
Milstar Summing Device for Aircraft



User's Manual
Doc. 2AA-00534-0400

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Note: This document makes use of graphics and images depicting the information and operation of the MSD and, as such, the information is to be taken as examples only.

Document Change Revision Log

DOCUMENT REVISION	DATE	DESCRIPTION OF CHANGE	SECTIONS AFFECTED
2AA-00534-0000	05/21/02	New document - Preliminary Version	All
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READ THIS FIRST

Safety Information

Caution
ELECTRICAL SHOCK HAZARD. This equipment is to be serviced by trained personnel only.
DANGER HAZARDOUS VOLTAGES INSIDE. Voltage or current hazard sufficient to cause shock.
The manufacturer requires that the unit be grounded. Ground the unit by attaching a ground wire between a known earth ground and the ground stud of the unit prior to plugging in the unit. Grounding the unit helps protect against damage caused by static voltage buildup and removes the risk of electric shock.
Always plug the power cord into the MSD first. Only after attaching the power cord into the MSD, connect to AC power source and power up the unit.
To avoid the risk of electrical shock, do not remove the cover (or back). There are no user serviceable parts inside. Refer servicing to qualified service personnel. Additionally, opening the unit's cover, changing or modifying the equipment by the user (unless expressly approved by the manufacturer) shall void the warranty.
Warning: To prevent fire or shock hazard, do not expose the unit to rain, moisture or corrosive gases.
Utilize safety precautions when installing the MSD. Follow the power installation directions carefully. The MSD, like other electronics, contains hazardous voltages. Do not attempt to open the MSD to service the unit. There are no user serviceable parts inside the MSD. If a failure occurs, please return through your RMA supply chain.
Operate the unit with the specified voltage. Using the wrong voltage risks fire and electrical shock.
At the first sign of smoke, an unusual smell or other problems indicating breakdown, disconnect external power cords. Continued use risks fire and electrical shock.

Product Description

The Milstar Summing Device – Aircraft version, Telecore part number 2AA-00500, (herein referred to as the MSD) provides Milstar Secure Voice Conferencing in support of the National Command Authority (NCA) mission. A remote MSD feature is available to allow two MSDs to be connected across a fiber optic link. The dual MSD configuration provides a mechanism for expanding switch and net port capacities. The MSD has also been upgraded to support Survivable Emergency Conferencing Network (SECN) Backup operations. This capability allows Milstar Command Consoles (MCC) to connect directly to an MSD in support of backup access to the Milstar network should the primary access through the switch fail. The MSD was further upgraded to incorporate SECN Enhancements features, including switch port and net port redundancy, MCC operator capability, MCC backup path enable/disable, net ports used as switch ports, Enhanced Switch Reporting System (ESRS) reporting, and Information Assurance (IA) safeguards.

The MSD provides a low-cost solution for Milstar secure voice conferencing in support of the National Command Authority (NCA) Mission and has seven primary functions:

- supplement the conferencing abilities of a switch connected to ANDVT Digital Interfaces (ADI),
- provide expandability of switch ports and net ports via use of two MSD units,
- provide remote access to conferences at another MSD,
- provide direct access to Milstar nets from MCCs for backup (or standalone) operations,
- provide MCCs access to MSD databases,
- provide the ability to remote a Call Box from a Terminal Access Controller (TAC), and
- provides two RS-422 Remote Control Head (RCH) ports.

The Milstar network utilizes several Public Automatic Branch Exchanges (PABX). In some cases, the Digital Small Switch (DSS) or Secure Digital Switch (SDS), developed by Raytheon Systems Company is used. In other cases a generic PABX supporting a standard 4W E&M (Ear & Mouth) interface may be used. For aircraft configuration, a Secure Voice Switch Assembly (SVSA) PABX is used, supporting Call/Seize signaling using RS-232 Request To Send/Clear To Send (RTS/CTS) signals with Push-To-Talk (PTT) control. If the SDS or DSS switch is used, then the STU-III/R interface is connected to the MSD for access to the ANDVT via the ADI.

The Milstar Summing Device will reside between the PABX and ADI interfaces. An additional fiber interface exists for purposes of interconnecting two MSDs. The MSD also interfaces directly to the Milstar Call Box, provides speaker outputs, and provides one handset port.

The purpose of the Milstar Summing Device is to integrate seamless operation between a PABX and ADI under various conditions including normal pass through mode and Milstar Conferencing mode.

With the addition of the SECN Backup capability, the MSD, in conjunction with MCC consoles, provides operators the ability to access the Milstar nets directly from the MCC consoles. This capability provides for automatic switchover to the backup path should a failure of the primary path be detected. The failure of the primary path may be either the MCC console link to the Raytheon switch or the switch port interface to the MSD. The SECN Backup capability also allows the MCC operator to use either the primary or backup path as the default path to the Milstar net as well as allowing MCC consoles with a switch interface to access the nets directly via the MSD. *Reference MCC User's Guide (TM-05-001-UG) for MCC console capabilities and operations.*

The following diagrams show typical applications of the MSD.

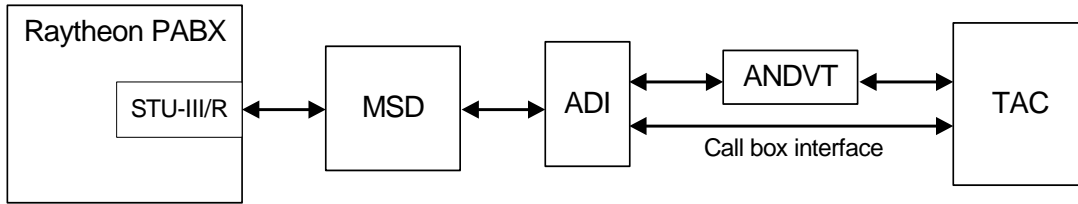


Figure 1: Fixed Site Single MSD Configuration

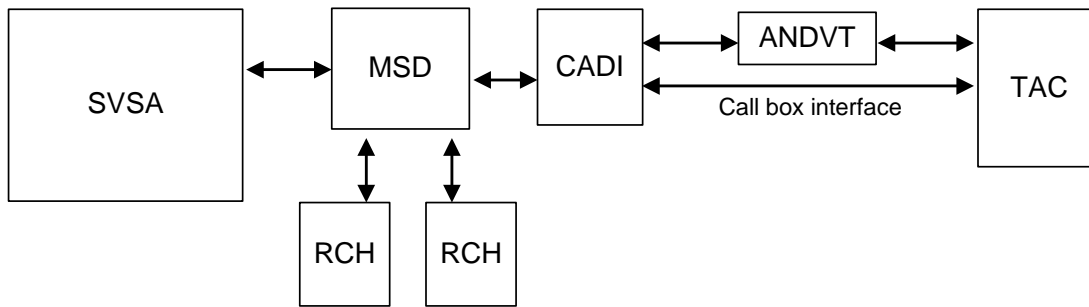


Figure 2: SECN E4 Aircraft MSD Configuration

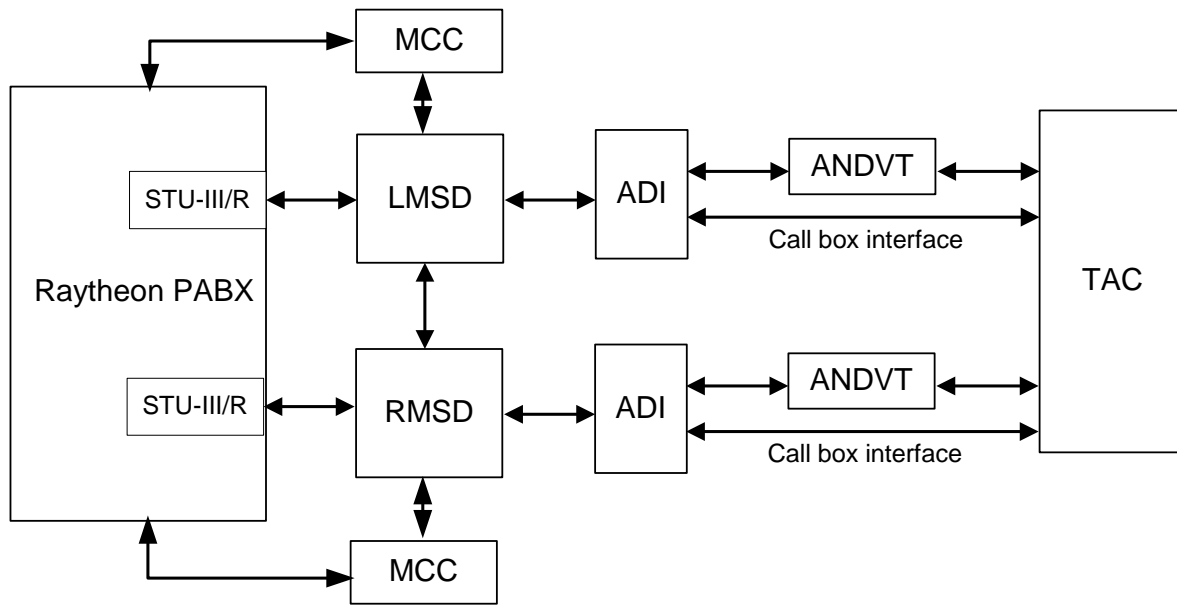


Figure 3: Dual MSD with MCC SECN Backup Configuration

MSD Features

- Ten 4W Audio Channels w/ Adjustable Gain
- Four ADI RS-232 Interfaces
- Six Standard Type II E&M/RS-232 or Four SVSA Interfaces
- Five Speaker Outputs (1W into 8 Ohms)
- Four Call Box Interfaces
- Two RCH Interfaces
- Front Panel LCD and Keypad for local MSD Configuration
- Fiber Optic Link for linking two MSD together

Specifications

Physical Characteristics

The MSD is packaged in aluminum sheet housing that conforms to the outline and dimensions shown in Figure 4 and Figure 5. The overall chassis dimensions of the MSD are 3.47 inches high, 20 inches wide (including aircraft brackets), and 16 inches deep (excluding connectors). The MSD weighs approximately 15 pounds. The MSD has

twelve external connectors distributed at the rear of the unit. Table 1: MSD Rear Panel Connector Definition summarizes the connector names and functions. The MSD is rack mounted with aircraft brackets located at either side of the MSD unit. The brackets are to be installed into PEM nuts on the chassis sides and then properly secured into the aircraft rack.

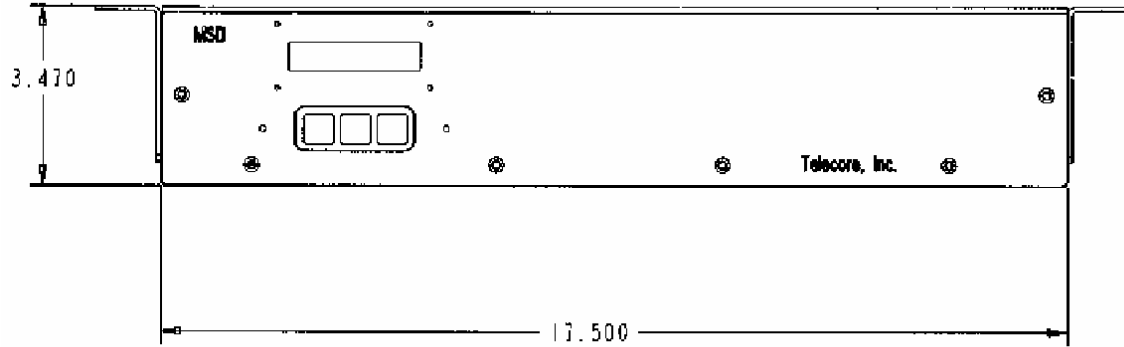


Figure 4: Front View – MSD Dimensions

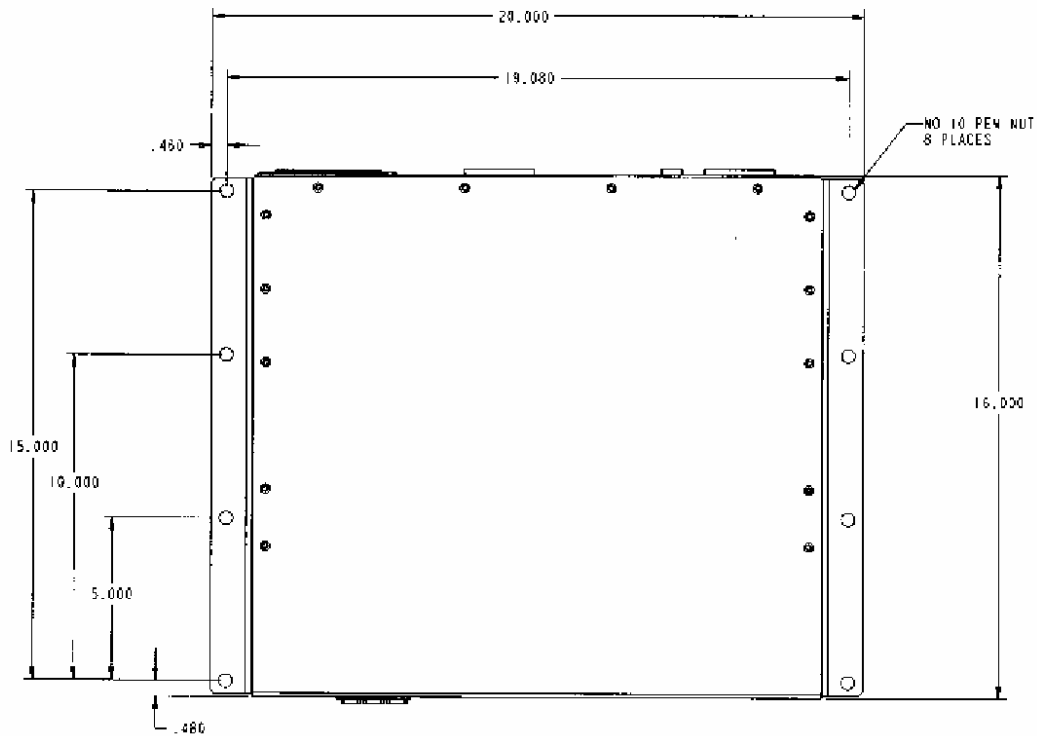


Figure 5: Top View - MSD Dimensions

MSD Front Panel

The MSD Front panel includes a Liquid Crystal Display (LCD) and a keypad interface for MSD setup and control functions. The keypad works in conjunction with the front panel LCD, allowing the operator to use the keypad to select items displayed on the front panel LCD and to subsequently update the MSD configuration database. The menu flow for the LCD is illustrated in the DISPLAY Hierarchy section beginning on page 46.

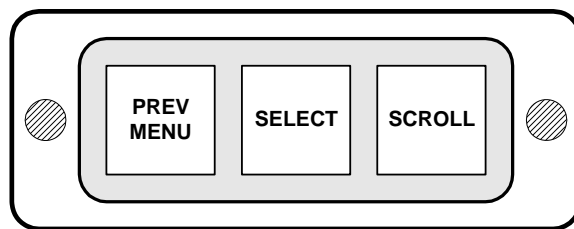


Figure 6: MSD front panel keypad layout.

MSD Rear Panel

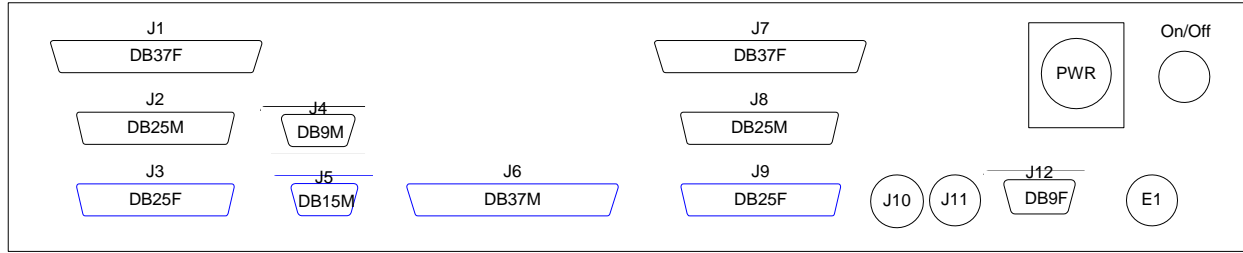


Figure 7: MSD Rear Panel

Connector Designator	Type	Definition
J1	DB-37-F	5 Channels RS-232 Signals (RX, TX, CTS, RTS, GND each) for 4 ADI ports and 1 Switch port
J2	DB-25-M	4 Channels Contact Closure Control Signals for ADI (MPOS, MNEG each)
J3	DB-25-F	4 Channels 4W Audio for ADI (TX+, TX-, RX+, RX- each)
J4	DB-9-M	External Handset Input (RX, PTT, TX, GND)
J5	DB-15-HD-M	5 Channels Speaker (TX+, TX- each)
J6	DB-37-M	4 Channels Call Box Interface
J7	DB-37-F	5 Channels RS-232 Signals (RX, TX, CTS, RTS, GND each) for Switch Interface
J8	DB-25-M	6 Channels 4W E&M Control Signals for Switch Interface (E, SB, E, S each)
J9	DB-25-F	6 Channels 4W Audio for Switch Interface (TX+, TX-, RX+, RX- each)
J10	Optical	Optical Fiber TX Output (850 nm)
J11	Optical	Optical Fiber RX Input (850 nm)
J12	DB-9-F	Ethernet Access
E1	Earth Ground	Earth Ground
PW1	AC Power Input	90-132 VAC, 47-440 Hz Power Input

Table 1: MSD Rear Panel Connector Definition

Power/Electrical Characteristics

The MSD requires a 90-132 VAC, 47 – 440 Hz. power source into connector PW1 and will consume no more than 40W during operation. The MSD power source should be disabled when inserting or removing the PW1 power cable connector. Refer to the Connector Signals section of this document for PW1 pin information.

The earth ground stud (E1) on the MSD rear chassis must be securely connected to a known earth ground source prior to connecting the power cable to the PW1 connector. Grounding the unit helps protect against damage and electric shock caused by input filter ground currents and by static voltage buildup.

Environmental Characteristics

The MSD complies with RTCA DO-160 D under the following criteria:

Table 2: MSD Environmental and Electromagnetic Testing

RTCA DO-160D Section	Paragraph or Category	Description of Test
Physical Environment		
4.5	4.5.1	Ground survival low temperature and operating low temperature
4.5	4.5.2	Ground survival high temperature test and short time operating high temperature
4.5	4.5.3	Operating high temperature
4.6	4.6.1	Altitude
4.6	4.6.2	Decompression
5.0	Category C	Temperature variation
6.0	Category A	Humidity
7.0	Category B	Operational shock and crash safety
8.0	Category S	Standard random vibration
9.0	Category E	Explosion Proofness
Electromagnetic Environment		
20.0	Category U	RF Susceptibility
21.0	Category L	Emissions of RF Energy

Connector Signals

The MSD has twelve external connectors distributed at the rear of the unit and defined in Table 1: MSD on page 7.

- Note:
- All connectors' I/O direction is referenced with respect to the MSD.
 - All description fields labeled "N/C" are not connected internally and will not impair MSD operation in the event an external signal is inadvertently connected.

J1

J1, the ADI Net Port Digital Control Connector provides 5 Channels of RS-232 signals (RX, TX, CTS, RTS, GND each) for the four ADI ports and one Switch port. It is a DB-37 and requires a standard 37 pin D-sub plug type connector for a mate.

Connector J1 (DB37) Net Port Control		
Pin	I/O	Description
1	O	NET-1 RS-232 TX
2	I	NET-1 RS-232 RX
3		GND
4		GND
5	O	NET-2 RS-232 TX
6	I	NET-2 RS-232 RX
7		GND
8		GND
9	O	NET-3 RS-232 TX
10	I	NET-3 RS-232 RX
11		GND
12		GND
13	O	NET-4 RS-232 TX
14	I	NET-4 RS-232 RX
15		GND
16		GND
17	O	Switch Port 6 RS-232 TX
18	I	Switch Port 6 RS-232 RX
19		GND
20	I	NET-1 RS232 CTS
21	O	NET-1 RS232 RTS
22	I	RS-422 Port A TXCLK+
23	I	RS-422 Port A TXCLK-
24	I	NET-2 RS232 CTS
25	O	NET-2 RS232 RTS
26	I	RS-422 Port A RXCLK+
27	I	RS-422 Port A RXCLK-
28	I	NET-3 RS232 CTS
29	O	NET-3 RS232 RTS
30	O	RS-422 Port A TX+
31	O	RS-422 Port A TX-
32	I	NET-4 RS232 CTS
33	O	NET-4 RS232 RTS
34	I	RS-422 Port A RX+

Connector J1 (DB37) Net Port Control		
Pin	I/O	Description
35	I	RS-422 Port A RX-
36	I	Switch Port 6 RS232 CTS
37	O	Switch Port 6 RS232 RTS

Table 3: J1, Net Port Control RS-232C Connector

J2

J2, the ADI Net Port Control connector provides 4 Channels Contact Closure Control Signals for the ADI (MPOS, MNEG each). It is a DB-25 and requires a standard 25 pin D-sub plug type connector for a mate.

Connector J2 (DB25) Net Port Signaling	
Pin	Description
1	GND
2	GND
3	GND
4	GND
5	NET-1 Contact A+
6	NET-1 Contact A-
7	NET-1 Contact B+
8	NET-1 Contact B-
9	GND
10	NET-2 Contact A+
11	NET-2 Contact A-
12	NET-2 Contact B+
13	NET-2 Contact B-
14	NET-3 Contact A+
15	NET-3 Contact A-
16	NET-3 Contact B+
17	NET-3 Contact B-
18	GND
19	GND
20	NET-4 Contact A+
21	NET-4 Contact A-
22	NET-4 Contact B+
23	NET-4 Contact B-
24	GND
25	GND

Table 4: J2, Net Port Signaling Connector

J3

J3, the ADI Net Port Audio connector provides 4 Channels 4-wire audio for the ADI (TX+, TX-, RX+, RX- each). It is a DB-25 and requires a standard 25 pin D-sub receptacle type connector for a mate.

Connector J3 (DB25) Net Port Audio		
Pin	I/O	Description
1		GND
2		GND
3		GND
4		GND
5	O	NET-1 TX+
6	O	NET-1 TX-
7	I	NET-1 RX+
8	I	NET-1 RX-
9		GND
10	O	NET-2 TX+
11	O	NET-2 TX-
12	I	NET-2 RX+
13	I	NET-2 RX-
14	O	NET-3 TX+
15	O	NET-3 TX-
16	I	NET-3 RX+
17	I	NET-3 RX-
18		GND
19		GND
20	O	NET-4 TX+
21	O	NET-4 TX-
22	I	NET-4 RX+
23	I	NET-4 RX-
24		GND
25		GND

Table 5: J3, Net Port Audio Connector

J4

J4, the Handset Interface connector provides the external handset input (RX, PTT, TX, GND). It is a DB-9 and requires a standard 9 pin D-sub receptacle type connector for a mate.

Connector J4 (DB9) Handset Port		
Pin	I/O	Description
1	O	Handset TX
2		GND
3	I	Handset PTT
4	I	Handset RX
5		GND
6		(Do Not Connect)
7		(Do Not Connect)
8		(Do Not Connect)
9		(Do Not Connect)

Table 6: J4, Handset Port

J5

J5, the Speaker Interface connector provides 5 Channels Speaker (TX+, TX- each). It is a high density DB-15 and requires a high density 15 pin D-sub plug type connector for a mate.

Connector J5 (DB9) Speaker Port		
Pin	I/O	Description
1	O	Speaker A Positive
2	O	Speaker A Negative
3		GND
4	O	Speaker B Positive
5	O	Speaker B Negative
6		GND
7	O	Speaker C Positive
8	O	Speaker C Negative
9		GND
10	O	Speaker D Positive
11	O	Speaker D Negative
12		GND
13	O	Speaker E Positive
14	O	Speaker E Negative
15		GND

Table 7: J5, Speaker Port

J6

J6, the Call Box Interface connector provides 4 Channels Call Box Interface. It is a DB-37 and requires a standard 37 pin D-sub receptacle type connector for a mate.

Connector J6 (DB37) Call Box/TAC Port				
Pin	I/O	Call Box Extender Mode, TAC Interface (I/O)	I/O	Call Box Extender Mode, Call Box Interface (I/O)
1	I	Call Box A – Audible Alarm	I	TAC A – Alarm Reset
2	I	Call Box A – CTS Indicator	I	TAC A – RTS Alarm
3	I	Call Box A – RTS Indicator	I	TAC A – RTS
4	I	Call Box A – Call Indicator	O	TAC A – Call Indicator
5	O	Call Box A – Alarm Reset	O	TAC A – Audible Alarm
6	O	Call Box A – RTS Alarm	O	TAC A – RTS Indicator
7	O	Call Box A – RTS	O	TAC A – CTS Indicator
8		Call Box A – RTS Return		TAC A – RTS Return
9		Call Box A – Common		TAC A – Common
10	I	Call Box B – Audible Alarm	I	TAC B – Alarm Reset
11	I	Call Box B – CTS Indicator	I	TAC B – RTS Alarm
12	I	Call Box B – RTS Indicator	I	TAC B – RTS
13	I	Call Box B – Call Indicator	O	TAC B – Call Indicator
14	O	Call Box B – Alarm Reset	O	TAC B – Audible Alarm
15	O	Call Box B – RTS Alarm	O	TAC B – RTS Indicator
16	O	Call Box B – RTS	O	TAC B – CTS Indicator
17		Call Box B – RTS Return		TAC B – RTS Return
18		Call Box B – Common		TAC B – Common
19		-5VDC		-5VDC
20	I	Call Box C – Audible Alarm	I	TAC C – Alarm Reset
21	I	Call Box C – CTS Indicator	I	TAC C – RTS Alarm
22	I	Call Box C – RTS Indicator	I	TAC C – RTS
23	I	Call Box C – Call Indicator	O	TAC C – Call Indicator
24	O	Call Box C – Alarm Reset	O	TAC C – Audible Alarm
25	O	Call Box C – RTS Alarm	O	TAC C – RTS Indicator
26	O	Call Box C – RTS	O	TAC C – CTS Indicator
27		Call Box C – RTS Return		TAC C – RTS Return
28		Call Box C – Common		TAC C – Common
29	I	Call Box D – Audible Alarm	I	TAC D – Alarm Reset
30	I	Call Box D – CTS Indicator	I	TAC D – RTS Alarm
31	I	Call Box D – RTS Indicator	I	TAC D – RTS
32	I	Call Box D – Call Indicator	O	TAC D – Call Indicator
33	O	Call Box D – Alarm Reset	O	TAC D – Audible Alarm
34	O	Call Box D – RTS Alarm	O	TAC D – RTS Indicator
35	O	Call Box D – RTS	O	TAC D – CTS Indicator
36		Call Box D – RTS Return		TAC D – RTS Return
37		Call Box D – Common		TAC D – Common

Table 8: J6, Call Box Connector

J7

J7, the Switch Port Digital Control connector provides 5 Channels RS-232 Signals (RX, TX, CTS, RTS, GND each) for the switch interface. It is a DB-37 and requires a standard 37 pin D-sub plug type connector for a mate.

Connector J7 (DB37) Switch Port Control		
Pin	I/O	Description
1	O	Switch Port 1 - RS-232 TX
2	I	Switch Port 1 - RS-232 RX
3		GND
4		GND
5	O	Switch Port 2 - RS-232 TX
6	I	Switch Port 2 - RS-232 RX
7		GND
8		GND
9	O	Switch Port 3 - RS-232 TX
10	I	Switch Port 3 - RS-232 RX
11		GND
12		GND
13	O	Switch Port 4 - RS-232 TX
14	I	Switch Port 4 - RS-232 RX
15		GND
16		GND
17	O	Switch Port 5 - RS-232 TX
18	I	Switch Port 5 - RS-232 RX
19		GND
20	I	Switch Port 1 - RS-232 CTS
21	O	Switch Port 1 - RS-232 RTS
22	I	RS-422 Port B TXCLK+
23	I	RS-422 Port B TXCLK-
24	I	Switch Port 2 - RS232 CTS
25	O	Switch Port 2 - RS232 RTS
26	I	RS-422 Port B RXCLK+
27	I	RS-422 Port B RXCLK-
28	I	Switch Port 3 - RS232 CTS
29	O	Switch Port 3 - RS232 RTS
30	O	RS-422 Port B TX+
31	O	RS-422 Port B TX-
32	I	Switch Port 4 - RS232 CTS
33	O	Switch Port 4 - RS232 RTS
34	I	RS-422 Port B RX+
35	I	RS-422 Port B RX-
36	I	Switch Port 5 - RS232 CTS
37	O	Switch Port 5 - RS232 RTS

Table 9: J7, Switch Port Control RS-232C Connector

J8

J8, the Switch Port Control connector provides 6 Channels 4-wire E&M control signals for the switch interface (E, SB, E, S each). It is a DB-25 and requires a standard 25 pin D-sub plug type connector for a mate.

Connector J8 (DB25) Switch Port Signaling		
Pin	I/O	Description
1		GND
2	I	Switch Port 1 – M Lead
3	O	Switch Port 1 – Signal Battery
4	O	Switch Port 1 – E Lead
5	Bi	Switch Port 1 – Signal Ground
6	I	Switch Port 2 – M Lead
7	O	Switch Port 2 – Signal Battery
8	O	Switch Port 2 – E Lead
9	Bi	Switch Port 2 – Signal Ground
10	I	Switch Port 3 – M Lead
11	O	Switch Port 3 – Signal Battery
12	O	Switch Port 3 – E Lead
13	Bi	Switch Port 3 – Signal Ground
14	I	Switch Port 4 – M Lead
15	O	Switch Port 4 – Signal Battery
16	O	Switch Port 4 – E Lead
17	Bi	Switch Port 4 – Signal Ground
18	I	Switch Port 5 – M Lead
19	O	Switch Port 5 – Signal Battery
20	O	Switch Port 5 – E Lead
21	Bi	Switch Port 5 – Signal Ground
22	I	Switch Port 6 – M Lead
23	O	Switch Port 6 – Signal Battery
24	O	Switch Port 6 – E Lead
25	Bi	Switch Port 6 – Signal Ground

Table 10: J8, Switch Port Type II E&M Connector

J9

J9, the Switch Port Audio connector provides 6 Channels 4-wire audio for the switch interface (TX+, TX-, RX+, RX- each). It is a DB-25 and requires a standard 25 pin D-sub receptacle type connector for a mate.

Connector J9 (DB25) Switch Port Audio		
Pin	I/O	Description
1		GND
2	O	Switch Port 1 – TX+
3	O	Switch Port 1 – TX-
4	I	Switch Port 1 – RX+
5	I	Switch Port 1 – RX-
6	O	Switch Port 2 – TX+
7	O	Switch Port 2 – TX-
8	I	Switch Port 2 – RX+
9	I	Switch Port 2 – RX-
10	O	Switch Port 3 – TX+
11	O	Switch Port 3 – TX-
12	I	Switch Port 3 – RX+
13	I	Switch Port 3 – RX-
14	O	Switch Port 4 – TX+
15	O	Switch Port 4 – TX-
16	I	Switch Port 4 – RX+
17	I	Switch Port 4 – RX-
18	O	Switch Port 5 – TX+
19	O	Switch Port 5 – TX-
20	I	Switch Port 5 – RX+
21	I	Switch Port 5 – RX-
22	O	Switch Port 6 – TX+
23	O	Switch Port 6 – TX-
24	I	Switch Port 6 – RX+
25	I	Switch Port 6 – RX-

Table 11: J9, Switch Port Audio Connector

J10

J10, the REM Port provides and optical fiber TX Output (850nm) and requires a fiber SMA connector for a mate. This Fiber Optic transmit interface which consists of a ST multimode, short reach, fiber optic transmitter is capable of driving 5000 feet of fiber optic cable. The transmitter is intended for use with 62.5/125 μ m multi-mode fiber. The nominal output power of the fiber optic transmitter is –17 dBm.

J11

J11, the REM Port provides and optical fiber RX Output (850nm) and requires a fiber SMA connector for a mate. This Fiber Optic receive interface consists of a ST multimode fiber optic receiver. The input sensitivity of the receiver is –23 dBm. This provides a fiber optic power budget between transmitter and receiver of 6 dB, using 62.5/125 μ m multi-mode fiber.

J12

J12, the Ethernet Interface is access for software development and support. It is a DB-9 and requires a standard 9 pin D-sub receptacle type connector for a mate and standard 8 pin Ethernet CAT-5 cable.

Connector J12 (DB9) 10/100 Ethernet Port	
Pin	Description
1	TX Data+
2	TX Data-
3	RX Data+
4	GND (Termination)
5	GND (Termination)
6	RX-Data-
7	GND (Termination)
8	GND (Termination)
9	(N/C)

Table 12: J12, 10/100 Ethernet Port

AC Power Connector

The AC power connector on the MSD is a circular MIL type connector nominal 115 VAC, 47-440 Hz. A 4 foot AC power cable is supplied with the unit.

Connector PW1 (Circular) AC Power		
Pin	I/O	Description
A	I	Voltage
B		Chassis Ground
C	I	Neutral

Table 13: PW1, AC Power Input

Interfaces

By default, the MSD has six switch interfaces, four ancillary net interfaces, a fiber interface, five speaker port interfaces, two RCH interfaces and a handset interface. Each of the switch side interfaces will support 4-wire E&M signaling interfaces, transmit/receive audio interfaces, and RS-232C control interfaces. The RS-232C control interfaces consist of both RX/TX asynchronous data signals and RTS/CTS control signals. Each of the ancillary side net interfaces will support M-lead contact closure (used to configure the ADI mode), transmit/receive analog interfaces, and RS-232C control interfaces. On the switch side, all switch interface types will use the audio interfaces; however, different switch/interface types will use different control interfaces. There are four basic interface type configurations: the RS232 Raytheon switch, 4-Wire PABX, the SVSA PABX and the MCC consoles. A given Raytheon switch will use the RS-232 control interfaces. A generic PABX will use 4-wire E&M interfaces. The SVSA PABX will use RS-232 RTS/CTS interfaces along with Call Box interfaces for PTT. The MCC console uses the RS-232 control interfaces. There are two RS-422 interfaces which may be configured to interface with up to two Remote Control Heads or as a Remote Port to another MSD.

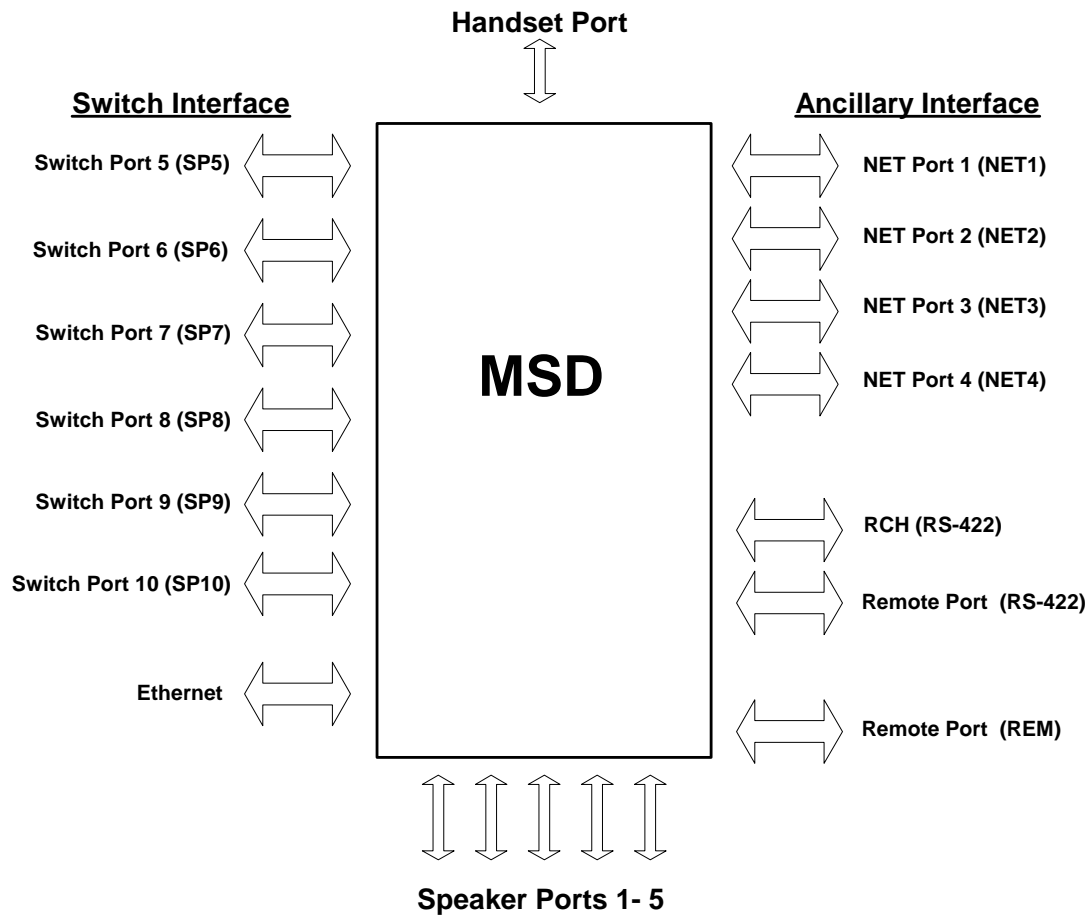


Figure 8: MSD Interfaces

Switch (and Console) Interfaces

On the switch side, the MSD may be connected to a Raytheon DSS or an SDS switch, an SVSA PABX, a generic PABX or an MCC console. Each of the six switch port interfaces can be set up for interface types independently. All audio is passed via the balanced transmit and receive analog interfaces. If connected to a DSS/SDS, the MSD will use an RS-232C interface (TX data, RX data, RTS and CTS signals) as a control port; the corresponding 4-wire E&M interface will not be used. If connected to a generic PABX, the MSD will use a 4-wire E&M interface as a control port; the corresponding RS-232C interface will not be used. If connected to an SVSA PABX, the MSD will use the RS-232 RTS/CTS signals for “Call and Seize” signaling and the call box interface as a PTT detect as control signals; the corresponding 4-wire E&M interface will not be used. If connected to an MCC console, the MSD will use an RS-232C interface as the control port; the corresponding 4-wire E&M interface will not be used.

Ancillary Interfaces

On the ancillary side, the MSD may be connected to an ADI, a Terminal Access Controller (TAC), or a Call Box.

ADI Interface (Net Ports)

If the MSD is connected to an ADI, the MSD will use the RS-232 ports for control. All audio is passed via the four-wire analog interfaces. The MSD supports two general-purpose M-Lead contact closure circuits for each of the four Net ports; these circuits are provided to interface and configure the ADI net circuits.

Call Box Interfaces

The MSD provides four call box interface circuits. The call box interface can be configured to support one of two interface types: (1) Call Box or (2) Terminal Access Controller (TAC).

When the MSD is configured for the Call Box Extender mode of operation, the interface type can be selected as TAC or Call Box. The interface type selection corresponds to the equipment that should be connected to the MSD call box interface (i.e. if a TAC interface is selected, the MSD should be connected to a Terminal Access Controller; or if the call box interface is selected, the MSD should be connected to a Call Box).

If the MSD call box interface is connected to the ADI call box emulation port, the ADI Callbox Signal Converter (Telecore P/N 2AA-00080-00) must be placed in series between the MSD connector J6 and the ADI callbox emulation port.

Note: If the 2AA-00080-00 signal converter box is not connected between the MSD J6 port and the ADI Call Box port, the MSD Call Box Interface will not function.

Remote Interface (Fiber)

The MSD contains a fiber optic link that functions as a remote (REM) port, allowing two MSD units to be optically connected where one MSD may be remotely located. The fiber optic ports consist of a separate transmit and receive optic interfaces that are each SMA type connectors designed for 850 nm fiber cable. The Remote MSD (RMSD) will recover timing from the fiber optic link and all voice/data on the remote MSD unit will be synchronous to the Local MSD (LMSD) unit.

Remote Interface (RS-422 Interface)

The MSD has two RS-422 connections. Previously, these ports were used solely for connectivity to the RCH. Because of the need to distinguish between an MSD failure and a fiber link failure during port redundancy

processing, the MSD uses one of these RS-422 ports to connect to the other MSD. If either the fiber link fails or the RS-422 link fails, each MSD will assume that the other MSD is still functional; if both fail, each MSD will assume that the other MSD has failed.

Speaker Interface

Five speaker interfaces are provided to allow summed audio from various 4-wire audio interfaces to be presented over a self-powered speaker. The speaker interface is designed to provide 1 W power into an 8 Ω load.

Handset Interface

The MSD supports one external handset input device. The circuit is designed to support a military style handset compatible with the H250 signal interface specifications, including Push-to-Talk (PTT) detection.

RCH Interface (RS-422 Interface)

A typical connection diagram between the MSD-Aircraft and the RCH control unit is shown in Figure 9: T.

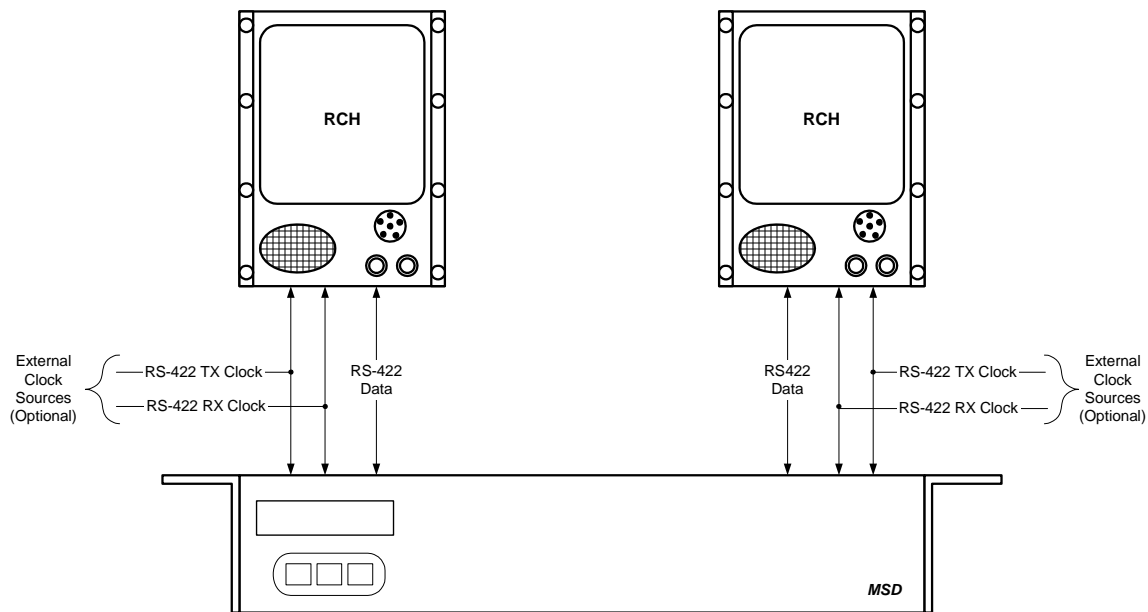


Figure 9: Typical connection between the MSD and the RCH

The MSD will support up to two RCH units allowing two remote stations simultaneous access to one specific MSD. The control link between the RCH and the MSD is an RS-422 link implementing a point-to-point (PPP) protocol data control channel. The MSD and RCH provide optional differential inputs for RS-422 transmit and receive clocks for synchronous operation; otherwise the RS-422 link will operate asynchronously between the MSD and RCH. The MSD may also be connected to up to four RCH-PCs via an Ethernet LAN. If configured appropriately, the MSD may connect to the RCH units via an Ethernet LAN, as well. Combinations of RCH units and RCH-PCs connecting either via RS-422 or via a LAN are configurable for up to 4 connections. For additional information

regarding MSD-RCH system functionality, please refer to the Telecore document 2AA-00634, Remote Control Head User's Manual.

NTP Interface

The MSD will interface to an external network time server to ascertain the current time. This is done using Network Time Protocol (NTP), which will report time in universal coordinated time (UTC). The MSD will receive universal datagram packets (UDP) from the time server.

TP Interface

The MSD will interface with the Telemetry Processor (TP), an ESRS system to report call activity and link status information. This interface will be via a Transport Layer Security (TLS) socket using a Raytheon proprietary interface.

Cable Diagrams

Cable diagram information is included for reference to aid installation. Please refer to the following for relevant cabling information. Note that a second RCH is optional.

MSD to RCH Wiring Diagram

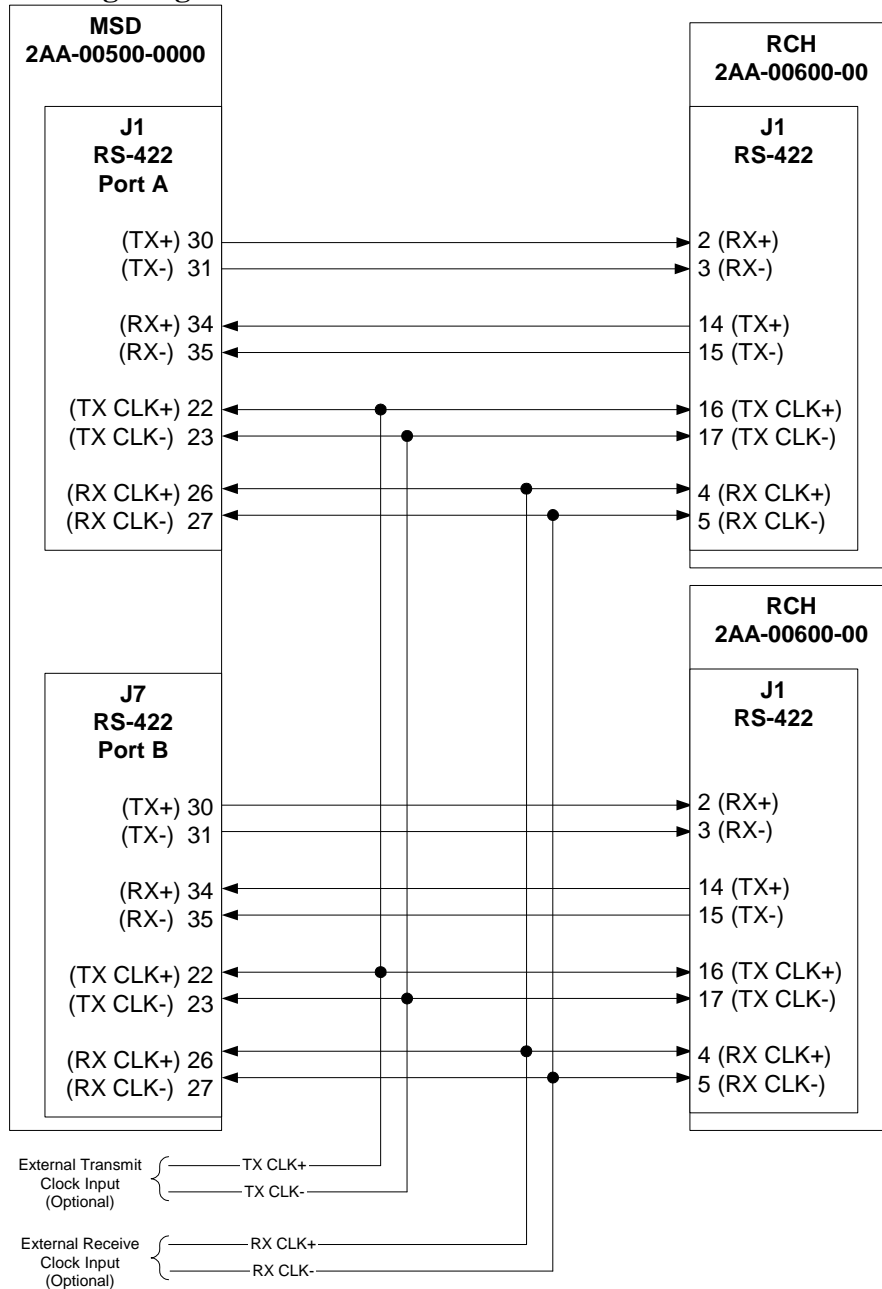


Figure 10: Typical MSD to RCH Cable Wiring Diagram

Configuration

The MSD may be configured from the front panel using the front panel display and the three selection buttons. The MSD may also be configured from the RCH or the MCC. The MSD configuration selections are stored in non-volatile RAM on the MSD to prevent reconfiguration if there is an unexpected power loss.

MSD Modes

The MSD has three operational modes: NCA, Remote, and Call Box Extender. In NCA mode the MSD will interconnect a generic PABX, an SVSA PABX or a Raytheon switch to an ADI Milstar net while providing conferencing capabilities. The NCA mode also supports SECN Backup operations whereby an MCC console's auxiliary port connects to the MSD switch port to provide direct access to the ADI Milstar net. In Remote mode, a second MSD configured as "Remote" will provide remote access to the interconnections and conferences provided by the local MSD that is in NCA mode. The Remote MSD (RMSD) essentially provides additional switch ports, net ports and speaker ports, effectively doubling the port capacity of a single MSD unit. The Local MSD (LMSD) is still configured as an NCA MSD mode and serves as the controlling MSD. MCC consoles can also provide SECN backup operations when connected to either a LMSD or a RMSD. In Call Box Extender mode, a pair of MSDs will provide the capability to remote a call box from a TAC. See Figure 12 for an illustration of MSD connectivity and modes.

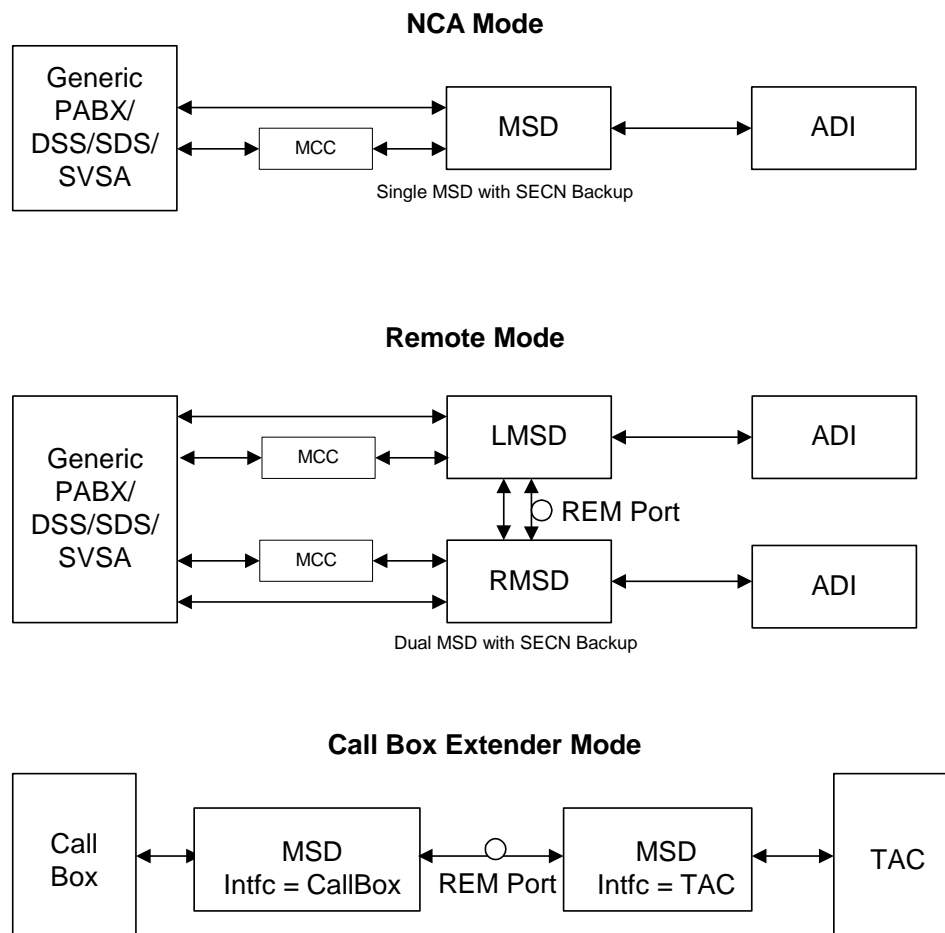


Figure 12: MSD Operational Modes

The MSD default mode is the NCA mode. Once the operational mode is selected, the pertinent interfaces may be configured. Configuration items that had been set in a previous mode and have no bearing in the new mode (e.g. speaker port configurations in call box mode) will be unchanged. If the mode is then changed back to the earlier mode, the previous settings will remain in effect. If a mode is changed, the MSD will undergo a reset cycle.

The following table identifies the valid configuration items for each mode and identifies where the data is entered.

Table 14: MSD Configuration Items

CONFIGURATION ITEMS	LEVEL	CONFIGURATION VALUES	DEFAULT	DATA ENTRY CSCI*
Operational Mode	MSD	NCA Remote Call Box	NCA	MSD MCC**
NCA Standalone Db ID	MSD	0	0	MSD
MSD Name	MSD	21-character string	“L-MSD NCA”	MCC
IP Address	MSD	Any valid IP address	192.168.0.120	MSD
CDH Enabled	MSD	Enabled Disabled	Disabled	MSD RCH MCC
Status (Error) Reporting	MSD	Enabled Disabled	Disabled	MSD RCH MCC
TP IP Address	MSD	Any valid IP address	None	MSD RCH MCC
NTP IP Address	MSD	Any valid IP address	None	MSD RCH MCC
PIN	MSD	6-10 character string from the following character set: "23456789ABCDEFGHJKLMNPRSTU"	“222222”	MSD
Password**	MSD	8-80 characters	“telecore”	MSD
Site Name	MSD	21-character string	NULL	MCC
Primary	MSD	1 = Primary terminal 2 = Backup terminal	1	MSD
RS-422 Port Configuration	Individual RS-422 Port	None MSD RCH	None	MSD
Local NCA Mode/ Remote Mode:				
Config Code	MSD	4-digit string	“1234”	RCH MCC
Handset	MSD	Disabled Enabled	Disabled	MSD
No-answer ring timeout	MSD	0-60 seconds (5-second increments)	0 (no time out)	MSD

MELP Boost	MSD	0-25	4	MSD RCH MCC
SAL String	MSD	16-character alpha-numeric string	“Milstar Backup”	MSD command line
Interface Type	Individual Port	Net (Ports 1-4) RS-232 (1-10) 4-wire (5-10) SVS-A (5-8) MCC-L (1-10) MCC-F (1-10)	Net (Ports 1-4) RS-232 (5-10)	MSD RCH MCC
Service Flag	Individual Port	In-service Out-of-service	In-service	MSD RCH MCC
Operator	Individual Port (MCC)	True False	False	MSD RCH MCC
Switch Port Connectivity	Individual Switch Port (Non-MCC)	Net Port(s) (TX, HDX, RX, Monitor) Switch Port(s) (RX, Monitor)	None configured	MSD RCH MCC
Cipher Code**	Individual Switch Port (MCC only)	4-digit numeric string	‘0000’	MSD (Reset) MCC
Redundancy	Individual Port	Primary Backup	Primary	MSD RCH MCC
Redundant Partner	Individual Port	Port number	None	MSD RCH MCC
Port Volume Adjustments	Individual Switch Port/Net Port	TX Volume (0-25) RX Volume (0-25)	12 (0 dB) 12 (0 dB)	MSD RCH MCC
RX VOX	Individual Switch Port/Net Port	Disabled Enabled	Disabled	MSD RCH MCC
Talk Threshold	Individual Switch Port/Net Port	0-23	8	MSD RCH MCC
Mute Threshold	Individual Switch Port/Net Port	0-23	1	MSD RCH MCC
Hold Time	Individual Switch Port/Net Port	0-9	1	MSD RCH MCC

Voice Messaging	Individual Switch Port	Enabled Disabled	Disabled	MSD RCH MCC
Precedence	Individual Switch Port (non-MCC)	1-20	1	MSD RCH MCC
PTT Override	Individual Switch Port (SVS-A only)	Enabled Disabled	Disabled	MSD RCH MCC
Switch Port Name	Individual Switch Port	6-character string	“L-SPx”, where x is the port number	MCC RCH
DTMF Enable	Individual Switch Port (4-wire only)	Enabled Disabled	Enabled	MSD RCH
Net Port Incoming Call Switch Port(s)	Individual Net Port	Switch Port(s)	None	RCH MCC
Net Port Status Destination	Individual Switch Port (non-MCC)	Switch Port	None	MSD RCH MCC
Net Name	Individual Net Port	6-character string	“L-NETx”, where x is the port number	RCH MCC
Speaker Port Connectivity	Individual Speaker Port and Operator	Net Port(s) Switch Port(s) Operator	None configured	MSD RCH MCC
Speaker Port Volume	Individual Speaker Port	0-25	12 (0 dB)	MSD RCH MCC
Speaker Port Name	Individual Speaker Port	6-character string	“L-Spkrx”, where x is the port number	RCH MCC
Config Code	MSD	4 to 21-character digit string	“1234”	RCH MCC
ANI Re-scroll Period	MSD	2-7 seconds	3 seconds	MSD
ADI Callbox Signal	Individual Net Port	Enable Disable Ignore	Ignore	MSD RCH MCC
ADI Voice Prompt	Individual Net Port	Enable Disable Ignore	Ignore	MSD RCH MCC
Call Box Extender Mode:				
Interface Type	MSD	TAC Call Box	TAC	MSD

* Note: The RCH/RCH-PC will be able to configure only those ports on the MSD to which it is connected.

**** NCA or Remote only**

General Configuration

NCA/Remote Mode

The typical single MSD NCA configuration will support up to four ADI or Cryptographic ANDVT Digital Interface (CADI) interfaces through the J1, J2, and J3 connectors. A dual MSD NCA configuration will support four additional ADI/CADI interfaces. The MSD NCA mode will support three types of switch interfaces to the PABX: (1) RS-232, (2) 4W E&M, and (3) SVSA. The switch port audio is always 4-wire and is provided on MSD connector J9. The switch port signaling is provided on MSD connector J6, J7 or J8, depending which interface type is selected. The MCC console port interface also uses a switch port audio interface along with a switch port RS-232 control interface. A single MSD configuration supports up to 10 PABX switch/MCC console ports while a dual MSD configuration supports up to 20 PABX switch/MCC console ports. The LMSD and RMSD for a dual MSD configuration are linked via the J10/J11 fiber interface.

RS-232 Interface

Each RS-232 interface consists of TX and RX data signals and RTS/CTS control signals. The NCA RS-232 interface type is used when the MSD (either LMSD or RMSD) is connected to a proprietary Raytheon SDS or DSS PABX. The MSD J1 and J7 connectors provide up to six switch port RS-232 interfaces that will typically connect to STU-III/R interface boards located in the Raytheon DSS to SDS switching systems. For SECN Backup this control interface is also used to connect to the MCC Auxiliary Port connector J4.

4 Wire E&M PABX Interface

The NCA 4W (4-wire) E&M interface type is used when the MSD is connected to a generic PABX. The MSD J8 connector provides up to six 4W E&M Type II interfaces that can be used to provide signaling between the MSD and a generic PABX.

SVSA PABX Interface

The SVSA interface type is used specifically for the MSD to SVSA PABX interface. The signaling format between the MSD and SVSA is “Call and Seize” using the RS-232 RTS and CTS signal leads and is provided by the MSD on connector J7. In addition, a manual PTT control from the SVSA is routed to MSD connector J6 and is used to simulate an RTS signal. Figure 10 herein provides the required wiring.

In the NCA-SVSA interface, only four switch ports (SP5 – SP8) are available.

Note: the SVSA interface type was designed specially for the SECN E4 airborne application and should not be used for fixed site applications.

Callbox Extender Mode

The Callbox Extender mode provides a means to remotely locate a Callbox from the TAC via the MSD over a fiber optic link. When the Callbox mode of operation is selected, the user can choose between a TAC or Callbox interface type. The interface type should be chosen according to the type of instrument that the MSD is connected to (i.e. if a TAC interface is selected, the MSD should be connected to a Terminal Access Controller; or if the Call Box interface is selected, the MSD should be connected to a Call Box). In addition, the handset port (J4) is always active and will provide a communication path between the two MSD units.

SECN Backup Operations

The SECN Backup capability provides MCC consoles a means for an MCC operator to have backup path access to the NCA Milstar nets. Should a failure occur in the primary path (either in the link connecting the MCC to the switch or the link connecting the switch STU-III/R interface to the MSD), the MSD will automatically re-route the

call to the backup path (via the MCC auxiliary port connection to the MSD). Line buttons are assigned at the MCC console to have switch port associations for backup access. The MCC console backup path access will retain the same operator control capabilities as was available on the primary path for a given switch port (providing MCC operators on the backup path the same control of nets as was available from the associated switch port). Furthermore, if multiple MCC operators are active on a given switch port and the switch port to MSD link fails, the MSD will re-route the primary audio of all operators and provide appropriate conferencing to retain the original switch port connections for all operators. In addition, MCC operators are given the capability to directly use the backup path (rather than the primary path) as their access to the Milstar nets (with or without a primary link). Consequently, standalone (without a switch) MCC operations are also supported

Handset Operations

The MSD provides special operational capabilities when the handset of either the LMSD or the RMSD is enabled. If the handset is enabled at the LMSD, all non-MCC LMSD switch ports are disabled and handset audio/control replaces the last non-MCC off-hook switch port audio/control and serves as the controller of the configured net. If the handset is enabled at the RMSD, then (1) all non-MCC switch ports are disabled on the RMSD and (2) when a non-MCC switch port on the RMSD goes off-hook, the remote handset audio/control replaces the corresponding LMSD switch port audio/control and serves as the controller of the configured net. Note: this only applies to switch ports having corresponding non-MCC switch port matches. In addition, the handset interfaces, if not otherwise enabled at either the LMSD or RMSD will provide handset-to-handset communications between the two units. The figure below illustrates the configuration for special handset operations.

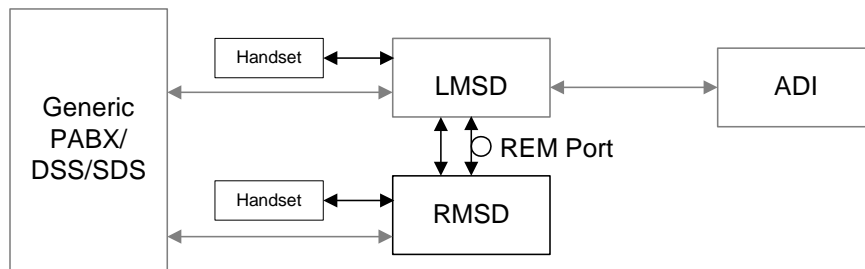


Figure 13: Configuration for Handset Operations

Detailed Configuration

NCA/Remote Mode

While the MSD is configured in NCA or Remote mode, all switch, ancillary, speaker, and handset ports are enabled and configurable. In NCA/Remote mode, the MSD will provide audio connectivity including conferences (audio summing). Conferenced audio will be available for each switch port, and speaker port. The NCA conferences will be based upon the configurations of the switch and speaker ports. The handsets, remote and local, will simply replace the selected switch port in its connectivity using the switch ports' configurations, if enabled. To maintain MCC Backup connectivity, summing of switch port and MCC console port audio may occur to retain original connectivity to the Net port. Although each switch ports will support conferencing, by selecting a single Net port, there may be a simple pass through connection. The following paragraphs will detail the NCA/Remote mode configuration items.

In NCA/Remote mode the interface type of ports will be configurable. By default, ports 1-4 are Net and ports 6-10 are RS-232. Only ports 1-4 are configurable as Net. However, ports 1-4 may be configured for RS-232, MCC-L and MCC-F if configured contiguously. For example, ports 1-3 could be configured as Net and port 4 as RS-232 or ports 1-2 could be configured as Net with port 3 as MCC-F and port 4 as RS-232. Interface ports must be placed out-of-service prior to configuring the interface type.

The interface port type may be configured for Net, RS-232, 4-wire E&M, SVSA, MCC-L or MCC-F according to the following table.

Port	Net	RS-232	MCC-L/F	SVSA	4-Wire
1	x	x	x		
2	x	x	x		
3	x	x	x		
4	x	x	x		
5		x	x	x	x
6		x	x	x	x
7		x	x	x	x
8		x	x	x	x
9		x	x		x
10		x	x		x

Table 15: Supported Interface Types

Both MCC-L and MCC-F configurations are used for SECN Backup MCC operations; the distinction between MCC-L and MCC-F is that MCC-L provides "limited" operator capabilities while MCC-F provides "full" operator capabilities. Essentially, the MCC-L operator is not provided a SECN status screen, as is provided to the MCC-F operator, offering extensive switch and net port operational status and direct net port controls.

Note: The SVSA switch port interface was designed specifically for the SECN E4 application and is not used for Milstar fixed site applications.

Audio Connectivity

In configuring the connectivity for a specific switch port (referred to herein as the controller), the first item will be the Net port or ports that it will control. A controller switch port may select up to 4 Net ports (single MSD) or up to 8 Net ports (dual MSD). Then for each Net port selected the connection type must be selected. The selection types will include receive (RX), receive without control or monitor (MON), transmit (TX), and half-duplex (HDX). All active Net ports will have their audio conferenced and output back to the switch port (when the switch port is active)

or the handset when the switch port is selected and the handset is enabled. All Net ports selected as TX and HDX will transmit the audio coming into the MSD from the switch port out the Net port.

A given Net port may be defined for use by several switch ports with different connectivity levels (TX, RX, MON, or HDX). The actual connectivity will be determined when the Net port is needed for use.

Once the Net port selections have been made, other switch ports may be selected for the controller switch port. The switch ports may be configured as either RX or monitor without control. If a switch port is configured as RX, when the controller switch port goes off-hook, the configured switch port will be sent an off-hook signal—if it is on-hook. If a switch port is configured as monitor, no off-hook signal will be sent; however, when both switch ports are off-hook, the audio connection will be established. When other switch ports are selected in this manner, they will serve as advisory ports. When a switch port is configured for another switch port's conference, the switch port will only transmit into the controller's conference and not receive the output of the conference. This other switch port may also be the controller of other Net port(s) and may also have other inputs from other switch ports. By placing a given switch port in another switch port's conference and that switch port in the given switch port's conference two-way audio between the two switch ports may be established.

Figure 14, NCA Mode Sample Configuration, illustrates a possible configuration for switch ports 5 and 6. In the example shown, SP5 is a controller with Net 1 configured as HDX, Net 2 as RX and SP6 (either monitor or receive). SP6 is acting as an advisory port to SP5. Also, SP6 is controller of Net 2 and has Net 1 configured as monitor only (no control by SP6), and SP5 configured as an advisory port. Only one switch port may control a Net port when that Net port is configured as half-duplex, but other switch ports may monitor that Net port audio if they are configured as monitor. Net ports configured as RX may be shared and have shared control by multiple switch ports.

Switch Port/Net Port Audio Adjustments

In addition to the selection of other ports, the audio of each switch port may be adjusted individually. Each switch port will allow for the individual adjustment of RX VOX and volume.

RX VOX is, by default, disabled. If RX VOX is enabled or view only, there are three configurable parameters: mute threshold, talk threshold, and hold time. The mute and talk thresholds have a range of 0 to 46 dB, changeable at 2 dB increments. When increasing the mute threshold, if the mute threshold exceeds the talk threshold, the talk threshold is automatically increased to match the mute threshold. In the reverse direction, if the talk threshold is lowered below the mute threshold, the mute threshold is automatically decreased to match the talk threshold. The hold time has a range of 100-1000 milliseconds with 10, 100 milliseconds steps. The default is 500 milliseconds—half a second.

The volume, or gain, is controllable over a range of -39dB to 39dB at 3 dB increments. The default volume setting is unity gain (+0dB).

The audio for each Net port is also individually configurable. The audio adjustments for Net ports include RX VOX and volume. The Net port audio adjustments are identical as those for switch port

Connectivity/Control

The Net port's connectivity is determined by the switch ports' configurations; there is no separate ability to configure the Net port connectivity.

The ability to accept incoming calls on a Net port is, by default, disabled. Incoming calls with alarm and without alarm may be enabled separately or as a pair. For a particular Net port, a switch port (which must already be configured to control this Net port), may be selected to receive all incoming calls, calls with alarm, or calls without alarm. If either of the last two options is selected, then the other call type may be routed to another switch port. If no switch port is selected for a call type, the call will not be routed - except perhaps to one or more speakers. In order to change the configuration for a switch port to no longer control a Net port, the Net port configuration must be changed such that incoming calls from that Net port are no longer routed to the selected switch port.

Each of the five speaker ports are configured individually by selecting which audio sources that are to be summed and output to the each speaker. For each speaker port, any or all switch ports may be selected, and any/all Net ports may be selected. The selected switch and Net ports' audio will be summed and provided to the speaker. If an incoming call is received at a Net port and a speaker port is configured with that Net port, the audio from the Net port will be routed to the speaker (or speakers) even without a controlling switch port. For a dual MSD configuration, the remote five speaker ports can be configured in a similar manner for summing selected switch and Net port audio.

When configured for a dual MSD configuration in NCA mode, the LMSD is set for NCA mode and the RMSD is configured for Remote mode. The two MSDs are linked together via the fiber optic REM port and an RS422 serial port. When the REM port is connected, all audio from each switch port, Net port, and handset port will be routed over the REM port to the other, connected MSD. Additionally, control messages will be routed between the two MSDs over the REM port. The NCA LMSD will serve as the main controller of connectivity/conferencing in the dual MSD configuration while the RMSD will be limited to localized interface processing and localized audio summing. Each MSD will maintain the configuration/status for the ports that are connected to it. Upon startup, each MSD will systematically send its configuration and status to the other. As soon as the RMSD sends its port status to the LMSD, it will relinquish the control/arbitration to the LMSD and forward its port status changes to LMSD. As soon as the LMSD receives the port status from the RMSD it will assume control of the RMSD ports. Should the fiber optic REM port link and the RS422 port link fail or be disconnected, each MSD will consider all ports on the "other" MSD as failed. Each MSD will then clear any connections with the "other" MSD and any other local,

relinquished Net ports will be re-allocated, if possible. Each MSD will assume control of its own ports and report the failure to any connected RCH and MCC consoles, including marking the other MSD ports as failed. Each MSD will assume that the other MSD is operational and only the link is failed. In general, connections that were active in the primary path will be maintained. The exception to this is when the primary path is on the other MSD, the backup is on the local MSD and the single controlled Net port is on the local MSD. A switchover will be forced to ensure connectivity between an MCC user with backup access and the Milstar network.

Switch Port/Net Port Redundancy

When appropriately configured, Nets and/or switch ports may provide redundancy. In the case of switch port redundancy, the redundancy is an alternate link to the same switch. For net port redundancy, there is a redundant string of equipment including baseband/terminal.

Of the redundant pair of interfaces, one is the primary and is preferred for use over the redundant. In the event of a failure of either the link or the device to which the interface is connected, the redundant is placed into use. A failover will happen without user intervention. The primary contains all non-audio-related configuration. The audio-related configuration is port specific.

SECN Backup Capabilities

The SECN Backup capability provides MCC console operators backup access to Milstar network whenever there is a failure detected in the primary path. This capability entails coordinated re-route switching and conferencing by the MSD in conjunction with MCC consoles to provide automatic switchover to use a backup path. The primary path of an MCC console involves its UDLT link to the Raytheon DSS/SDS switch with an internal switch connection to a STU-III/R interface connected to a MSD switch port. A failure detected in either the UDLT link connecting the MCC to the switch or a failure in link connecting the switch STU-III/R interface to the MSD switch port constitutes a primary path failure. The backup path is a direct connection from the MCC console's auxiliary port to an MSD switch port. An MCC console line button is configured within the MCC to have an MSD switch port association. One or more such associations can be made. For backup line calls, the MCC console is provided the same Milstar access and controls as is available on the primary path involving the associated MSD switch port. Switchover to the backup path will occur automatically for an active primary path call upon detection of a primary path failure. Also subsequent incoming and outgoing Milstar calls will be made using the backup path while the failure persists in the primary path. Manual switchover to the backup path is also available to the MCC console.

Figure 15 below illustrates typical primary path connections within the switch and MSDs involving MCC consoles and a Milstar net. MCC-A auxiliary port is connected to the RMSD SP10 (RSP10). MCC-A and MCC-B each have a line button association with to LMSD SP5 (LSP5). MCC-A and MCC-B are conferenced in the DSS/SDS switch and connected via STU-III/R interface LSP5. MCC-C is connected via the DSS/SDS and a STU-III/R interface to LSP6. LSP5 is configured in the LMSD for LNET1 as HDX and LSP6. LSP6 is configured for LSP5 and LNET1 as monitor.

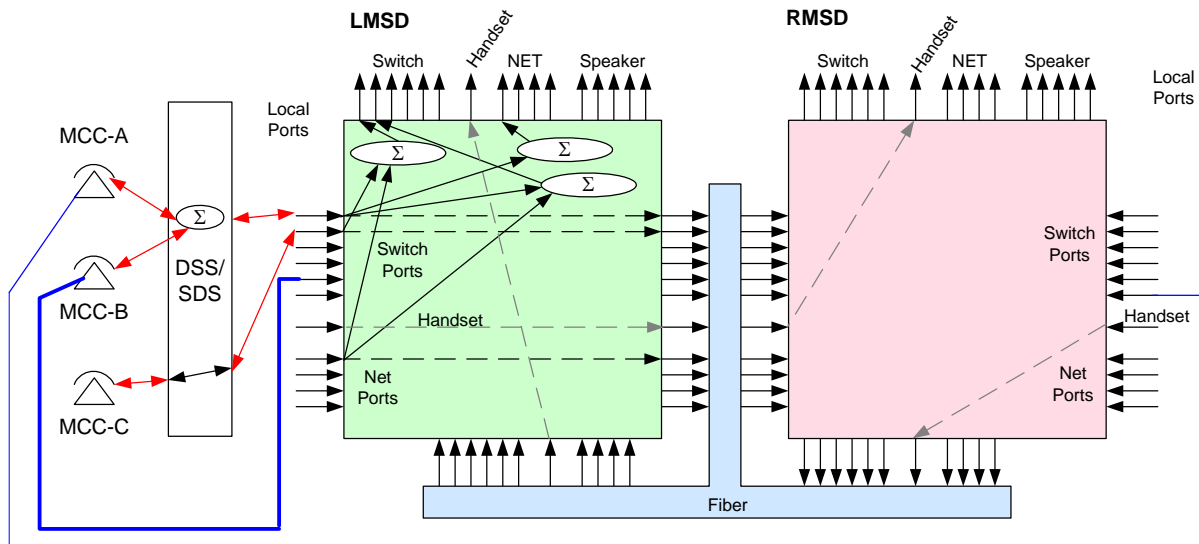


Figure 15: Example of Typical Primary Path MSD Connections

If the MCC console calls are active in the primary path per Figure 15 and a failure of MCC-A's UDLT link to the switch is detected, the LMSD and RMSD will provide MSD re-route switching and conferencing as illustrated in Figure 16. MCC-A's original connectivity is retained via its backup path.

If the MCC console calls are active in the primary path per Figure 15 and a failure of switch STU-III/R link to the LMSD SP5 is detected, the LMSD and RMSD will provide MSD re-route switching and conferencing as illustrated in Figure 17. MCC-A's and MCC-B's original connectivity is retained via its backup path.

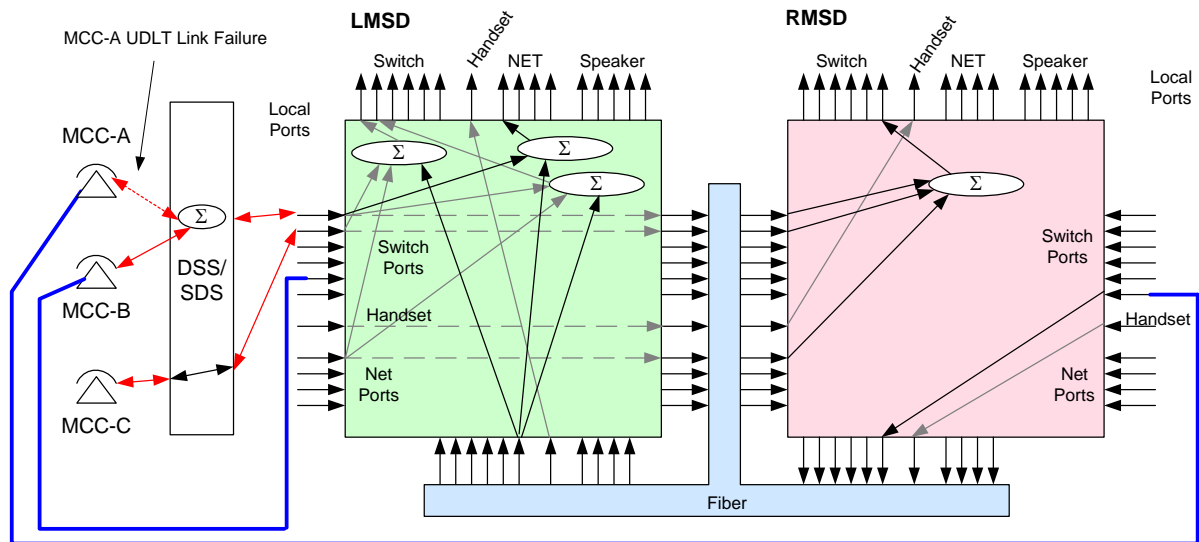


Figure 16: MSD Backup Reconfiguration Due to MCC-A UDLT Link Failure

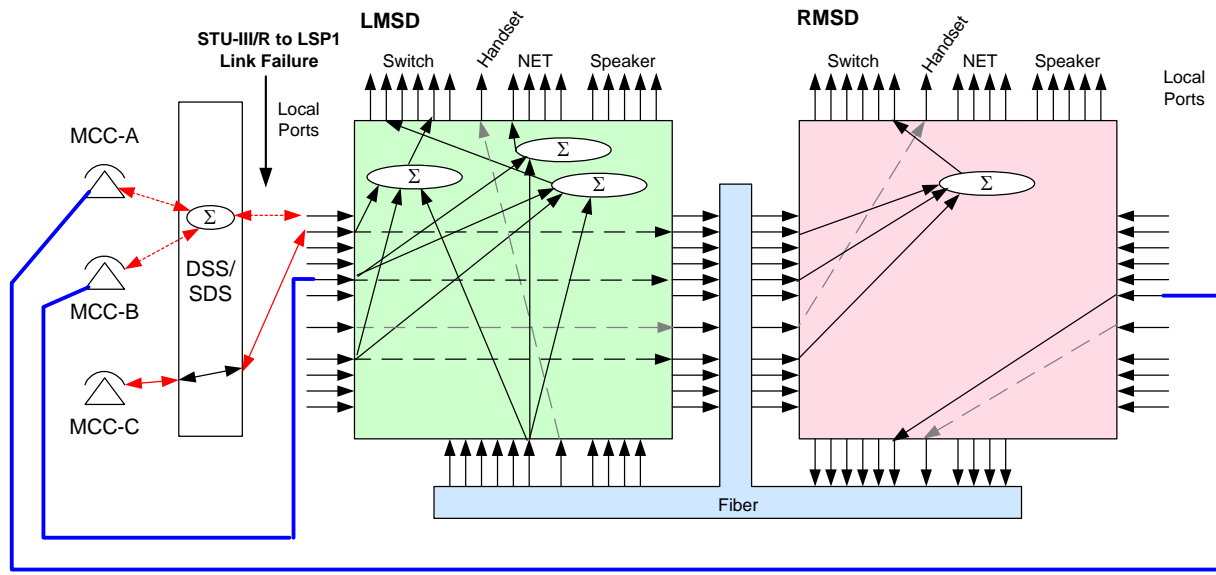


Figure 17: MSD Backup Reconfiguration Due to STU-III/R to LSP5 Link Failure

Handset Functionality

The MSD provides special functionality whenever the handset is enabled. For a dual MSD configuration, if the handset is not enabled on either the LMSD or the RMSD, the MSDs will provide a simple handset-to-handset audio connection with no other special functions enabled.

Local Handset

When the handset becomes enabled at the LMSD, the handset-to-handset connection will be disabled and all non-MCC LMSD switch ports will be disabled relinquishing Net ports. The LMSD will begin monitoring all non-MCC switch ports of M-lead hook changes. When an off-hook is detected on a switch port M-lead, the local handset will be connected and will arbitrate for Net ports using the defined configuration of the detected switch port. All audio and controls from the replaced switch port will be ignored entirely. All configurations in which the specified switch port is configured will be applied to the handset. The handset PTT will provide the request-to-send and release control of the Net port. The handset will not replace any LMSD MCC switch ports but will jointly have access to those involved ports. Figure 18 provides an example of this functionality.

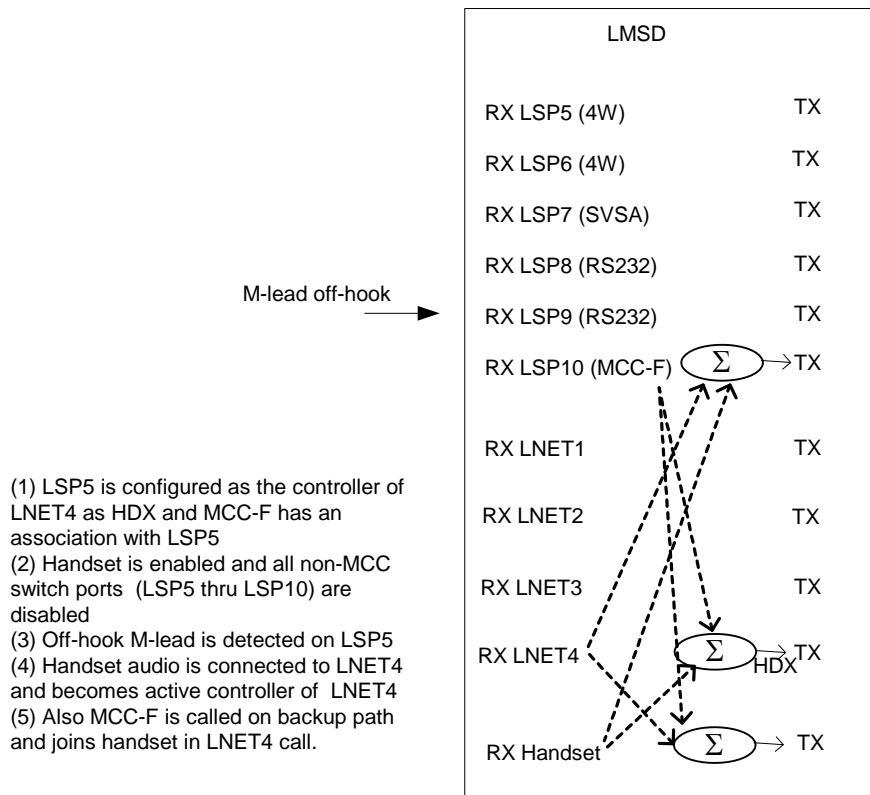
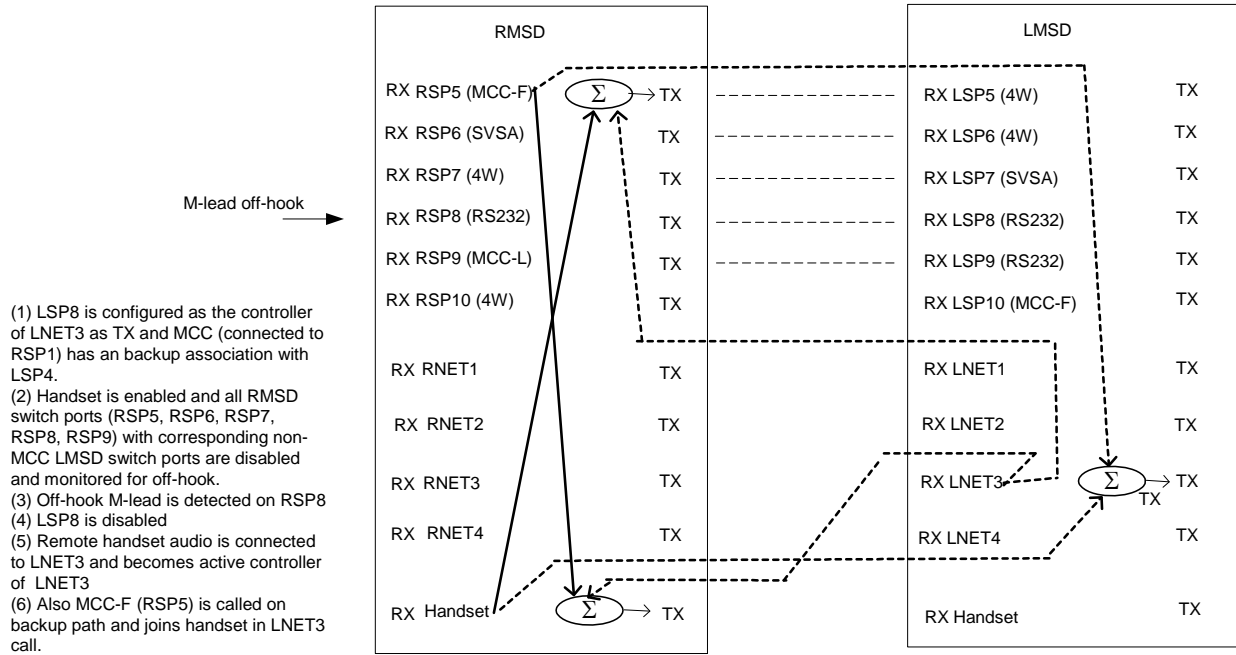


Figure 18: Example: Local Handset Enabled

Remote Handset

When the handset becomes enabled at the RMSD, the handset-to-handset connection will be disabled and all non-MCC RMSD switch ports will be disabled relinquishing Net ports. The RMSD will begin monitoring for M-lead hook changes at the RMSD for all switch ports that have a corresponding non-MCC switch port at the LMSD. When an off-hook is detected on a switch port M-lead at the RMSD, the corresponding LMSD switch port will be disabled and the remote handset will be connected and will arbitrate for Net ports using the defined configuration of the corresponding LMSD switch port. All audio and controls from the replaced switch port will be ignored entirely. All configurations in which the specified switch port is configured will be applied to the handset. The handset PTT will provide the request-to-send and release control of the Net port. The handset will not replace any MCC switch port but will jointly have access to those involved ports.



Note: Dashed lines are connections via the REM fiber port

Figure 19: Remote Handset Enabled

Enhanced Switch Reporting System

The MSD provides support for the Enhanced Switch Reporting System (ESRS). When configured, call detail history and port status/error records are reported to the Telemetry Processor (TP) using a Transport Layer Security (TLS) data link. All records are time stamped with the time received from a configured Network Time Protocol (NTP) server. The MSD will not begin generating ESRS records until the time is received from the NTP server. The MSD will continue generating ESRS records when the connection to the NTP server fails. When the connection to the TP fails, ESRS records will continue to be generated and buffered in RAM for up to five days. When the connection to the TP recovers, all buffered records are delivered.

To enable ESRS reporting, the IP addresses of the TP and NTP servers must be configured. Two flags: CDH (call detail history) and Status control the records generated. The system may be configured to deliver ESRS records from the LMSD or the RMSD or both.

Additionally, the Site Name, MSD Name, and Terminal Type (Primary/Backup) may be configured. These items are included in all generated ESRS records to identify the source of the record.

Call Box Extender Mode

In Call Box Extender Mode, two MSDs will be connected over the REM port with one MSD connected to a call box and the other MSD connected to a TAC. In this mode, each MSD will have to be configured to specify which device to which it will be connected: Call Box or TAC. The default will be TAC. As in any mode, when the handsets are disabled, their audio is passed to the REM port, and the handset audio from the REM port is routed to the handset.

Care must be taken to ensure the MSD is configured correctly prior to connecting it to the TAC or equipment damage may occur.

Functional Descriptions

NCA Conferencing

In NCA mode, the MSD (or LMSD and RMSD if in a dual MSD configuration) will interconnect a switch port with an ADI Net providing conferenced audio to the various ports. All non-MCC switch ports can be configured as controllers of Nets. MCC switch ports do not have controller capabilities but instead can have an association with RS-232 switch port. This association allows an MCC operator to be a controller of Nets on the backup path to which a line button to RS-232 switch port association has been made.

The signaling between a Raytheon switch, generic PABX and SVSA PABX is different. The following paragraphs describe their processing.

Once the off-hook is detected, all audio connections in which the switch port is configured will be enabled. Any idle switch port configured (as advisory ports) for the just-activated switch port will be signaled of an incoming call. If the MSD switch port is connected to a generic PABX 4-Wire interface, DTMF detection will be enabled to extract and process DTMF digit sequences.

The MSD will determine which Net ports are configured for the particular switch port and which are available for use by that switch port. If a Net port is held active by another switch port, the configuration will determine whether it is unavailable, shared, or preempted by the new switch port. If both switch ports are configured to monitor the Net port (RX), the Net port audio will be sent to both and control will be shared. In all other cases the determination will be based upon the defined precedence and then the access level of the switch ports. The switch port with the higher precedence will gain access to the Net port; the other switch port will either be blocked or preempted depending upon which had access first. For switch ports with the same precedence, the switch port with the higher priority connection level will be granted the Net port. The priorities are as follows: TX, HDX, and RX. Table 16, Switch Port Interactions, identifies the different configuration cases and the resulting connections for switch ports with the same precedence.

Table 16: Switch Port Interactions

CURRENT STATE (Held By <i>SPa</i>)	REQUESTING STATE (Requested By <i>SPb</i>)	RESULT		
		State	Audio	Controller
TX	TX	TX	From <i>SPa</i>	<i>SPa</i>
TX	RX	TX	From <i>SPa</i>	<i>SPa</i>
TX	HDX	TX	From <i>SPa</i>	<i>SPa</i>
HDX	TX	TX	From <i>SPb</i>	<i>SPb</i>
HDX	HDX	HDX	To/From <i>SPa</i>	<i>SPa</i>
HDX	RX	HDX	To/From <i>SPa</i>	<i>SPa</i>
RX	TX	TX	From <i>SPb</i>	<i>SPb</i>
RX	HDX	HDX	To/From <i>SPb</i>	<i>SPb</i>
RX	RX	RX	To <i>SPa</i> and <i>SPb</i>	Shared

If the switch port is overridden by a requesting switch port, the Net port's connectivity is changed by updating the ADI. If the Net port is shared, the audio is simply added to the appropriate conferences. This determination will be

done for each Net port that is configured for the just-activated switch port; therefore, some or none of the configuration may be actually connected to the switch port.

Once the M-Leads (control leads, establishing the connection type as TX, HDX RX) have been configured appropriately, an off-hook command will be sent to the ADI interface(s). If voice messaging is enabled for the specific switch port, the MSD will add the appropriate messages informing the user at the switch the status of the call as it progresses. The user at the switch will engage the ADI by dialing access codes. These access codes will be sent to the MSD as commands.

If the MSD is connected to a generic PABX, the MSD will detect and translate the digit sequence as commands. See Table 17, DTMF to Command Translations.

Table 17: DTMF to Command Translations

DTMF SEQUENCE	INTERPRETATION
*45#	Milstar request
*46#	Milstar cancel
*47#	Go to MELP transmit mode
*48#	Go to LPC transmit mode
*49#	RTS with alarm
*50#	Alert acknowledge

An individual Net port may be configured for multiple switch ports; each potentially attempting to control the Net port. For HDX Net ports, the commands initiated by the specified controller of the Net port will be passed to the Net port. Commands from Nets will only be routed to the switch port configured to route that Net port's messages and then only if the switch port is off-hook and controlling the Net port.

Each Net port (on LMSD and RMSD) may be configured to accept and route incoming calls (via the ADI) if it has a configured switch port connection assignment (HDX, TX, RX). There are two call types: with alarm and without alarm. Each call with alarm and without alarm may be routed to separate switch ports or the same switch port. If an incoming call is received on a Net port while the MSD is not in handset mode, the call notification will be sent to the switch port designated to receive incoming calls of the particular type for that Net port.

If a speaker is selected to monitor the Net port, there will be an audible indication of the incoming call at that speaker. If the MSD has the handset enabled but no switch port is selected to the handset, a switch port for which the Net is configured must be selected to accept the incoming call with the only possible notification having come from a speaker; the call will not be automatically routed to the handset.

If the handset is enabled and a switch port to which a particular Net port's incoming calls are to be routed is selected, there should be no incoming calls; the particular Net port would have been activated by the switch port or vice versa.

Port Redundancy

The MSD allows net ports and switch ports to have redundant partners. When a port fails, its redundant partner can take over.

The MSD will monitor each recovered RS-232 switch port and each net port for activity. If there have been no messages from a port for the required amount of time (29 seconds for a net port and 5 seconds for a switch port), the port will be considered failed.

Net Port Failure

The MSD may detect a failure of a net port in two ways: by the lack of any poll response or CTS being dropped by the ADI. If a net port fails that is acting as a primary, the net port will be removed from any conferences in which it is participating, clearing its own conference altogether. If the failing net port was half-duplex with transmit authority when the failure occurred, the MSD will play the access lost voice message to any controlling switch ports with voice messaging enabled. The status will be reported to RCHs, MCCs, and the distant MSD (LMSD or RMSD). The MSD display will also reflect the change in status.

If the failing net port has a redundant partner defined and it is in-service and up, it will be taken off-hook and replaced in all conferences in which the failed net port was participating. The call will not be re-arbitrated based upon potential intervening database changes. If the failed net port recovers it will not replace the current net port. For future calls, the net port designated as the primary will be employed, if in-service and up. If the primary is not available, the secondary/redundant will be used. If the primary is available, only incoming calls from that port will be accepted. If the primary is not available, the secondary will be treated as the primary, and incoming calls will be accepted.

Switch Port Failure

If an MSD switch port fails while idle, it will simply be marked as failed. If a non-MCC switch port is active and has a redundant partner that is also off hook, the MSD will perform a hot switchover to the redundant switch port. The redundant switch port will assume the conference setup of the failed primary switch port and the primary will be cleared of any conference participation. If there is no secondary switch port, the secondary is failed or not off hook, the MSD will resort to an MCC backup path switchover, if available.

When there is no available switch port redundancy, the MSD will invoke backup path processing, attempting a switchover to any MCC active as the now failed switch port. If there is more than one MCC meeting this criteria, they will all be switched and then placed in each other's conference. The MSD will create a conference for the MCC port, using the conference members of the failing switch port—not including the failed port, of course. If an MCC has an association and the line with the association is idle, the MCC will not assume control of the net port. Once an MCC has assumed control of the net port or there is no net port to take over, the failed switch port will be removed from any conferences in which it is participating. If an MCC is already active via the backup path representing the failing switch port, the MCC will retain control of any nets. If there is no MCC active (to which to switchover the net(s) or to retain the net(s)), the controlled net ports will be freed for use by other switch ports. The MSD will re-arbitrate the remaining off-hook switch ports re-allocating any freed net ports using the arbitration algorithm described earlier. This process will be followed whether the switch port is at the Remote or Local MSD but does not include MCC ports. MCC port failure will follow.

Fiber Port Failure

If the fiber link fails and the redundant switch ports are on different MSDs, the switch port redundancy will not be invoked unless or until the RS-422 link connecting the pair of MSDs is also lost; once again based upon the assumption that if both links are failed, the MSD has failed. If the fiber link fails and the redundant net ports are on different MSDs, the MSD will failover redundant net ports if the standby net port is available and located at the same MSD as the master switch port controlling that net port. For example (see figure below), LSP5 and RSP6 control LNP1 (shared as RX); LSP5 and RSP6 have corresponding redundant ports on opposite MSDs, and LNP1 has a redundant net port of RNP1. With the fiber connection in tact, LSP5 and RSP6 will both connect and control LNP1. If the fiber link fails but the RS-422 remains up, LSP5 will retain control of LNP1, and RSP5 will switchover

to using RNP1 providing both access to the Milstar network. The redundant switch ports would not come into play; they would remain unused.

If a master switch port loses all possibility of connectivity to its net port(s) because of a fiber-only failure and the master switch port's redundant partner is on the other MSD (same as the net ports), the master will become standby and the standby will become master (at both MSDs). This is an exception to the general rule that the MSD will not failover switch ports when there is a fiber only failure. This evaluation will be done for non-redundant net ports or redundant net ports on the same MSD. While in limited operations due to a fiber failure, if the possibility exists that the primary and secondary switch port could both be connected into switch conference and to the Milstar network, the switch port will be restricted to the primary—even if the primary is failed or out-of service.

If the fiber and the RS-422 links fail, both the net ports and switch ports will be switched over. Using the previous example, when the second of the two - fiber and RS-422 fails, each MSD would assume that the other MSD has failed and provide connectivity to the switch through the secondary ports.

If both the fiber and RS-422 links were down and the RS-422 link recovers, the MSD will take no action, leaving all conferences in tact. When the fiber recovers, the LMSD will exchange databases and call status. Once the RMSD has sent its call status, it will relinquish control of its ports. When the MSD receives the RMSD call status, the LMSD will assume control of all ports. Upon assumption of control, the LMSD will ensure that only one switch port of a redundant pair is active. If both were active, the LMSD will disconnect the conferences of the redundant switch port, leaving the off hook notation intact for the redundant; the primary switch port will continue to use whichever net ports it has under its control. Any nets that were under control of the secondary switch port (whose conference is being cleared), that are the redundant partner of the ones controlled by the primary/master will assume standby status.

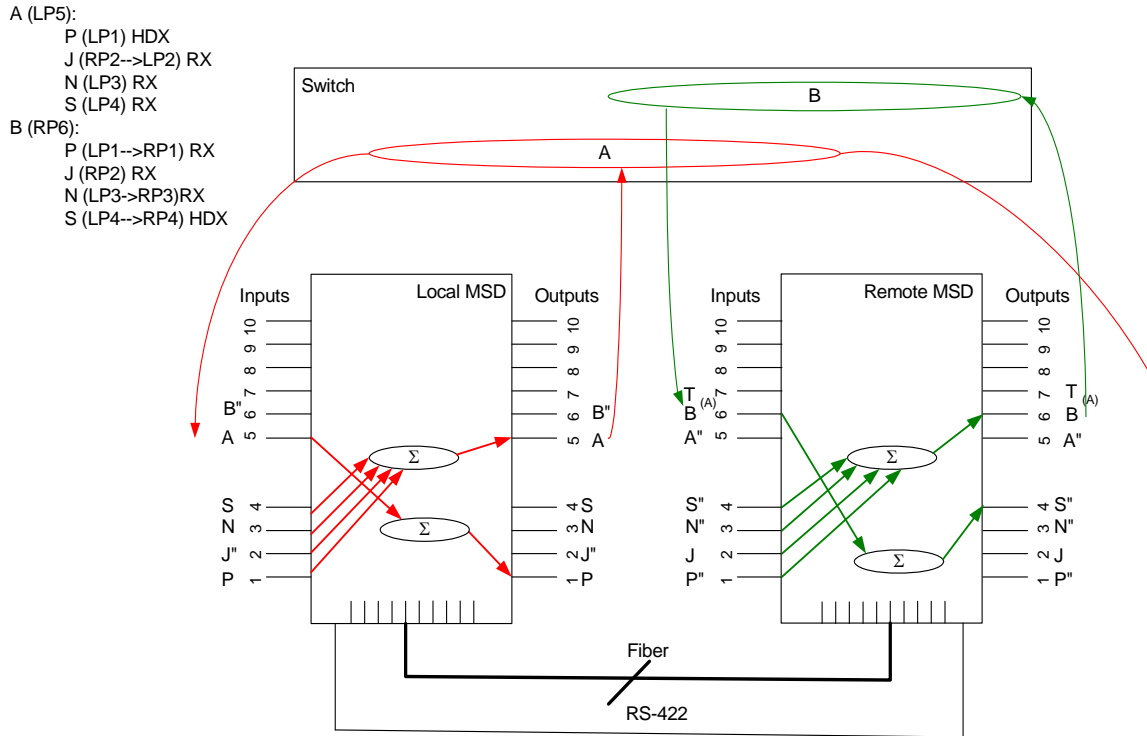


Figure 20: Fiber Failure

SECN Backup Enable/Disable

At most sites or phone locations within a site, it is standard practice to disable a phone when the location is not manned. The phone is disabled through a standard secure dial line button by selecting the dial line button followed by the DISABLE feature key. The MCC will be disabled from both normal SECN operation and SECN calls via the backup path.

If the primary secure lines are available, the phone should be enabled by selecting a dial line button, selecting the ENABLE feature, and entering the four-digit cipher code. However, if the normal secure line buttons are not available, The MSD provides the capability to process the ENABLE, DISABLE, and CIPHER CHANGE features on the SECN backup path when the primary secure lines are unavailable.

Operator

MCC ports may be configured as an operator port. There may be zero, one, or more operator ports configured and available at any given time. For an MCC to provide operator capabilities it must be defined at the MSD as an operator and have a line defined at the MCC with an operator association. An operator may be called in one of two ways: selecting a line at an MCC for the backup path while the MCC backup path is disabled at the MSD and selecting an idle line at an MCC with an operator association. If the operator MCC is idle when a line is selected at another MCC that would initiate a call to the operator, the operator MCC will be told to ring. The MSD will withhold routing the call for up to 30 seconds to allow the user to select the ENABLE feature key. If the ENABLE feature key is not selected within the time or any other feature or DTMF key is dialed, the operator will be rung. If the operator MCC is active in a call on the operator line when disabled user attempts a call, the MCC will be connected to a voice message, if they are enabled, or an error tone.

If an operator MCC user selects an idle operator line and there are one or more additional operators, they will be told to ring. When any of them answers, the rest will be told to stop ringing. The not in-use operator line buttons will show as active but not selected. The other operator MCCs may join in the call such that they can all talk and hear each other. If there are no other operators, the original operator will have a call but no far-end users.

Call Box Extender Mode

When the MSD is in Call Box Extender mode, it will be connected to another MSD, which must also be in Call Box Extender mode, and to either a call box or a terminal access controller (TAC). In this mode, the MSD pair will simply allow commands to pass between the call box and TAC. The only audio interface provided will be handset-to-handset.

Administrative Menu

The MSD PIN protects the following administrative options on the front panel:

- IP Addresses
- Change PIN
- Audio CODEC
- MCC Cipher Reset
- IA Mode
- Serial Number
- Hardware Test

The default PIN (222222) should be changed for security reasons. The PIN may be comprised of characters from the following set: '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'J', 'K', 'M', 'N', 'P', 'R', 'S', 'T', 'U'. The PIN may be from 6 to 10 characters. The PIN may be changed using the **Change PIN** option on the Admin Option menu. When entering a new PIN using the Change PIN option, between six and ten characters may be entered. Terminate the new PIN using the terminating character '>'.

IA Mode

The MSD can operate in the following IA modes:

- Maintenance Failure - the BSP determined during start-up that the MSD is inoperative—typically because either the Telecore Security Package (TSP) is not installed or the Application software is not installed. In either of these cases, there is no software (besides the operating system) running on the MSD, rendering it in-operative.
- Maintenance - the MSD could be operational, but the user has selected to enter maintenance mode, which will cause all of the audio interfaces (and in general their command and control interface, as well) to be shutdown and opening up the Ethernet port for maintenance use (ftp and telnet will be enabled). The RCH and MCC command and control interfaces will be available to allow maintenance functions, like reconfiguring the MSD. The MCC audio interfaces will be shutdown—much like the user had disabled the phone for MSD operations. Because in Maintenance mode all interfaces will be down, no calls may be routed to an operator; users selecting SECN Backup lines will receive either a voice message or a tone depending on their setting. If the MCC is enabled by the user while the MSD is in Maintenance mode, the MCC will receive a text string indicating the MSD mode; if the MCC is disabled while in Maintenance mode, the MCC will receive the standard interface disabled message. Because the services available in Maintenance mode are nonreentrant, neither is Maintenance mode fully reentrant; if the MSD enters Maintenance mode and then exits, it will not allow the user to select Maintenance mode again. In this case,

if upon connection to another MSD, this MSD must lower itself to Maintenance mode, the audio interfaces will be shut down, but the services (FTP and telnet) will not be started.

- Debug - the MSD will operate normally, except that the Ethernet port will be available for secure debugging using sFTP and SSH. A text message will be displayed at the MSD indicating as such to the user.
- Operational - the MSD will operate normally; however, the Ethernet port will be disabled from use except for known software (as opposed to user) interfaces. In this case, it will be limited to the ESRS and the NTP server.

All mode transitions are PIN protected and may only be performed from the front panel of the MSD. When there are two MSDs connected and acting as a pair, the two will be in the same mode. During fiber connectivity and arbitration, the lower (least operational) mode will be entered by both regardless of whether it was the RMSD or LMSD which had actually selected the mode. The mode settings, from highest to lowest, are operational, debug, and maintenance. Once connected, mode changes will be limited to the NCA (LMSD) MSD. If the fiber becomes disconnected, either MSD may change its mode (they will both operationally be in NCA mode). If an MSD is in Maintenance Failure mode, the fiber will not connect (the other end will not have been started) and it will remain stand alone and remain in whatever mode it was in,

Maintenance Operations

When the MSD is not being configured, the MSD front panel display will identify the states of the MSD Net ports. The five possible states will be not connected (“N/C”), idle (“Idl”), off-hook/active (“Act”), out-of-service (OOS), or Pxx where xx is the redundant net port’s primary port.. The status of the ports will be updated every ten seconds.

The presence of an (“**”) in the upper-right corner of the front panel display indicates the time has been received from the NTP server and ESRS reporting can transpire.

Note: The time must be received prior to any ESRS reporting.

The MSD front panel identifies the current IA mode “Debug Mode Enabled” or “Maintenance Mode Enabled” when the MSD is not in Operational Mode.

DISPLAY Hierarchy

The following diagrams illustrate the LCD menu display hierarchy. The top line in each of the blocks will be the top line displayed in the LCD display. The remaining lines in each box show the scroll items available at that menu level. Only one of these will be displayed at a time in the second line of the display.

Configuration Menus

When the SCROLL button is selected the second line will be updated with the menu item following the currently displayed item. The menu will wrap to the first option after the last option is shown. Simply scrolling through the available menu choices will not cause the database to be modified.

When the SELECT button is pressed, the menu connected to the right of the currently displayed menu item will become the new current menu—if there is a submenu. If there is not a submenu for a given menu, that menu is illustrated below with a thick border. If there is not a submenu, the SELECT button will initiate the database change indicated by the second line of the display. Once the change has been completed, the first line will be updated to reflect the change. For example, if the first display line is “Mode:NCA” and the second line is “Remote”, pressing the “SELECT” button will initiate a change to the database to change the mode to Remote mode. When the change has been completed (in this case the MSD will also perform a power reset), the first line will be updated to read, “Mode: Remote,” and the second line will remain “Remote.”

The PREV MENU button will cause the menu to the left of the current menu to be displayed. The PREV MENU button will not initiate a change to the database. For example, if the display currently reads “Mode:NCA” and “Remote,” pressing the PREV MENU button will cause the display to be updated with “Configure” and “Mode.” Pressing the PREV MENU button while the Configure menu is displayed will return to the Maintenance display. The PREV MENU button will return to the same scroll item in the previous menu as was selected to get to the current submenu. For example, if the current menu is “Speaker Ports” and “Spkr3” and the PREV MENU button is pressed, the display will be updated to read “Configure” and “Speaker Ports.”

Confirmation is required when changing Modes or enabling/disabling the Handset. Confirmation is accomplished by reselecting the SELECT key a second time. The configuration change can be aborted by pressing the PREV MENU key instead of the second SELECT.

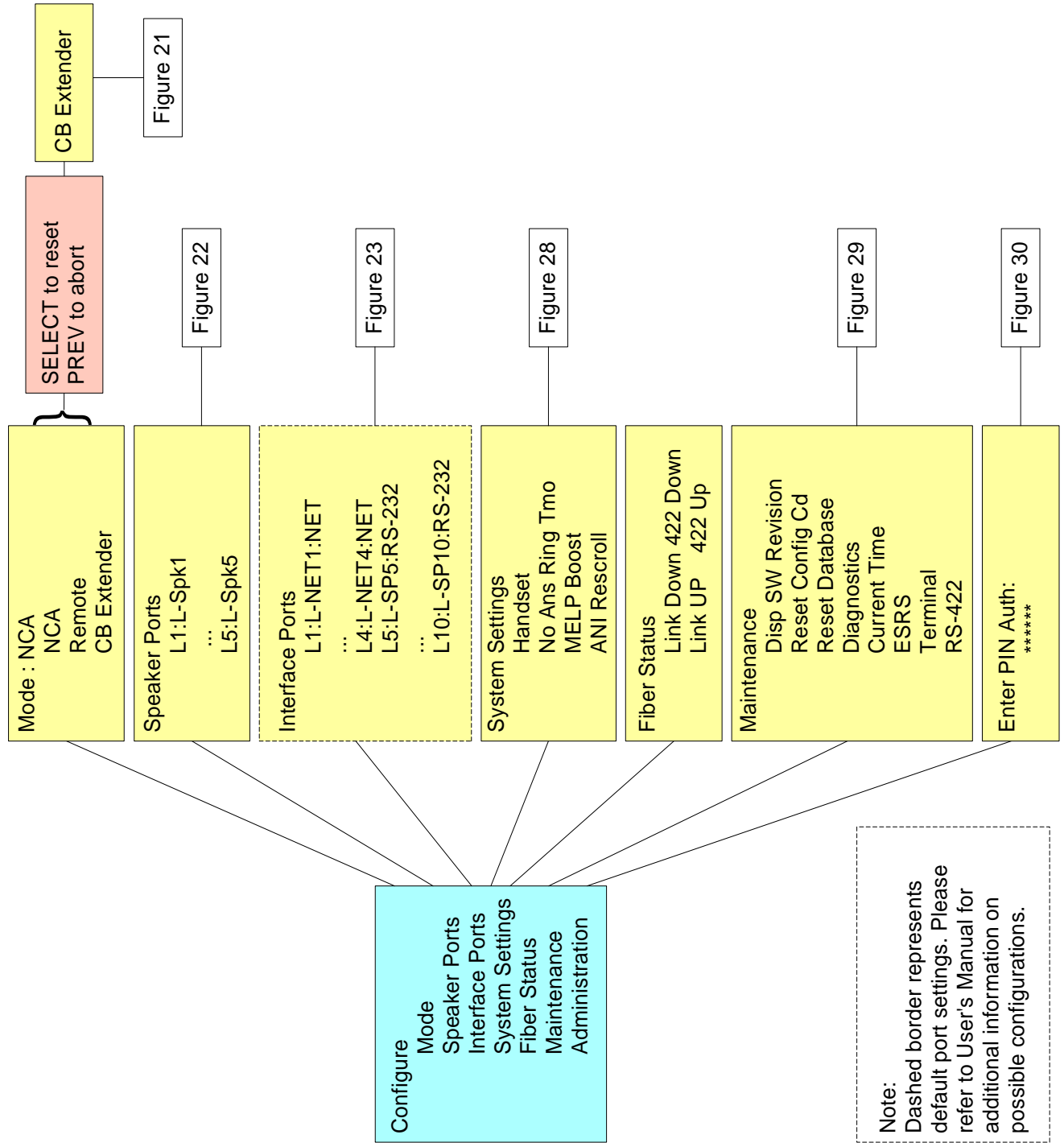


Figure 21: Configuration Menus Part 1

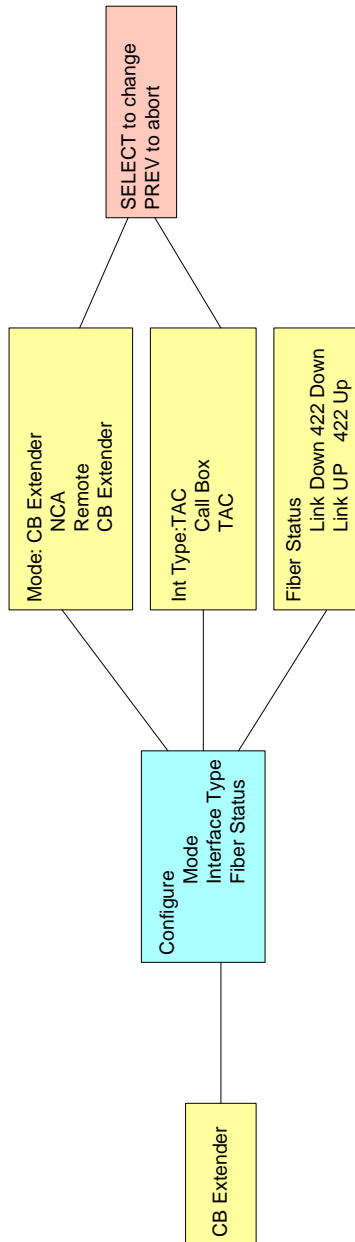


Figure 22: Configuration Menus Part 2

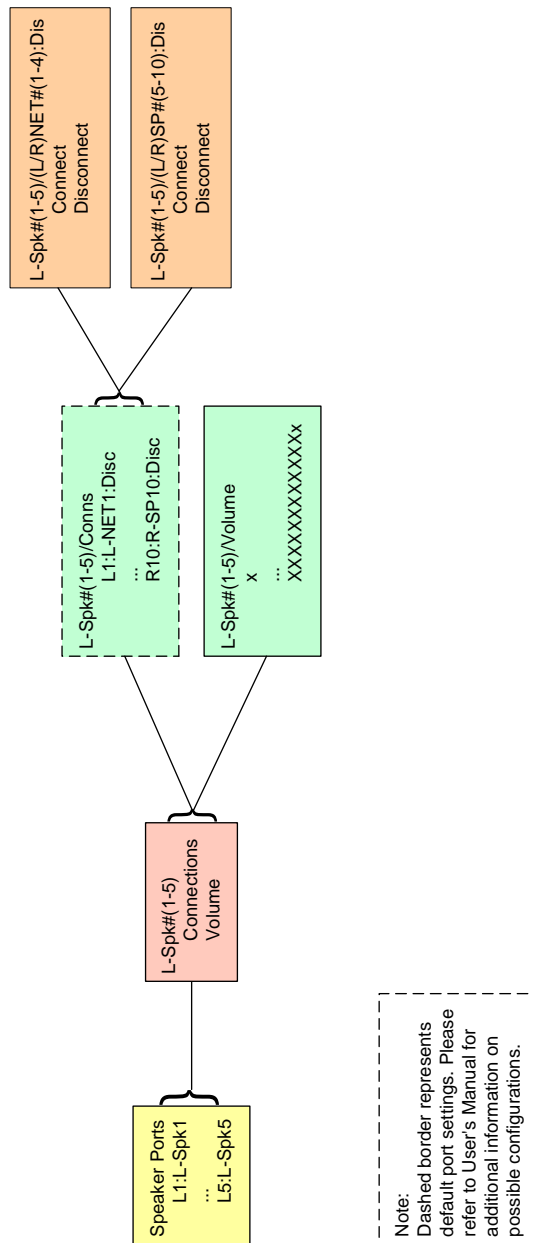


Figure 23: Configuration Menus Part 3

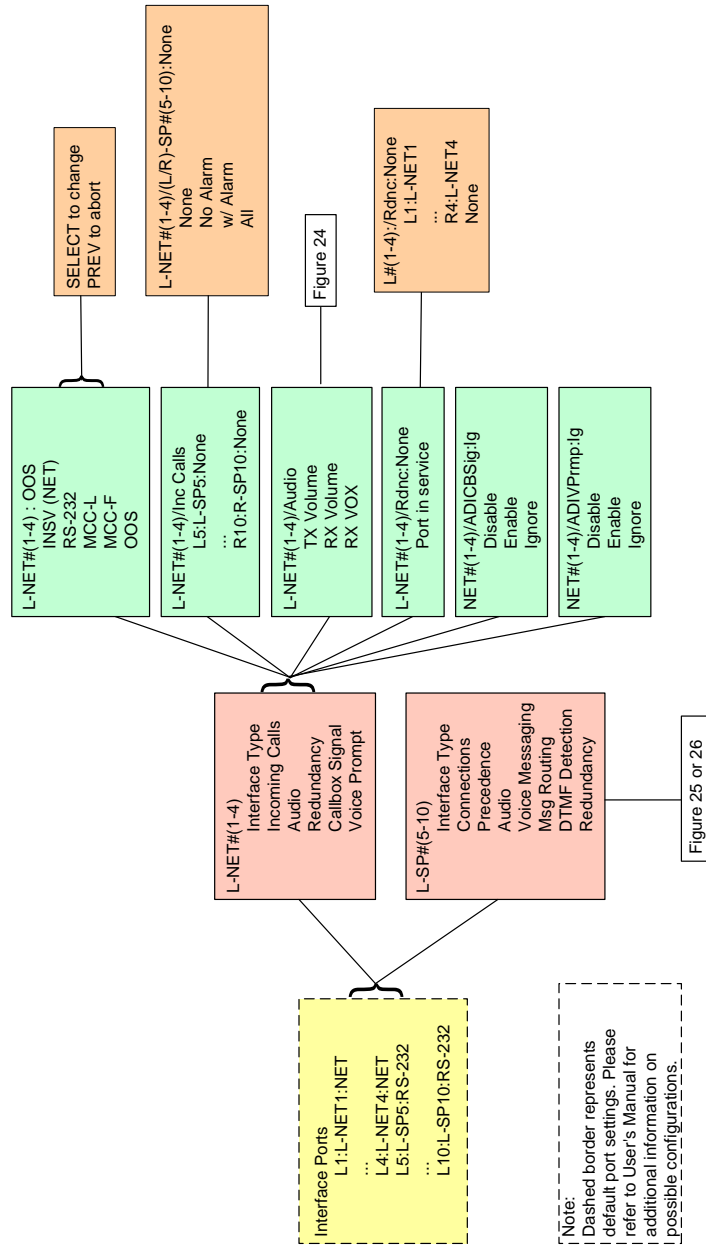


Figure 24: Configuration Menus Part 4

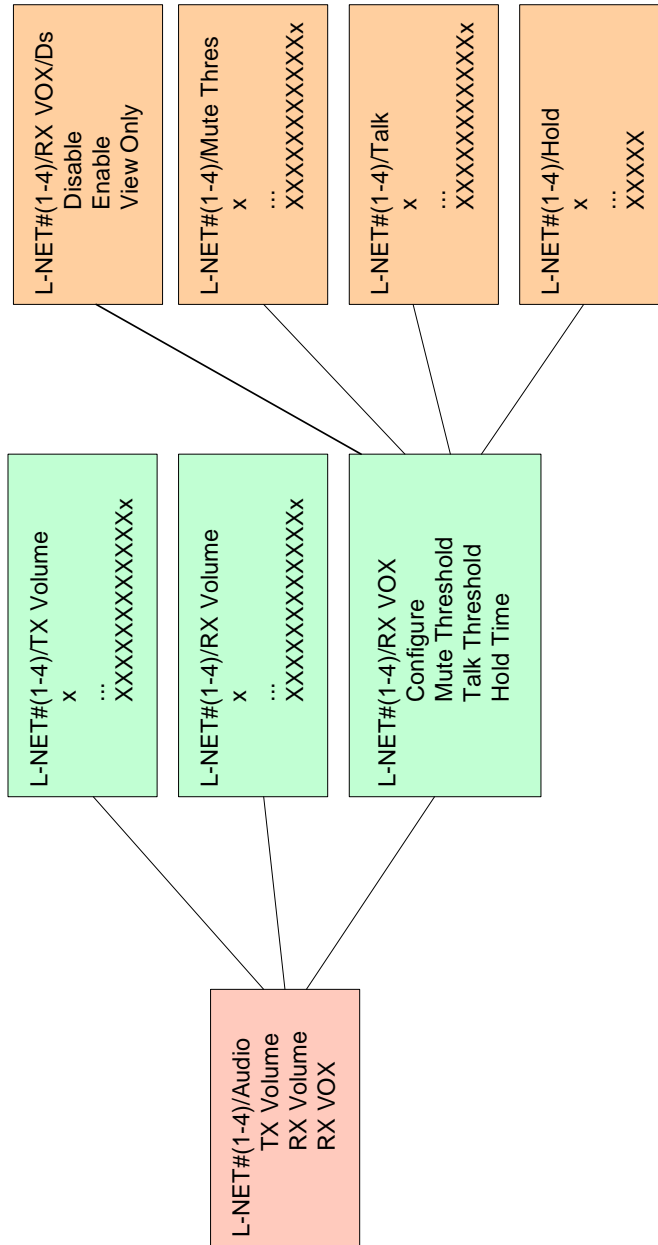


Figure 25: Configuration Menus Part 5

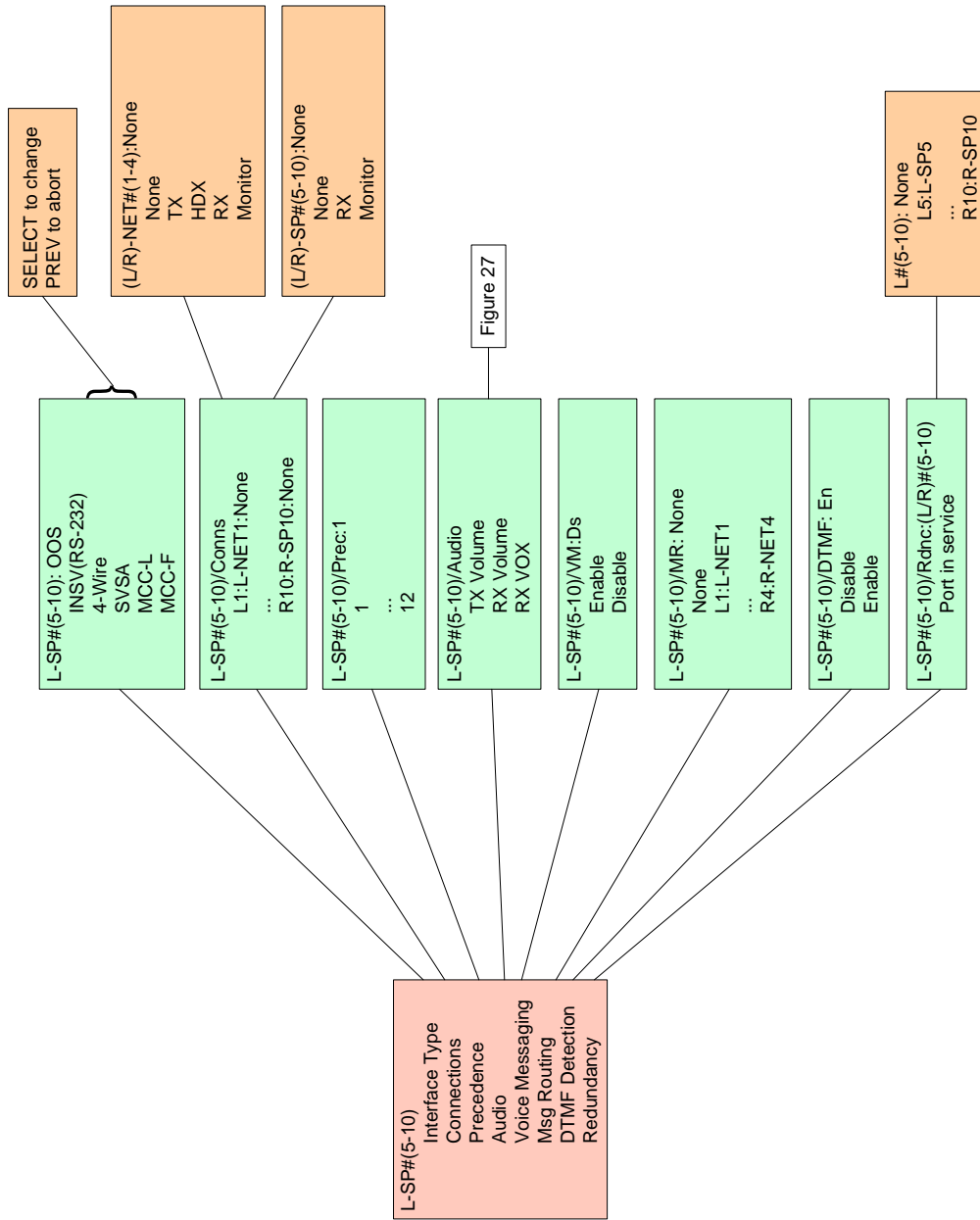


Figure 26: Configuration Menus Part 6

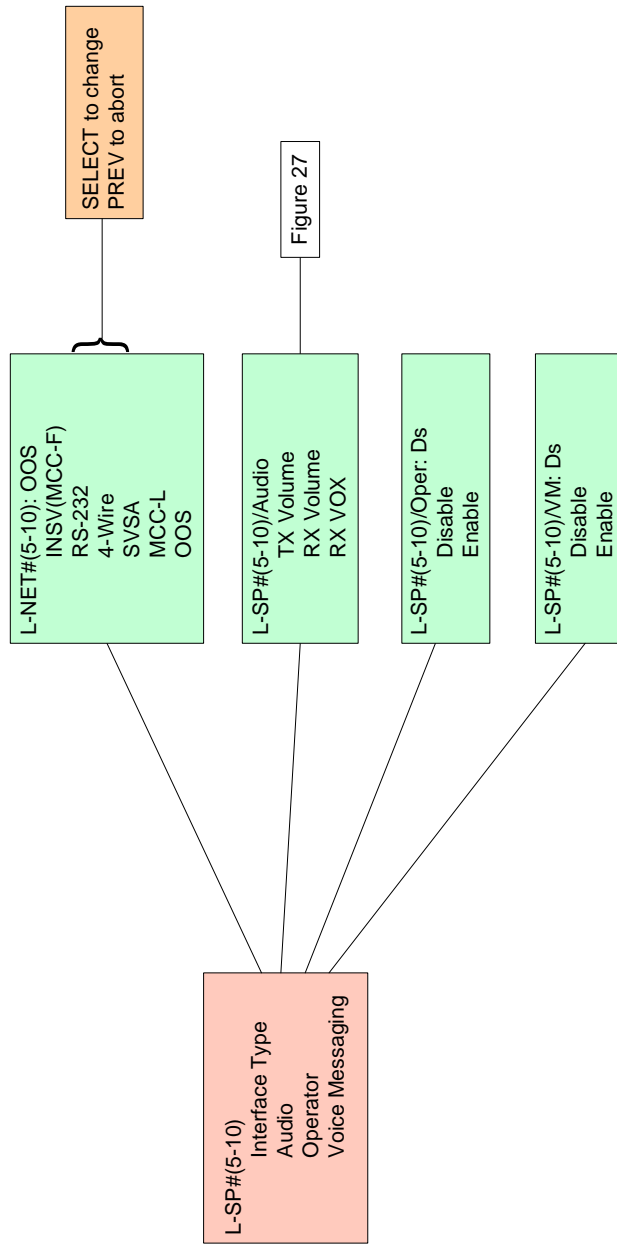


Figure 27: Configuration Menus Part 7

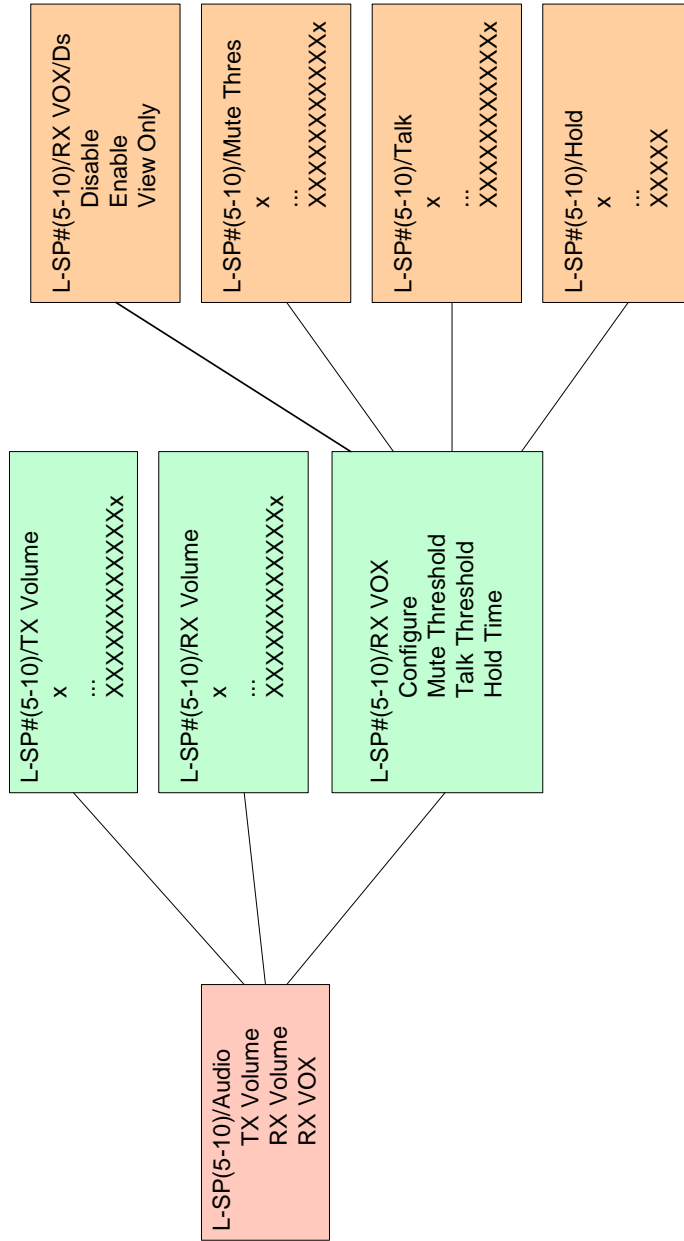


Figure 28: Configuration Menus Part 8

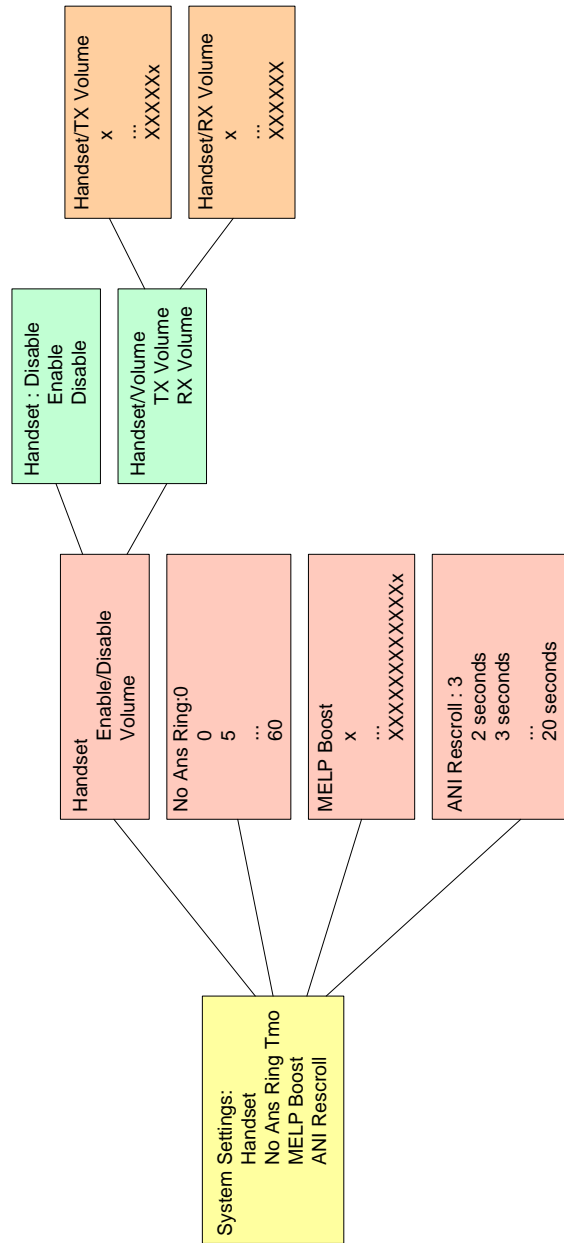


Figure 29: Configuration Menus Part 9

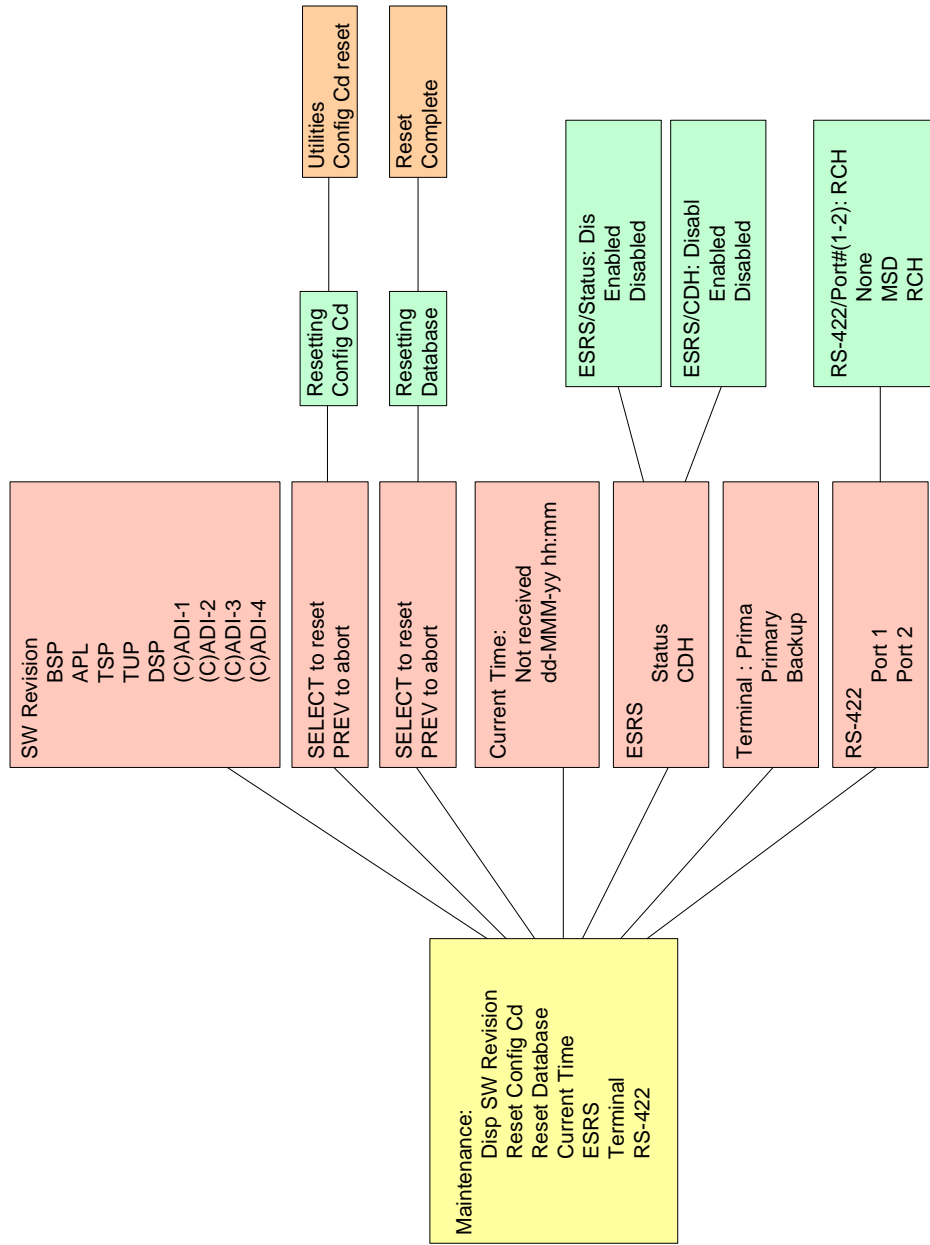
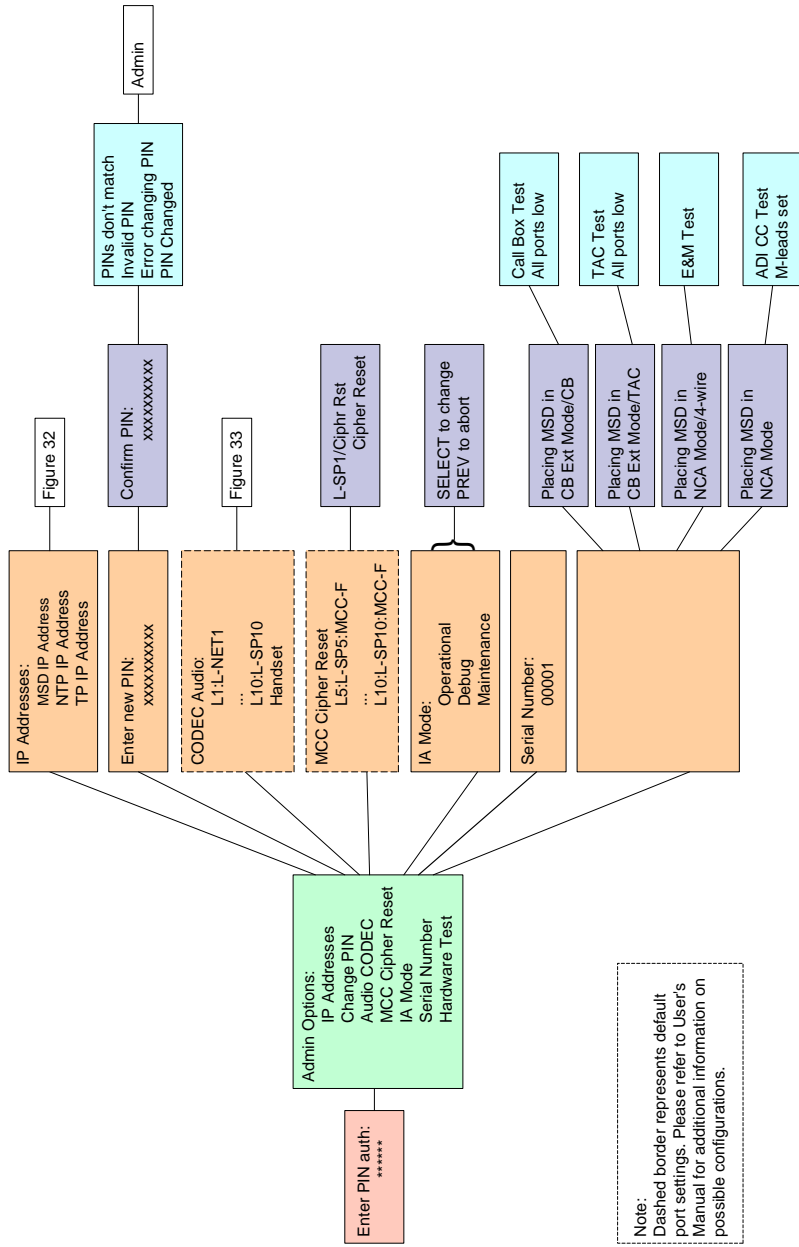


Figure 30: Configuration Menus Part 10



Note:
Dashed border represents default
port settings. Please refer to User's
Manual for additional information on
possible configurations.

Figure 31: Configuration Menus Part 11

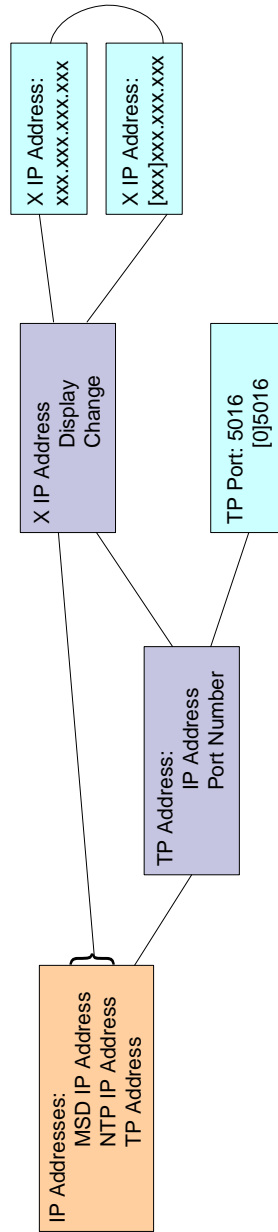


Figure 32: Configuration Menus Part 12

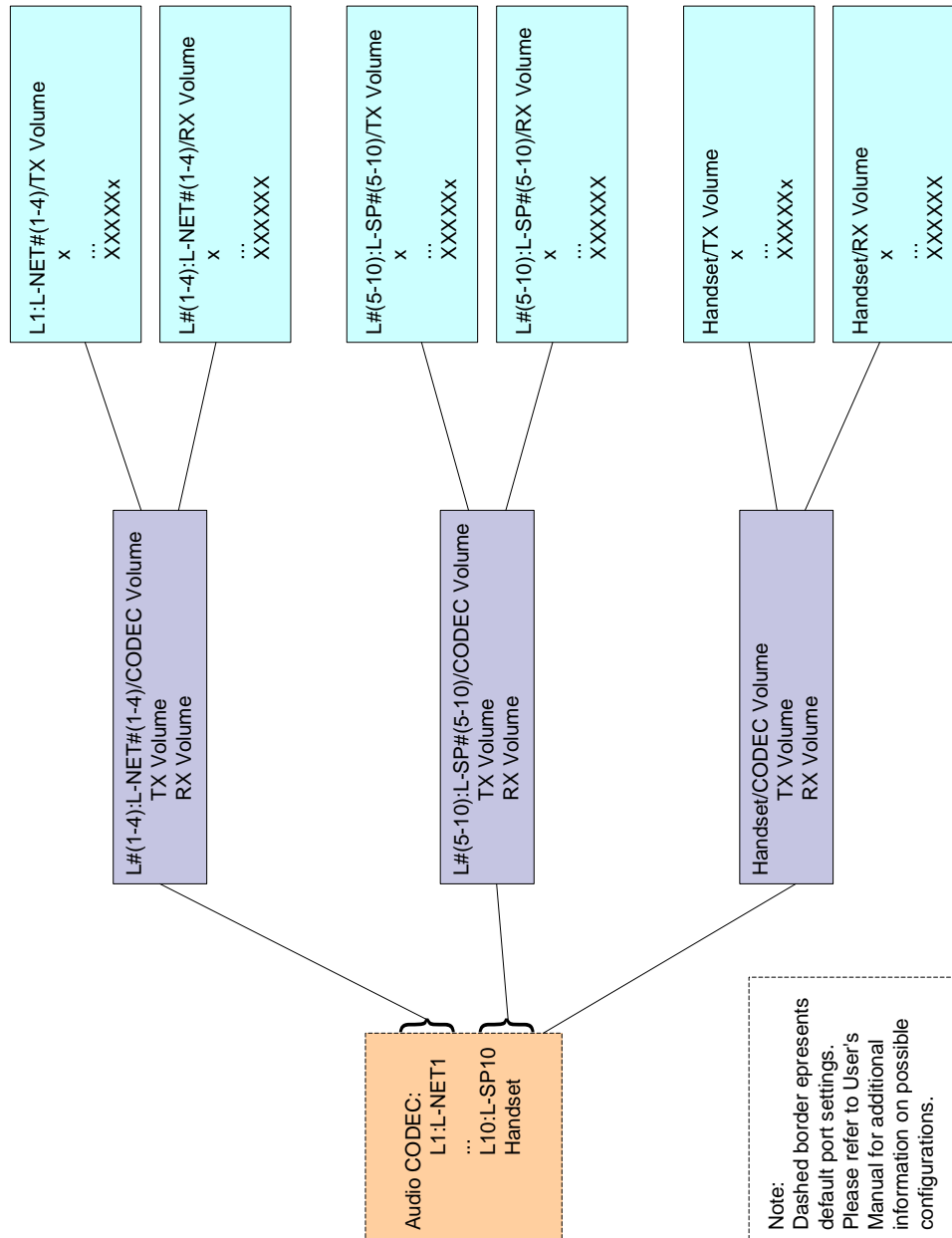


Figure 33: Configuration Menus Part 13

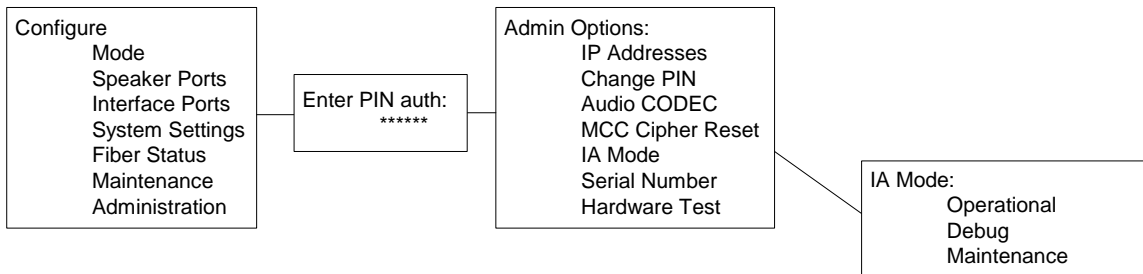
Installation Instructions

Please refer to the applicable Version Description Documents for software version compatibility.

IA Modes

When the MSD is already loaded with release 2SA-00069-1000 or above MSD application software, it must be placed into “Maintenance Mode” to enable Telnet and FTP access. To place the MSD into “Maintenance Mode”, use the front panel Administration/IA Mode menu. The default PIN number is “222222”.

Note: If the MSD comes up with the Configure menu below, the MSD application software is 2AA-00069-1000 or above. Otherwise, IA Modes are not applicable.



While in “Maintenance Mode”, the MSD port J12 may be accessed using Telnet or FTP.

BSP Software

The program file, 2AA-00071-1001.bin, should be transferred using ftp in binary mode to the “C:\” directory on the MSD.

Note: This should ONLY be done if the correct BSP has not already loaded. Be sure to check all intervening VDDs for any special instructions prior to loading the BSP.

1. From the Administration menu, change IA mode to “Maintenance Mode”.
Note: This step is only necessary when the MSD is already loaded with 2AA-00069-1000 or above.
2. Telnet to MSD port J12:
C:\> **telnet <IP address>**
VxWorks login: **telecore**
Password: **telecore**
3. Remove application software:
MSD-> **rm “apl/2AA-00069.out”**
value = 0 = 0x0
4. Cycle power.
5. FTP to MSD port J12:
C:\>**ftp <IP address>**
Connected to 192.168.0.126.
220 VxWorks (VxWorks5.5.1) FTP server ready
User (192.168.0.126:(none)): **telecore**
331 Password required
Password: **telecore**
230 User logged in

6. Change to root directory:
ftp> **cd /**
250 Changed directory to "C:/"
7. Change to binary mode:
ftp> **bin**
200 Type set to I, binary mode
8. Transfer installation file:
ftp> **put 2AA-00071-1001.bin boot.bin**
200 Port set okay
150 Opening BINARY mode data connection
226 Transfer complete
ftp: 1183216 bytes sent in 47.05Seconds 25.15Kbytes/sec.
9. Exit ftp:
ftp> **bye**
221 Bye...see you later
10. Telnet to MSD port J12:
C:\> **telnet <IP address>**
VxWorks login: **telecore**
Password: **telecore**
11. Load BSP:
Note: This process takes a while. Be patient.
MSD-> **progBoot**
erasing entire flash
flash program complete
startAddress = 0x8000000, stopAddress = 0x8120dcf
trueFFS startAddress = 0x180001
value = 32 = 0x20 = ''
12. Exit Telnet:
MSD-> **exit**
Connection to host lost.
13. Cycle power.
Note: This process takes a while. Be patient.

Note: When MSD fully recovers, front panel should display "TSP Code Needed" and the current MSD IP address.

The new version of the MSD BSP has now been loaded and is running. The BSP will recreate the flash file system at which time the operation software and firmware files will need to be loaded before system operation can take place.

Checking the Serial Number

The MSD serial number is normally programmed during the manufacturing process. However, there are a number of MSDs which left manufacturing without having the serial numbers programmed. The following procedure may be used to determine whether the serial number has been programmed.

1. From the Administration menu, change IA mode to "Maintenance Mode".
Note: This step is only necessary when the MSD is already loaded with 2AA-00069-1000 or above.
2. Telnet to MSD port J12:
C:\> **telnet <IP address>**
VxWorks login: **telecore**
Password: **telecore**

3. Get MSD serial number:
sysSerialNumGet
value = 10 = 0xa

In this example, the MSD serial number is 10. The value returned by the command should be the same as the value on the MSD serial number plate. If the value is incorrect, the serial number must be programmed for the MSD to function properly.

Programming the Serial Number

The following procedure may be used to program the MSD serial number:

1. From the Administration menu, change IA mode to “Maintenance Mode”.
Note: This step is only necessary when the MSD is already loaded with 2AA-00069-1000 or above.
2. Telnet to MSD port J12:
C:\> **telnet <IP address>**
VxWorks login: **telecore**
Password: **telecore**
3. Set MSD serial number:
sysSerialNumSet 10
value = 0 = 0x0

In this example, the MSD serial number is set to 10. The value of 0 returned by the command indicates the MSD serial number was successfully programmed.

Application Software

Note: If the MSD BSP requires loading, complete the MSD BSP installation prior to following this procedure.

The program files 2AA-00069-1004.out, 2AA-00075-0000.out, and 2AA-00076-0000.out must be transferred using ftp in binary mode to the c:/apl directory on the MSD:

1. From the Administration menu, change the IA mode to “Maintenance Mode”.
Note: This step is only necessary when the MSD is already loaded with 2AA-00069-1000 or above.
2. FTP to MSD port J12:
ftp <IP address>
Connected to 192.168.0.126.
220 VxWorks (VxWorks5.5.1) FTP server ready
User (192.168.0.126:(none)): **telecore**
331 Password required
Password: **telecore**
230 User logged in
3. Change to apl directory:
ftp> **cd /apl**
250 Changed directory to “C:/apl”
4. Change to binary mode:
ftp> **bin**
200 Type set to I, binary mode
5. Transfer installation files:
ftp> **put 2AA-00069-1004.out 2AA-00069.out**
200 Port set okay
150 Opening BINARY mode data connection

- ```

226 Transfer complete
ftp: 950184 bytes sent in 128.72Seconds 7.38Kbytes/sec.
ftp> put 2AA-00075-0000.out 2AA-00075.out
200 Port set okay
150 Opening BINARY mode data connection
226 Transfer complete
ftp: 1932364 bytes sent in 53.95Seconds 35.82Kbytes/sec.
ftp> put 2AA-00076-0000.out 2AA-00076.out
200 Port set okay
150 Opening BINARY mode data connection
226 Transfer complete
ftp: 144163 bytes sent in 9.33Seconds 15.45Kbytes/sec.

```
6. Exit ftp:  
ftp> **bye**  
221 Bye...see you later
  7. Cycle power.  
Note: This process takes a while. Be patient.

The new version of the MSD Application, TSP and TUP software have now been loaded and are running. The MSD will be in “Operational Mode”. The MSD IP address will be default IP address 192.168.0.126.

Note: The MSD must be set into “Maintenance Mode” for any ftp or telnet access. However, sftp and ssh access are available in “Debug Mode”.

## DSP Software

Normally, programming of the MSD DSP is done at Telecore since special loading software and a special cable is needed for this installation. However, for the SECN Enhancements upgrade of the MSD, this special software and cable will be provided to Raytheon in order that this upgrade can be performed by Raytheon personnel who have been familiarized with the procedure below and have the special software/cable.

This procedure requires a DOS-based PC (or equivalent) and the DOS program “msddl.exe” to download the DSP application code to the MSD. This software is delivered with the software set; as part number 2SA-00078-0000.exe. This procedure also requires having a special serial cable (defined in Appendix A) connecting the PC’s serial port to the MSD J4 connector.

### Set up:

1. Create a temporary directory on the PC hard drive and into that directory place the following delivered files.
  - a. Copy the file 2SA-00078-0000.exe renaming it **msddl.exe**.
  - b. Copy file 2AA-00072-0300.hex renaming it **msd\_01.hex** file directory into the temporary directory.
  - c. Copy the file promptj.hex into temporary directory.
2. Change the file permissions of the **msd\_01.hex** and **promptj.hex** files to be read/write by clearing the check mark in the General tab of the Properties window.

### Installing the DSP Software:

3. Attach the DSP serial cable (see Appendix A and ensure toggle switch is open) to connector J4 on the MSD-A and to the PC COM1 port. On the PC, set up the HyperTerminal window per the following settings: 38400 Bits per second, 8 Data bits, no Parity, 1 Stop bit, and no Flow control.
4. Power-on the MSD-A.
5. Verify the HyperTerminal screen is updated with the DSP initialization text and that the DSP is reporting that application code is found for existing MSD boards being upgraded.

6. Disconnect the HyperTerminal window from the COM port by selecting Call and then Disconnect from the HyperTerminal toolbar menu.
7. Open a Command Prompt window and change directories to the temporary folder that was created in the previous step.
8. At the command prompt, type: **msddl msd\_01.hex 1** <enter>  
Note: msd\_01.hex is the name of the application S-Record file.
9. Manually short (via toggle switch) the RTS (pin 6) and CTS (pin 7) signals on J4 MSD-A (refer to Appendix A).
10. Cycle power on the MSD-A, and verify the code download executes.
11. Once the download has completed, turn the MSD-A power off and remove the manual short (open toggle switch) from the MSD-A RTS and CTS pins.
12. Re-connect the HyperTerminal window (select Call from menu) to the appropriate COM port and power-on the MSD-A. Verify the DSP boot screen appears and that a valid program found flag appears on the screen and a prompt is available.

### Installing the Voice Prompts

Note: This procedure will take several minutes to complete the download.

If continuing from installing the DSP software, proceed to Step 4.

1. Attach the DSP serial cable (see Appendix A and ensure toggle switch is open) to connector J4 on the MSD-A and to the PC COM1 port with the following HyperTerminal window settings: 38400 Bits per second, 8 Data bits, no Parity, 1 Stop bit, and no Flow control.
2. Power-on the MSD-A.
3. Verify the HyperTerminal screen is updated with the DSP initialization text and that the DSP is reporting that valid application code is found.
4. Disconnect the HyperTerminal window from the COM port by selecting Call then Disconnect from the HyperTerminal toolbar menu.
5. On the PC, open a Command Prompt window and change directories to the temporary folder that was created in the set up.
6. At the command prompt, type: **msddl promptj.hex 1 1** <enter>  
Note: promptj.hex is the name of the voice prompt S-Record file.
7. At the J4 connector on the MSD-A, manually short (via toggle switch) the RTS (pin 6) and CTS (pin 7) signals on MSD-A J4 (refer to Appendix A).
8. Cycle power on the MSD-A, and verify the code download executes.
9. Once the download has completed, turn the MSD-A power off and remove manual short (open toggle switch) from the RTS and CTS PINs.
10. Re-connect the HyperTerminal window to the appropriate COM port and power-on the MSD-A. Verify the DSP boot screen appears and that a valid program found flag appears on the screen and a prompt is available.

### Password Change

With MSD application 2AA-00069-1000 or above, the MSD command line password can now be changed. The password will be store encrypted in non-volatile memory on FLASH. The default password is *telecore*. The MSD command line may be accessed in Maintenance mode or Debug mode. Following any reset until all software has been installed on the MSD, the MSD will recover to Maintenance mode. Once the MSD has been fully installed, the mode may be set via the Administrative menu from the front panel of the MSD. A PIN (Personal Identification Number) is required to gain access to the Administrative menu; the default PIN is 22222. The PIN may be changed via an additional Administrative menu option.

To change the current password on the MSD, enter the following command:

1. From the Administration menu, change IA mode to “Maintenance Mode”.  
Note: This step is only necessary when the MSD is already loaded with 2AA-00069-1000 or above.
2. Telnet to MSD port J12:  
C:\> **telnet <IP address>**  
VxWorks login: **telecore**  
Password: **telecore**
3. Change password:  
**tspChangePassword "telecore", "raytheon", "raytheon"**  
value = 0 = 0x0

In this example, the default password *telecore* is changed to the new password *raytheon*. The value of 0 returned by the command indicates the password was successfully changed.

### Changing the MSD IP Address

The MSD as configured from the factory comes with a default Ethernet port IP address of “192.168.0.126”. This default IP address can be changed from a command line telnet session by using the following command: `sysIpSet “192.168.0.xx0”`. As indicated the last digit must end in a “0”. This allows up to 6 MCCs to connect to the MSD for Backup operations via Ethernet. If an MCC is to be configured for Backup operations using Ethernet, it’s MSD IP address must be changed (by entering Maintenance mode and the Phone IP screen) from “Serial” to the “192.168.0.xxy” where the “xx” portion is as defined in the MSD `sysIpSet` command and the “y” portion is a single digit in the range of “1” through “6”. The specific number entered is the switch port number of the MSD to which the auxiliary port audio of the MCC is connected.

## Terms and Definitions

|             |                                            |
|-------------|--------------------------------------------|
| 4W          | Four-wire                                  |
| A/D         | Analog-to-Digital                          |
| ADI         | ANDVT Digital Interface                    |
| ANDVT       | Advanced Narrowband Digital Voice Terminal |
| APL         | Application                                |
| CADI        | Crypto ANDVT Digital Interface             |
| CDHP        | Call Detail History Protocol               |
| COMSEC      | Communications Security                    |
| CTS         | Clear To Send                              |
| CTSI        | Clear To Send Indicate                     |
| DCE         | Data Circuit –Terminating Equipment        |
| DTE         | Data Terminal Equipment                    |
| DOD         | Department of Defense                      |
| DRSN        | Defense Red Switch Network                 |
| DSP         | Digital Signal Processor                   |
| DSS         | Digital Small Switch                       |
| DTMF        | Dual Tone Multi-Frequency                  |
| E&M         | Ear and Mouth                              |
| ESRS        | Enhanced Switch Reporting System           |
| GND         | Ground                                     |
| HDX         | Half-duplex                                |
| I/O         | Input/Output                               |
| Intfc       | Interface                                  |
| ITU         | International Telecommunications Union     |
| LCD         | Liquid Crystal Display                     |
| LPC         | Linear Predictive Coding                   |
| MCC         | Milstar Command Console                    |
| MELP        | Mixed Excitation Linear Predictive         |
| Milstar Net | Milstar circuit                            |
| Monitor     | Receive (RX) without control               |
| MSD         | Milstar Summing Device                     |
| NCA         | National Command Authority                 |
| NTP         | Network Time Protocol                      |
| PABX        | Private Automated Branch Exchange          |
| PPP         | Point-to-Point Protocol                    |
| PTT         | Push-To-Talk                               |
| PWA         | Printed Wiring Assembly                    |
| RAM         | Random Access Memory                       |
| RCH         | Remote Control Head                        |
| REM         | Remote                                     |
| RMA         | Returned Materials Authorization           |
| RMSD        | Remote Milstar Summing Device              |
| RTS         | Request To Send                            |
| RTSI        | Request To Send Indicate                   |
| RX          | Receive                                    |
| SDS         | Secure Digital Switch                      |
| SECN        | Survivable Emergency Conferencing Network  |
| SP          | Switch Port                                |
| STU-III     | Secure Telephone Unit                      |
| SVSA        | Secure Voice Switching Assembly            |
| TAC         | Terminal Access Controller                 |
| TACTERM     | Tactical Terminal                          |
| TDM         | Time Division Multiplexed                  |

|     |                            |
|-----|----------------------------|
| TLS | Transport Layer Security   |
| TP  | Telemetry Processor        |
| TSP | Telecore Security Package  |
| TUP | Telecore Utility Package   |
| TX  | Transmit                   |
| UDP | User Datagram Protocol     |
| UTC | Coordinated Universal Time |
| VAC | Volts Alternating Current  |
| VOX | Voice-operated Switch      |

## Warranty Terms and Conditions

Telecore, Inc. provides a manufacturer's warranty that for a period of one year commencing on date of shipment: Goods are and will be free from defects in design, material, and workmanship; will conform to and perform in accordance with the Specifications, if any; that it will convey good and valid title to all Goods; and that all Goods are being provided free and clear of any and all liens and encumbrances. This warranty will survive inspection, acceptance, and payment. This warranty shall be null and void in the event the Buyer or any third party attempts repair of the Goods without Telecore, Inc. advanced written authorization, or in the event the Goods are misused, including termination of non-compliant third party equipment on Telecore's interfaces, or damaged by Buyer, or shipped to any country other than that originally specified in Buyer's Purchase Order. Goods not meeting this warranty will be promptly repaired or replaced, at Telecore's option, upon return to Telecore's facility freight prepaid; provided, however, that Buyer has first obtained a return materials authorization number ("**RMA Number**") from Telecore authorizing such return. An RMA number may be requested from Telecore's website at [www.telecore-inc.com](http://www.telecore-inc.com). The RMA Number shall be placed on the exterior packaging of all returns. Goods to Buyer. THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF TITLE, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE HOWSOEVER ARISING.

### Shipping Return Address

Equipment will be shipped to the following Supplier address as directed by the Supplier's Customer Service Department at the time the RMA number is assigned:

ADDRESS:

Telecore Inc  
1800 North Glenville Dr.  
Suite 116  
Richardson, TX 75081-1953  
ATTENTION: Customer Service