2 fault.
Bit 3 = No interface specified for prime modem #3 fault.
Bit 2 = No interface specified for prime modem #4 fault.
Bit 1 = No interface specified for prime modem #5 fault.
Bit 0 = No interface specified for prime modem #6 fault.

Character “aa”: Missing parameters fault status character 8.
Bit 6 = 1 always.
Bit 5 = No interface specified for prime modem #7 fault.
Bit 4 = No interface specified for prime modem #8 fault.
Bit 3 = No interface specified for backup modem #1 fault.
Bit 2 = No interface specified for backup modem #2 fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “ab”: Missing parameters fault status character 9.
Bit 6 = 1 always.
Bit 5 = No downlink specified for prime modem #1 fault.
Bit 4 = No downlink specified for prime modem #2 fault.
Bit 3 = No downlink specified for prime modem #3 fault.
Bit 2 = No downlink specified for prime modem #4 fault.
Bit 1 = No downlink specified for prime modem #5 fault.
Bit 0 = No downlink specified for prime modem #6 fault.

Character “ac”: Missing parameters fault status character 10.
Bit 6 = 1 always.
Bit 5 = No downlink specified for prime modem #7 fault.
Bit 4 = No downlink specified for prime modem #8 fault.
Bit 3 = Reserved.
Bit 2 = Reserved.
Bit 1 = Reserved.
Bit 0 = Reserved.

Character “ad”: Modem communications faults character 1.
Bit 6 = 1 always.
Bit 5 = Prime modem #1 communications fault.
Bit 4 = Prime modem #2 communications fault.
Bit 3 = Prime modem #3 communications fault.
Bit 2 = Prime modem #4 communications fault.
Bit 1 = Prime modem #5 communications fault.
Bit 0 = Prime modem #6 communications fault.

Character “ae”: Modem communications faults character 2.
Bit 6 = 1 always.
Bit 5 = Prime modem #7 communications fault.
Bit 4 = Prime modem #8 communications fault.
Bit 3 = Backup modem #1 communications fault.
Bit 2 = Backup modem #2 communications fault.
Bit 1 = Reserved.
Bit 0 = Reserved.

B.3.5.9 Downlink Transponder Option

This command configures the SMS-758 for cabling options that support four or seven downlink transponders. When this option is set to “4”, two backup modems may be specified with four downlinks available to each backup modem. If this option is set to “7”, one backup modem (backup #1) may be specified with seven downlinks available to the backup modem.

Command: `<add/DTO_n”cr”`
Response: `>add/DTO_n”cr””lf”]`

Status Only: `<add/DTO_”cr”`
Response: `>add/DTO_n”cr””lf”]`

Where: n = 4 or 7 (maximum number of downlinks).

Appendix C.
7 DOWNLINK OPTION

This appendix describes the 7 downlink option installed in the SMS-758.

Operation of the switch is basically the same as in 4 downlink/2 backup mode, except that only one backup is used.

Refer to Appendixes A and B for remote control information.

Enclosed is a rear panel sticker for the 7 downlink option that displays the proper rear panel connectors and J-numbers.

To install the 7 downlink sticker:

1. Remove the 10 nuts from the downlink inputs and backup demod outputs.
2. Wipe down the rear panel around the downlink inputs to remove any loose dirt.
3. Remove the backing from the sticker.
4. Place the sticker as shown in Figure 2-1, being sure to smooth out any air bubbles.
5. Replace the 10 nuts on the BNC connectors, being careful not to damage the sticker.

C.1 External Connections

The external connections for the 7 downlink option are slightly different than the standard SMS-758.

Make sure the rear panel sticker supplied with this appendix has been properly installed.

The only connectors that are different are J7 through J16, the downlink inputs, and backup demod outputs.

Table 2-1 lists the connectors for the 7 downlink option operation. All other connectors are the same as described in Chapter 2 of the manual.

The use of each of these connectors is described in the following paragraphs.

Table 2-1. 7 Downlink Option Connectors

Name	Ref. Desig.	Connector Type	Function
D/L SWITCH INPUT	J7	BNC	DOWNLINK SWITCH INPUT
D/L SWITCH OUTPUT	J16	BNC	DOWNLINK SWITCH OUTPUT
DOWNLINK INPUTS	J8 to J10 J12 to J15	BNC	DOWNLINK IF INPUTS
BACKUP DEMOD	J11	BNC	DOWNLINK OUTPUT TO BACKUP DEMOD

C.1.1 D/L Switch Input (J7)

This is the downlink switch input connector. When using the 7 downlink option, connect a cable from J16, D/L Switch Out, to J7, D/L Switch In. This enables downlink inputs 5 through 7.

When the 7 downlink option is not being used, this connector is a downlink input to backup modem 1.

C.1.2 D/L Switch Output (J16)

This is the downlink switch output connector. As described above, when using the 7 downlink option, this connector enables downlink inputs 5 through 7, when connected to J7.

When the 7 downlink option is not being used, this connector is the backup demod #2 output.

C.1.3 Downlink Inputs

These are the downlink input connectors. These connections provide the inputs to the downlink switching matrix.

Connectors J12 through J15 are the downlink inputs 1 through 4.

When the 7 downlink option is being used, connectors J8 through J10 are the downlink inputs 5 through 7.

When the 7 downlink option is not being used, connectors J8 through J10 are downlink inputs to backup modem 1. Downlink inputs that are not being used must be terminated in 75Ω.

C.1.4 Backup Demod (J11)

This is the backup demod output connector. It connects to the backup modem RX IF input.

When the 7 downlink option is being used, there is only one backup demod output.

C.2 Front Panel Operation

Refer to Chapter 3 for front panel operation information.

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