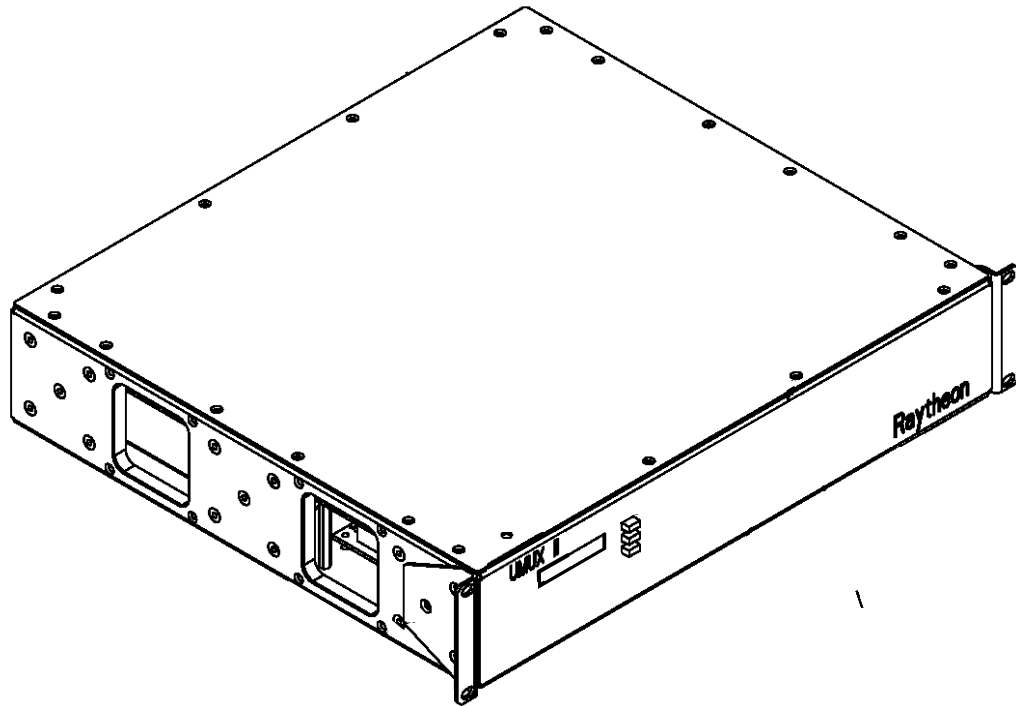


EQUIPMENT SETUP GUIDE

for the UMUX-III



ABOUT THE COMPANY

Telecore, Inc. is a telecommunications research and development company. The company's unique vision supports both fundamental research and commercialization activities within one organization, funded by both private resources and programs. The company will achieve its long-term mission -- to be one of the world's telecommunications leaders -- by building on its track record of outstanding technical successes.

Telecore's products will produce a fundamental change in communications, in much the same way that the integrated circuit revolutionized data processing. Telecore's blend of world-class researchers and product developers place it at the forefront of the telecommunications industry.

Telecore, Inc.
P.O. Box 867411
Plano, Texas 75086

Document Change Revision Log

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2AA-00760-0000	06/12/03	New document – preliminary. Legacy mode only	All
2AA-00760-0001	09/15/03	Added Raytheon document number	Cover sheet
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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, E1, 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.
Never use an extension cord that does not have an earth ground connection. Never use an adapter that does not have an earth ground connection. If necessary, always use a suitable ground adapter. If possible, ground the extra wire on the ground adapter. Never use extension cords with non-polarized plugs or ones with broken off ground pins. Never break off the ground pin on electric equipment.
Always plug the power cord into the UMUX-III first. Only after plugging the power cord into the UMUX-III, plug the three-pronged AC plug into an AC outlet and power up the unit.
To disconnect the cord, always pull it out by grasping the plug. Never pull it out by the cord.
To avoid the risk of electrical shock, do not remove the cover. 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.
Use only the power supply cord supplied with the product. The UMUX-III is equipped with a polarized alternating-current line plug (a plug having one blade wider than the other). This plug will fit into the power outlet only one way. This is a safety feature. Match the wide blade of plug to wide slot of the outlet and fully insert.
Warning: To prevent fire or shock hazard, do not expose the unit to rain, moisture or corrosive gases.
Utilize safety precautions when installing the UMUX-III. The UMUX-III like other commercial and home electronics contains hazardous voltages, do not attempt to open the product to inspect or service the unit. There are no user serviceable parts inside. 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. Should any solid or liquid fall into the unit, disconnect the AC power cord and have unit professionally checked before operating the unit again. Continued use risks fire and electrical shock.
Ventilation openings must not be blocked or covered. Air intake and exhaust openings are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating. Air intake and exhaust opening should be cleaned on an annual basis to ensure longevity of the product.
Always make sure connectivity matches that chosen in System Configuration Display. When configured for phones, the unit supplies power. Therefore improper connectivity could damage connected equipment as well as risk fire and electrical shock.

Initial Configuration

*When changing the system configuration: Once the user presses the SELECT key to make the change permanent, the hardware/software will be reconfigured. **Because 48V phone power is supplied by the UMUX-III in some modes, it is best to configure the UMUX-III when it is disconnected from all external equipment.** Once the SELECT key is pressed, allow the unit a few moments to reconfigure the system configuration. When system reconfiguration is complete, power the unit OFF, make the necessary cable connections, and power the unit back ON. When the unit powers up it will be configured in the new operating mode.*

Product Description

Raytheon's Command and Control Switching Systems (CCSS) products utilize the Motorola Universal Digital-Loop Transceivers (UDLT) technology for providing connectivity between the switches and the subscriber end instrument. The UDLT technology and requirement to provide -48V to the end instrument over the wire pair restricts remoting of the subscriber end instrument to a cable length of 2000 feet. The UDLT Multiplexer (UMUX) provides a low cost solution to remote up to 23 CCSS phones beyond the 2000-foot limit. In Fiber mode, the subscriber end instruments can be remoted up to 5000 feet. In DS1 electrical UMUX-II legacy mode the subscriber end instruments can be remoted up to 4000 feet. For the new UMUX-III DS1 electrical mode subscriber end instruments can be remoted up to 2650 feet. When using other network transmission media (e.g., satellite transmission), there are virtually no limits for remoting subscriber end instruments.

Two separate products made up the original UMUX family of devices: the UMUX Master (UMUX-M) and the UMUX Slave (UMUX-S). The UMUX-M interface is designed for direct connection to the Electrospace™ Secure Digital Switch (SDS) or Digital Small Switch (DSS). The UMUX-S interface is designed for direct connection to the Electrospace™ CCSS phones. Using an external bandwidth manager, a single UMUX-M can be interconnected with up to five UMUX-S devices. Each voice channel is also separated from the corresponding in-band control/data channel for applications that must use voice compression to reduce the required network bandwidth.

The UMUX-II is the second generation UMUX device which combines the functionality of both UMUX-M and UMUX-S into one unit. The UMUX-II Legacy mode supports backward compatibility with the original UMUX devices. The UMUX-II supports remote operation of up to 19 UDLT phones. A Switch end and a Phone end UMUX-II are needed to provide this functionality.

The UMUX-III is the third generation UMUX device which combines the functionality of the UMUX-II with the new functionality of a Digital Phone Multiplexer (DPM). This new functionality is an enhanced version of Raytheon's legacy DPM-1 Digital Phone Multiplexer. The legacy DPM-1 extended UDLT phone service for up to 16 phones from

the main switch using a Limited Bandwidth T1 (LBT1) interface. The enhanced UMUX-III provides UDLT phone service for up to 23 phones allowing configuration of the interface to the main switch (Ingress link). The Ingress link can be configured to be any 3 electrical T1 interfaces, the Fiber Optic interface or the MIL-188-144 interface. Additionally, the UMUX-III can be configured to provide remote service to instruments located on a “cascaded” UMUX-III by defining an Egress link and defining the interfaces to be “passed” to the remote UMUX-III.

Figure 1 is a top level block diagram of the UMUX-III. The diagram shows 24 UDLT interfaces at connector J33. A rear cabling harness (not shown) breaks out the individual UDLT interface into 24 discrete 6-pin Stewart Stamping connectors, labeled on the rear as J1 through J24. The UMUX-II Phone end uses the first 19 UDLT interfaces; the UMUX-III (Direct Phone unit or the Network Phone unit) uses the first 23 UDLT interfaces. The UMUX-III uses a Quad FALC device to provide up to 4 T1 interfaces at connector J27. The 4th FALC T1 interface also is programmable to provide a Fiber Optic T1 interface at connector J28. For current UMUX-III applications only T1-1 and T1-4 interfaces are used. T1-1 is a network interface used for the Direct Phone unit T1 interface to the switch. T1-4 is configured as a Fiber Optic network interface for both the Network Link unit and the Network Phone unit. J29 provides the MIL-188-114 network interface for both of these units. This same J29 interface is also use for the UMUX-II MIL-188-114 interface. The UMUX-II uses the legacy T1 interface at J32 and a fiber network interface at J30/J31 (ST connectors). The UMUX-III also includes a couple of Ethernet maintenance console ports at J25 and J26.

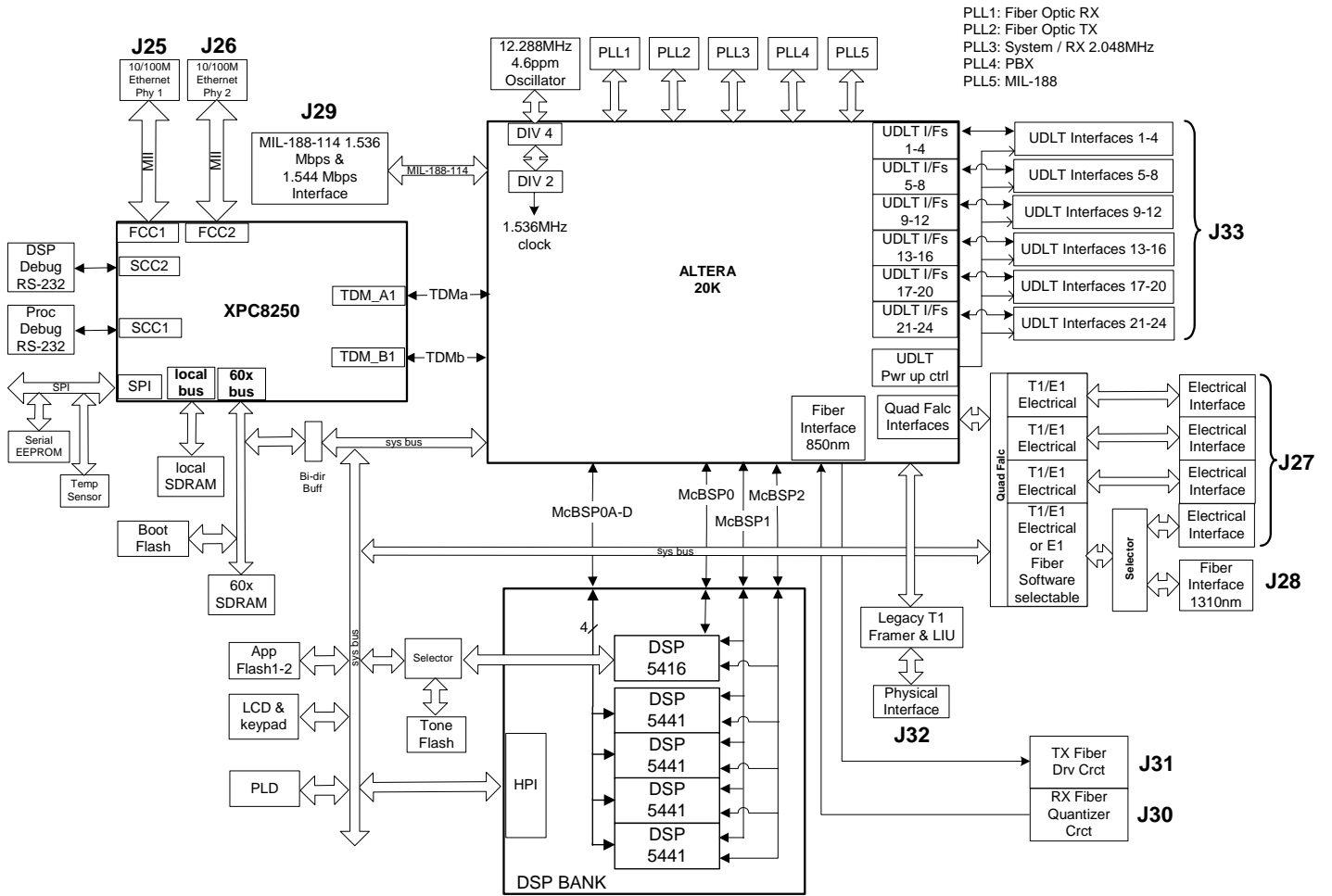


Figure 1: UMUX-III Block Diagram

Features

- AC input – 120/240 VAC, 50 or 60 Hz. No external D.C. power supply needed.
- Front panel status indicators and control switch to status display and configuration control
- Individual 6-pin Stewart Stamping connectors for each UDLT interface
- Provides three network interfaces: DS1/T1 electrical, Fiber, MIL-188-114
- MIL-188-114 network interface provides contact closure crypto resync
- Supports 1.536 Mbps mode for MIL-188-114

When configured as a UMUX-II unit:

- Supports up to 16 CCSS phones
- UMUX-II Switch timing derived from a UDLT link, line timed or external timing source (1.544 MHz)

When configured as a UMUX-III unit:

- Supports up to 23 CCSS phones
- Ingress Link (link to a switch or cascaded UMUX-III) configurable for any of five links:
 - T1 Electrical available on three different ports (T1-1, T1-2 and T1-3)
 - T1 Fiber (T1-4 only)
 - MIL-188-144
- Egress link (link to UMUX-III providing remote service) configurable for any of five links:
 - T1 Electrical available on three different ports (T1-1, T1-2 and T1-3)
 - T1 Fiber (T1-4 only)
 - MIL-188-144
- Cascading of UMUX-III's allow for any combination of CCSS phones "local" or "remote"
- UMUX-III timing configurable for each mode

UMUX-II Network Interface

When configured as a UMUX-II unit, the UMUX provides three network interfaces. Selection of the network interface is provided by means of dipswitches as set via a Legacy Mode Edit menu using front panel controls and Liquid Crystal Display (LCD) display. Providing three different network interfaces allows the network architect a great deal of flexibility when planning and deploying the remote CCSS phones.

- Long/Short Haul T1 (J32) – Copper interface that supports cable distances of up to 4000 feet. Selectable Extended Super Frame (ESF) or D4 framing with Alternate Mark Inversion (AMI) or Bipolar 8 Zero Suppression (B8ZS) line coding.
- Fiber (J30/J31) – ST interface that supports fiber distances up to approximately 1500 meters, 6 dB optical power budget, using 62.5/125 μm multimode fiber.
- MIL-188-114 (J29) – copper interface that supports separate clock and data for installations that require external crypto equipment. The data rate is either 1.544 Mbps or 1.536 Mbps as set up via the Modify Mode menu. Provides a contact closure output for a crypto resync signal.

UMUX-II Timing

The UMUX-II SWITCH is capable of deriving timing from the network, a UDLT interface, or an external 1.544 MHz timing source. In network timing mode, the T1 interface can be selected as the timing source. When the UDLT timing mode is selected, internal timing verification circuitry derives timing from the first available active UDLT port. In external timing mode, a 1.544 MHz RS-422 clock is input on the MIL-188-114 rear panel connector. The UMUX-II PHONE always derives timing from the selected network interface.

Timing source selection is provided by means of the LCD menus with front panel switches.

UMUX-III Network Interface

When configured as a UMUX-III unit, the UMUX provides five network interfaces. Selection of the network interface is provided by means of front panel controls and LCD display.

- (3) Short Haul T1's (J24) – Copper interfaces that support cable distances of up to 655 feet. The interfaces are set for Extended Super Frame (ESF) framing and Bipolar 8 Zero Suppression (B8ZS) line coding.
- Fiber (J28) – MTJR interface that supports fiber distances up to approximately 2000 meters, 6 dB optical power budget, using 62.5/125 μm multimode fiber.
- MIL-188-114 (J29) – copper interface that supports separate clock and data for installations that require external cryptographic equipment. The data rate is fixed at 1.536 Mbps. Provides a contact closure output for a crypto resync signal.

UMUX-III Timing

When configured as a UMUX-III unit, the unit can be configured to use the T1 RX clock, the MIL-188 TX clock, the MIL-188 RX clock. When configured for a T1 Ingress link (Electrical or Fiber), the selected timing would normally be the T1 RX clock (default). When configured for a MIL-188 Ingress link, timing will normally be derived from the MIL-188 TX clock (default) or the MIL-188 RX clock. In any configuration, external timing can be implemented by configuring the UMUX-III to use the MIL-188 TX clock or MIL-188 RX clock. UMUX-III timing is discussed more thoroughly in subsequent portions of this manual.

UMUX-II Interfaces and Dimensions

Figure 2 below identifies the UMUX-III interfaces.

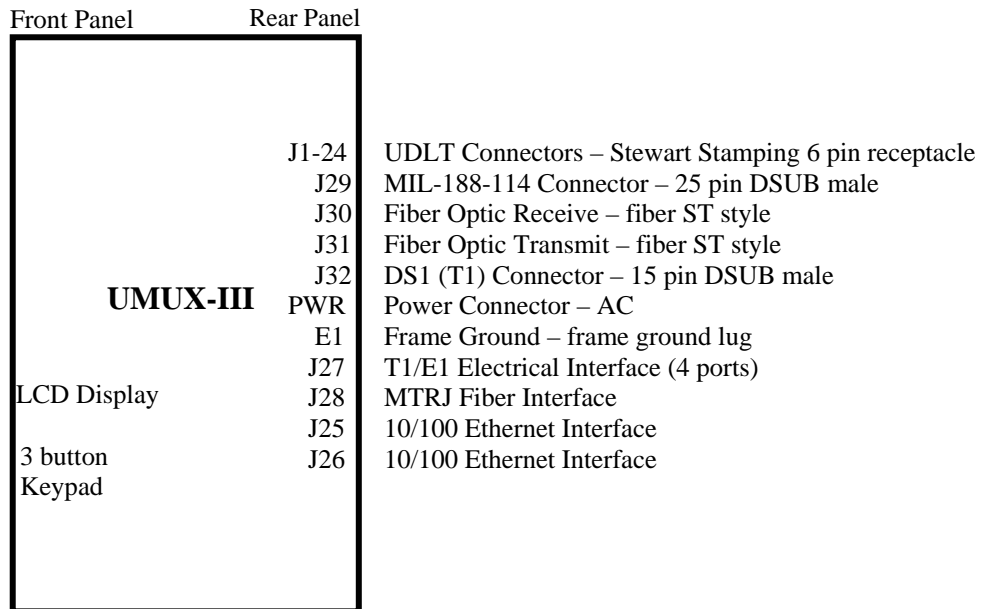


Figure 2: UMUX-III Interfaces

Physical Characteristics

The UMUX-III is a 19-inch rack-mount unit, with a 2 U (3.5 inch) rack height. The unit is 16 inches deep, not counting rear mounting connectors/components. The unit weighs 15.25 lbs.

Front Panel Interfaces

The UMUX-III front panel consists of an LCD display, and a three-button keypad interface. The LCD is a 2 by 16 character display provides real time display of the UMUX-III operational status. Figure 3 is a graphic representation of the UMUX-II front panel. Note: the UMUX-III retains the UMUX-II front panel legend.

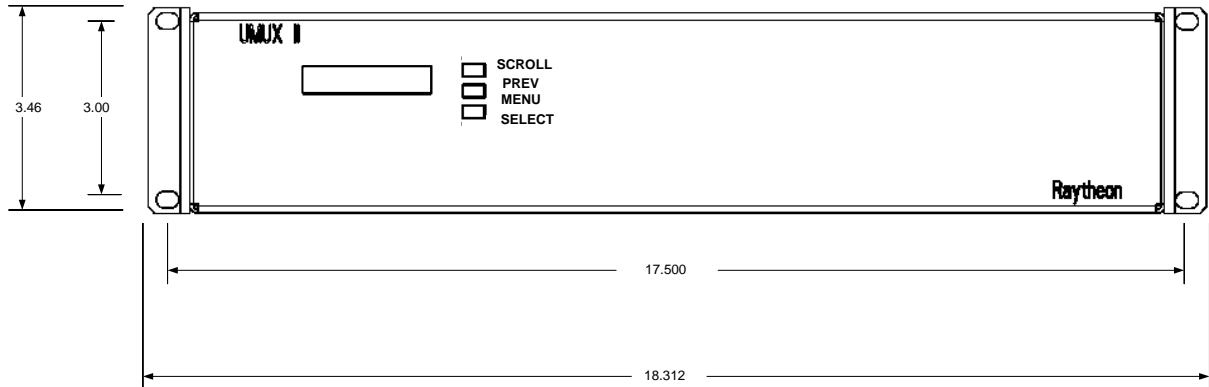


Figure 3: UMUX-III Front Panel Interfaces

Keypad

The UMUX-III provides three defined keys for the user input and query of run-time characteristics. The first key is defined to be the “SCROLL” key and allows the user to “scroll” through the menu items contained in the UMUX-III. The second key is defined as the “PREV MENU” key provides a method for the user to “escape” or “back out” of a given sequence. The third key is the “SELECT” key, which causes the system to take an action.

LCD Display

The LCD is a 2-line, 16-character display that provides status and allows the user to provision the UMUX-III.

Rear Panel Interfaces

Figure 4 provides a rear view of the UMUX-III.

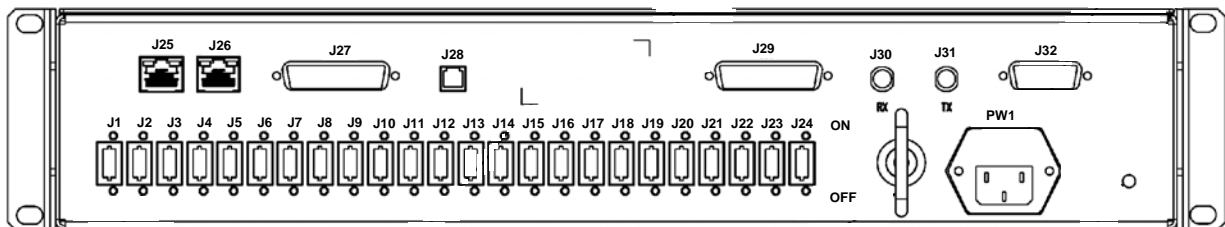


Figure 4: UMUX-III Rear Panel Interfaces

Connectors

Table 1: Rear Panel Connector I/O Definitions

Designator	Function	Connector Type	MFG/MFG P/N	Mate Type
J1-J24	24 UDLT Interfaces	Stewart Stamping 6 position	Stewart Stamping/SS-620606-FF-P1-3-4/	Stewart Stamping Plug, P/N. SS310606
J25	10/100Mbps Ethernet #1	RJ-45 Receptacle w/LEDs	AMP/406549-1	Standard RJ-45 Plug (Cat 5 Network cable)
J26	10/100Mbps Ethernet #2	RJ-45 Receptacle w/LEDs	AMP/406549-1	Standard RJ-45 Plug (Cat 5 Network cable)
J27	Primary Rate T1/E1 4 ports	DB-25M	AMP/747842-4	Standard DB-25 Receptacle
J28	Fiber TX/RX MDA compatible	MTRJ (1310nm)	Agilent/HFBR-5903	Standard MTRJ connector.
J29	MIL-188-114 Network Interface	DB-25M	AMP/747842-4	Standard DB25 Receptacle
J30	Fiber Network Interface RX, UMUX compatible	Optical Fiber (850 nm)	Agilent HFBR-2416T	Standard Fiber ST Connector
J31	Fiber Network Interface TX, UMUX compatible	Optical Fiber (850 nm)	Agilent HFBR-1414T	Standard Fiber ST Connector
J32	1.544 Mbps T1 network interface, UMUX compatible	DB-15M	AMP/747841-4	Standard DB15 Receptacle
PW1	120VAC Power Input	Filtered/Fused Power Entry	Corcom, 6EHG1-2	AC power cord, NEMA 5-15 Plug to IEC-320 C13 receptacle, 6 ft., Supplied with unit.

J1-J24 UDLT Connectors

Table 2: UDLT connectors pin definitions

Conn	Pin	Description	Pin	Description
J1	1	UDLT 1 (+)	6	UDLT 1 (-)
J2	1	UDLT 2 (+)	6	UDLT 2 (-)
J3	1	UDLT 3 (+)	6	UDLT 3 (-)
J4	1	UDLT 4 (+)	6	UDLT 4 (-)
J5	1	UDLT 5 (+)	6	UDLT 5 (-)
J6	1	UDLT 6 (+)	6	UDLT 6 (-)
J7	1	UDLT 7 (+)	6	UDLT 7 (-)
J8	1	UDLT 8 (+)	6	UDLT 8 (-)
J9	1	UDLT 9 (+)	6	UDLT 9 (-)
J10	1	UDLT 10 (+)	6	UDLT 10 (-)
J11	1	UDLT 11 (+)	6	UDLT 11 (-)
J12	1	UDLT 12 (+)	6	UDLT 12 (-)
J13	1	UDLT 13 (+)	6	UDLT 13 (-)
J14	1	UDLT 14 (+)	6	UDLT 14 (-)
J15	1	UDLT 15 (+)	6	UDLT 15 (-)
J16	1	UDLT 16 (+)	6	UDLT 16 (-)
J17	1	UDLT 17 (+)	6	UDLT 17 (-)
J18	1	UDLT 18 (+)	6	UDLT 18 (-)
J19	1	UDLT 19 (+)	6	UDLT 19 (-)
J20	1	UDLT 20 (+)	6	UDLT 20 (-)
J21	1	UDLT 21 (+)	6	UDLT 21 (-)
J22	1	UDLT 22 (+)	6	UDLT 22 (-)
J23	1	UDLT 23 (+)	6	UDLT 23 (-)
J24	1	UDLT 24 (+)	6	UDLT 24 (-)

Note: pins 2-5 are NC on all connectors

J29 MIL-188-114 Connector

Table 3: MIL-188-114 connector pin definitions

Pin	Description	Pin	Description
1	Frame GND	14	TX Data (-)
2	TX Data (+)	15	TX CLK (+)
3	RX Data (+)	16	RX Data (-)
4	Frame GND	17	RX CLK (+)
5	Resync (+)	18	422CLKOut(+)
6	MIL SNGL	19	422CLKOut(-)
7	Frame GND	20	Frame GND
8	422 Spare In (-)	21	GND
9	RX CLK (-)	22	RS422 Spare
10	422 Spare In (+)	23	RS422 Spare
11	Frame GND	24	422 Ssync CMD
12	TX CLK (-)	25	422 Ssync CMD
13	Resync (-)		

J32 Legacy UMUX DS1 Connector

Table 4: Legacy UMUX DS1 connector pin definitions

Pin	Description	Pin	Description
1	DS1 TX (+)	9	DS1 TX (-)
2	Frame (GND)	10	Frame GND
3	DS1 RX (+)	11	DS1 RX (-)
4	Frame GND	12	Frame GND
5	DSP Debug	13	DSP Debug IN
6	Proc Debug	14	Proc Debug
7	Proc Debug	15	Proc Debug
8	Frame GND		

J27 Quad T1/E1 Electrical Interfaces

Table 5: Quad T1/E1 Electrical interfaces connector pin definitions

Pin	Signal	Direction I/O	Description
1	Frm Gnd	N/A	Frame Gnd
2	T1 E1 TX1 P	O	T1 E1 TX Data Ch #1 Positive
3	T1 E1 TX1 N	O	T1 E1 TX Data Ch #1 Negative
4	Frm Gnd	N/A	Frame Gnd
5	T1 E1 TX2 P	O	T1 E1 TX Data Ch #2 Positive
6	T1 E1 TX2 N	O	T1 E1 TX Data Ch #2 Negative
7	Frm Gnd	N/A	Frame Gnd
8	T1 E1 TX3 P	O	T1 E1 TX Data Ch #3 Positive
9	T1 E1 TX3 N	O	T1 E1 TX Data Ch #3 Negative
10	Frm Gnd	N/A	Frame Gnd
11	T1 E1 TX4 P	O	T1 E1 TX Data Ch #4 Positive
12	T1 E1 TX4 N	O	T1 E1 TX Data Ch #4 Negative
13	Frm Gnd	N/A	Frame Gnd
14	T1 E1 RX1 P	I	T1 E1 RX Data Ch #1 Positive
15	T1 E1 RX1 N	I	T1 E1 RX Data Ch #1 Negative
16	Frm Gnd	N/A	Frame Gnd
17	T1 E1 RX2 P	I	T1 E1 RX Data Ch #2 Positive
18	T1 E1 RX2 N	I	T1 E1 RX Data Ch #2 Negative
19	Frm Gnd	N/A	Frame Gnd
20	T1 E1 RX3 P	I	T1 E1 RX Data Ch #3 Positive
21	T1 E1 RX3 N	I	T1 E1 RX Data Ch #3 Negative
22	Frm Gnd	N/A	Frame Gnd
23	T1 E1 RX4 P	I	T1 E1 RX Data Ch #4 Positive
24	T1 E1 RX4 N	I	T1 E1 RX Data Ch #4 Negative
25	Frm Gnd	N/A	Frame Gnd

J25 and J26 10/100 Mbit Ethernet Interfaces

Table 6: 10/100Mbit Ethernet connector pin definitions

Pin	Signal Name	Direction I/O	Description
1	TX +	O	Transmit data Positive
2	TX -	O	Transmit data Negative
3	RX+	I	Receive data Positive
4	Termination	I	Termination
5	Termination	I	Termination
6	RX-	I	Receive data Negative
7	Termination	I	Termination
8	Termination	I	Termination

OPERATION and SETUP

The UMUX-III as initially configured and shipped from the factory will default to a UMUX-II Switch side unit whereby -48 VDC power will not be enabled. This configuration is considered the failsafe mode prior the physical installation and setup of the unit. It is recommended that the unit be properly configured for its intended functional use prior to interconnecting the unit to its external interfaces.

Figure 5 provides the main configuration menus for the UMUX-III unit. This top level menu diagram allows the unit to be configured/re-configured either as UMUX-II unit (extension of phones from the switch via UDLT interfaces) or as a UMUX-III unit (extension of phones from the switch via an aggregate T1 interface). The Modify Unit Configuration (Mod Unit Config) menu is used to select the desired unit configuration. Other main menu options then provide the appropriate sub-menu options for either UMUX-II or UMUX-III operations.

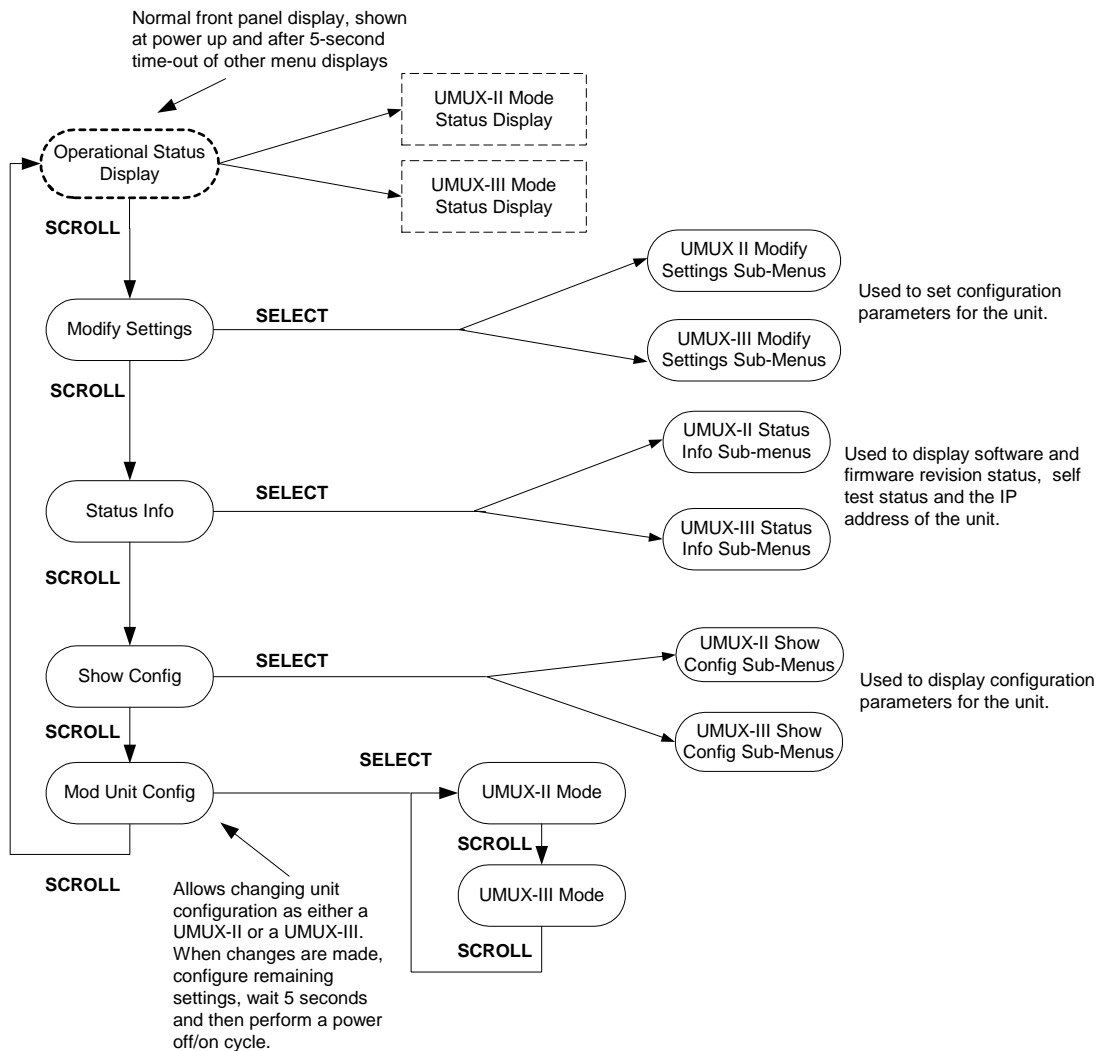


Figure 5: Main UMUX-III Configuration Menus

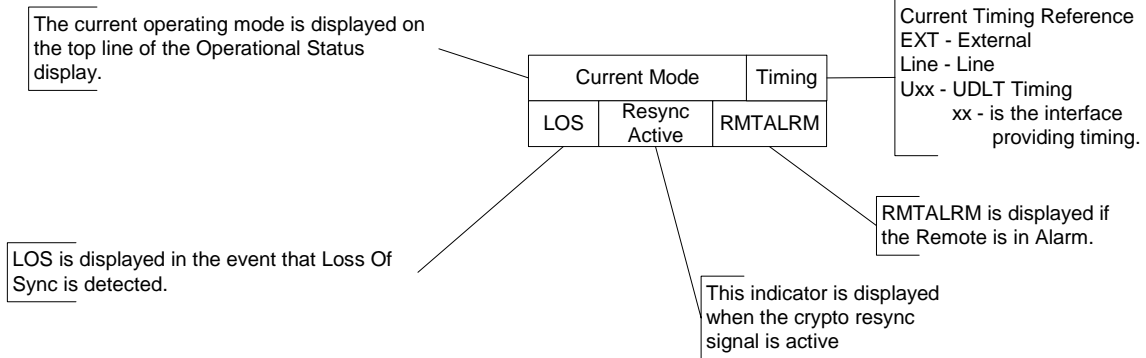
UMUX-II Operations

Once configured as UMUX-II unit for extension of UDLT interfaces from the switch to distant phones via a configured network interface, the unit may be further configured as either switch side or phone side unit via the front panel controls. This mode of operation also provides backward compatibility with the original UMUX-M or UMUX-S units.

UMUX-II Indicators

The front panel display provides real time operational status for the UMUX-II mode. This replaces the functionality (power, timing, loss of sync, and alarms) of the front panel visual indicators (LEDs) that the original UMUX provided. Figure 6 shows the status screen of the UMUX-III LCD screen when configured for a UMUX-II

UMUX-II Operational Status Display Description



Legacy Mode Normal Operation Example (External Timing)

LEGACY NORM EXT
NORMAL OPERATION

Legacy Mode Normal Operation Example (Timing derived from UDLT Interface #10)

LEGACY NORM U10
NORMAL OPERATION

Legacy Mode Loss of Sync Example (Timing derived from UDLT Interface #10)

LEGACY NORM U10
LOS

Legacy Mode Remote Alarm Example (Timing derived from UDLT Interface #10)

LEGACY NORM U10
LOS RMTALRM

Legacy Mode Resync Active Example (Timing derived from External Source)

LEGACY NORM EXT
RESYNC ACTIVE

Figure 6: LCD Status and Examples

UMUX-II Configuration

The UMUX-II provides menu selection controls via the front panel keypad and LCD as shown in Figure 7. The menus allow selections for modifying the configuration of the unit (Modify Settings), the display of software/firmware revision status, self test status and the IP address of the unit (Status Info) and the configuration setup status of the unit (Show Config).

The Modify Settings menu allows the configuration of the UMUX-II to be compatible with the Legacy Mode UMUX units (Legacy Norm). This setting retains all legacy UMUX configuration options, including operating the MIL-188 interface at a 1.544 Mbps rate. Operating the MIL-188 interface at this 1.544 Mbps rate is not recommended since recognizing out-of-sync conditions may be unreliable. Selection of the Legacy 1.536 Mode is the recommended mode when two UMUX-II units are interconnected with an encrypted link operating at 1.536 Mbps rate. Other setup controls (Modify Config and Legacy Mode Edit) also apply to this selected mode. The Modify Configuration (Modify Config) menu is used to set up the UMUX-II for either the Switch end (legacy UMUX-M) or the Phone end (legacy UMUX-S). The Legacy Mode Edit menu allows the configuration of two switch banks, identically to what was previously performed on the legacy UMUX units using rear panel dipswitches. The switch bank switch settings are discussed in the next section.

The Status Information (Status Info) menu provides display of software and firmware part numbers/revision status, power up non-critical failure self test results status and Internet Protocol (IP) address of the unit.

The Show Configuration (Show Config) menu identifies the unit as being configured as UMUX-II unit, and being set for either “Legacy Norm” mode (legacy UMUX compatibility) or the new UMUX-II “Legacy 1.536” mode for a 1.536 Mbps MIL-188 network interface. This menu also shows the status of the two switch bank settings.

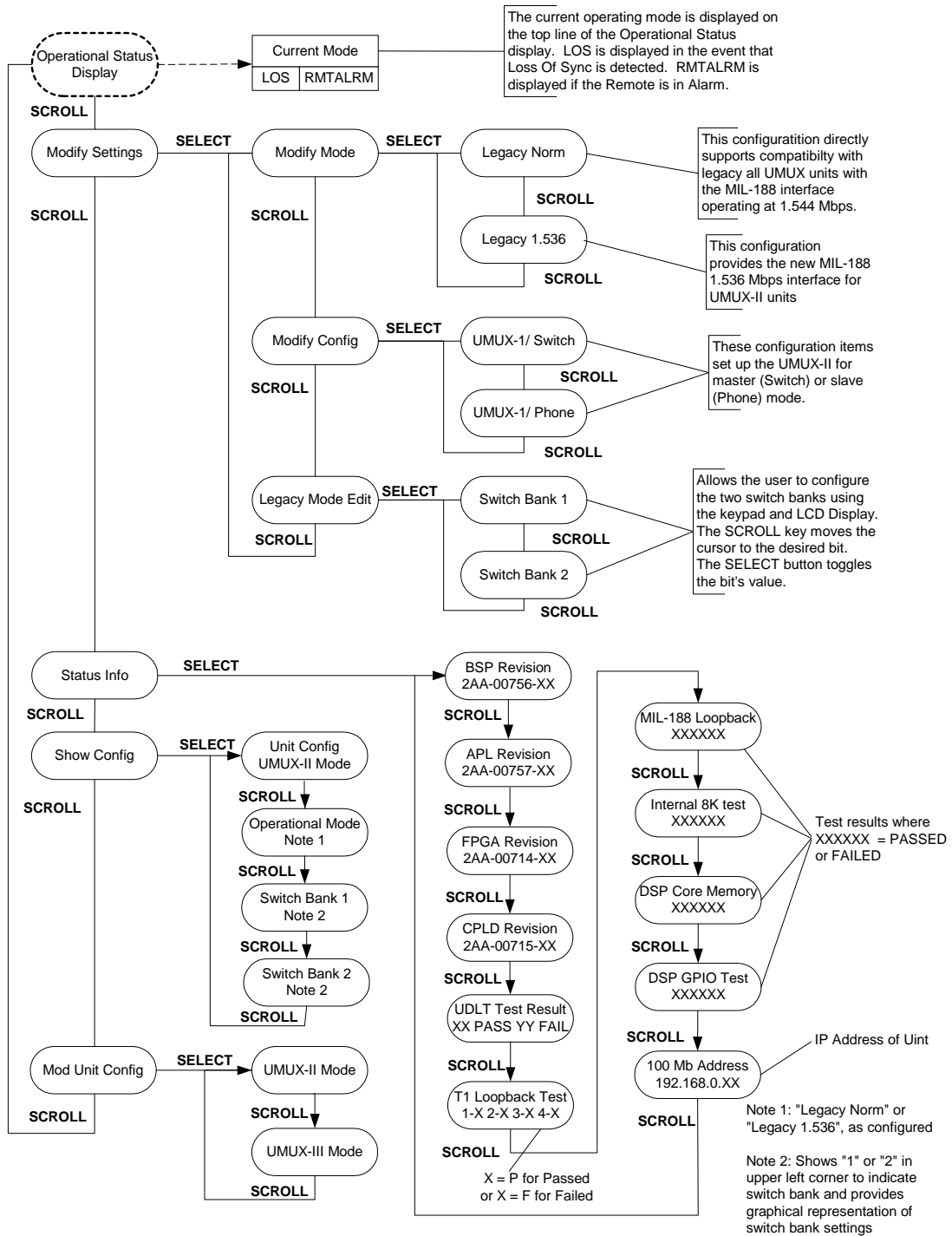


Figure 7: UMUX-II Configuration Menus

UMUX-II Switches

The external configuration switch settings are available in the Legacy Mode Edit menu (previously on the UMUX they were actual switches, accessible from the rear of the unit and are numbered from left to right looking from the rear of the unit). There are a total of 24 configuration switch settings.

Switch Definitions

Dipswitches SW1-1, SW1-2, SW1-3 and SW1-4 are relevant for the Long/Short Haul T1 Network Interface, supporting configuration for various Line Build-Out options for different T1 cable distances. They should be set according to the function and pulse. The PULSE column in the table below corresponds to the power output of the transmitter. The GAIN column corresponds to the amount of gain applied by the receive equalizer. For short haul applications, set the dipswitches according to the approximate cable length indicated in the PULSE column. For long haul applications, use the 36 dB gain settings for longer cable lengths and the 26 dB gain settings for shorter cable lengths. Select the setting within each group that gives the best Bit-Error-Rate (BER) performance. In order to optimize the performance in long haul applications, it is necessary to measure pulse mask at the far end of the link and adjust the switch settings to best meet the pulse mask. This procedure is also recommended for short haul applications.

For Fiber or MIL-188 network interfaces, these switches should be set to OFF.

SW1-1	SW1-2	SW1-3	SW1-4	FUNCTION	PULSE	CABLE	GAIN
ON	ON	ON	ON	T1 Long Haul	0.0 dB pulse	100 Ω TP	36 dB
ON	OFF	ON	ON	T1 Long Haul	-7.5 dB pulse	100 Ω TP	36 dB
ON	ON	OFF	ON	T1 Long Haul	-15.0 dB pulse	100 Ω TP	36 dB
ON	OFF	OFF	ON	T1 Long Haul	-22.5 dB pulse	100 Ω TP	36 dB
OFF	ON	ON	ON	T1 Long Haul	0.0 dB pulse	100 Ω TP	26 dB
OFF	OFF	ON	ON	T1 Long Haul	-7.5 dB pulse	100 Ω TP	26 dB
OFF	ON	OFF	ON	T1 Long Haul	-15.0 dB pulse	100 Ω TP	26 dB
OFF	OFF	OFF	ON	T1 Long Haul	-22.5 dB pulse	100 Ω TP	26 dB
OFF	OFF	ON	OFF	T1 Short Haul	0-133 ft/0.6 dB	100 Ω TP	12 dB
ON	ON	OFF	OFF	T1 Short Haul	133-266 ft/1.2 dB	100 Ω TP	12 dB
OFF	ON	OFF	OFF	T1 Short Haul	266-399 ft/1.8 dB	100 Ω TP	12 dB
ON	OFF	OFF	OFF	T1 Short Haul	399-533 ft/2.4 dB	100 Ω TP	12 dB
OFF	OFF	OFF	OFF	T1 Short Haul	533-655 ft/3.0 dB	100 Ω TP	12 dB

Dipswitch SW1-5 is used to configure the DS1 Line Interface Unit in Facility (FAC) loopback mode. This loopback mode is used to test the facility by looping back the DS1 electrical signal when it comes into the unit. The normal configuration for this switch should be in the ON position. This switch is used during line testing and line fault isolation diagnostic testing.

SW1-5	SELECTION
ON	Normal
OFF	DS1 FAC Loopback

Dipswitch SW1-6 is used to configure the DS1 Line Interface Unit (LIU) in local loopback. LIU local loopback is used to test the local unit. This would include the framer, LIU, and all other associated equipment. Setting this switch to the OFF position configures the LIU to loop the received bipolar pair and clock (TPOS/TNEG/TCLK) to the transmit bipolar pair and clock (RPOS/RNEG/RCLK). The normal configuration for this switch is the ON position. **This switch should be set to the OFF position in FIBER MODE.**

SW1-6	SELECTION
ON	Normal (electrical)
OFF	DS1 LIU Local Loopback/Fiber T1

Dipswitches SW1-7 and SW1-8 are used to select the DS1 LIU interface data generation mode of operation for the UMUX. The primary use of these switches is for line diagnostic testing and for measuring/adjusting the pulse mask. Three selections are available. 1. Normal should be selected for normal unit operation. 2. Quasi-Random Signaling Source (QRSS) mode generates QRSS data as well as enables the QRSS detector in the receiver. This mode can be used for pulse mask testing as well as BER testing. 3. TAOS mode configures the electrical DS1 output to Transmit All Ones (TAOS). This is the BLUE ALARM condition (Unframed 1's). Selecting either of these conditions overrides all other data select modes configured for the DS1 framer.

SW1-7	SW1-8	SELECTION
ON	ON	Invalid
OFF	ON	TAOS
ON	OFF	QRSS
OFF	OFF	Normal

Dipswitch SW1-9 provides the capability to generate an Isolated One (ISO One) data pattern in DS1 electrical mode. Setting this switch to the ON position will generate an isolated one data pattern for use in pulse mask testing. Normally, this switch will be OFF. It should be used when configuring a new circuit or diagnosing line problems.

SW1-9	SELECTION
ON	ISO One Enable
OFF	Normal

Dipswitch SW1-10 provides the capability to force a yellow alarm on the outgoing DS1 electrical line. Setting this switch to the ON position will cause a yellow alarm. Normally, this switch will be OFF. It should be used when configuring a new circuit or diagnosing line problems.

SW1-10	SELECTION
ON	GEN YLW Alarm
OFF	Normal

Dipswitches SW1-11 and SW1-12 determine the DS1 line-coding scheme as shown in the table below. When operating in fiber mode, D4/AMI must be selected.

SW1-11	SW1-12	SELECTION
ON	ON	D4, AMI/Fiber
ON	OFF	D4, B8ZS
OFF	ON	ESF, AMI
OFF	OFF	ESF, B8ZS

Dipswitches SW2-1 and SW2-4 select the DS1 timeslot partitioning and the summing option for the –01 revision of the UMUX. SW 2-1 should be left in the **off** position **unless** a –01 revision UMUX is being used **and** mode 8 functionality is required. SW 2-4 should be left in the **off** position on the UMUX-II Phone unit **unless** a –01 revision UMUX is being used **and** SW 2-1 is in the **on** position for both the Master and Slave units **and** summing functionality is required. SW 2-4 should be left in the **off** position on the UMUX-II Switch unit in **all** configuration options. Refer to the table below for strapping information:

SW2-1	UMUX-II PHONE SW2-4	UMUX-II SWITCH SW2-4	SELECTION
ON	ON	OFF	Group 8 Enable with Summing
ON	OFF	OFF	Group 8 Enable w/o Summing
OFF	ON	ON	Undefined mode, DO NOT USE!
OFF	OFF	OFF	Default setting, use for –00 revisions (Group 4)

Dipswitch SW2-2 is not used.

Dipswitch SW2-3 is reserved for new functionality. It should be set to the OFF position.

SW2-3	SELECTION
ON	LSB Stuff Enable
OFF	Normal

Dipswitch SW2-5 determines whether Zero Code Suppression (ZCS) is enabled. Some networks cannot pass the “00” code. This mode can be enabled to provide substitution of “FF” for ”00” to accommodate the network equipment. ZCS must be set the same on both ends of the link. When doing voice compression with IDNX, ZCS should be enabled.

SW2-5	SELECTION
ON	ZCS Enabled
OFF	ZCS Disabled

The combination of dipswitches SW2-6 and SW2-7 determines the desired DS-1 mode for the UMUX as follows:

SW2-6	SW2-7	SELECTION
ON	ON	INVALID
ON	OFF	DS1 MIL-188
OFF	ON	DS1 Fiber
OFF	OFF	DS1 Electrical

The combination of dipswitches SW2-8 and SW2-9 determines the timing source selection. For the UMUX-II SWITCH, the three timing choices are: MIL-188 Timing (external), UDLT Timing, or Line Timing. For the UMUX-II PHONE, the two choices are MIL-188 Timing (external), or Line Timing. SW2-8 OFF and SW2-9 OFF, configures the UMUX-II PHONE for line timing. Line timing is derived from the selected network interface (i.e. fiber, MIL-188-114 or DS1 Electrical). Line Timing is the most common configuration for the UMUX-II PHONE.

SW2-8	SW2-9	SELECTION
ON	ON	INVALID
ON	OFF	MIL-188 Timing/External
OFF	ON	UDLT Timing (Master only)
OFF	OFF	Line Timing

The MIL-188 RESYNC pair is a loop closure. The loop will cycle closed->open when the RED ALARM (LOS) condition is detected on the T1 link, and will continue until the LOS condition is cleared. The closure rate is selectable via dipswitch SW2-10. When this dipswitch is OFF, the loop closure time will be 1 second closed and 5 seconds open. Setting this dipswitch ON will select a loop closure rate of 1 second closed and 10 seconds open. In MIL-188-114 1.544Mbps mode (a mode not recommended), the re-synchronization detection is done on a clock and data presence basis only. In this configuration, the RESYNC may not be reliably activated if a failure occurs on the network side of the crypto.

SW2-10	SELECTION
ON	Resync 5 seconds
OFF	Resync 10 seconds

Dipswitches SW2-11 and SW2-12 are not used.

DS1 Electrical Switch Settings

The following switches are involved with configuring the DS1 Electrical mode: SW1-1, SW1-2, SW1-3, SW1-4, SW1-5, SW1-6, SW1-11, SW1-12, SW2-1, SW2-4, SW2-5, SW2-6, and SW2-7. Additionally, the timing switches SW2-8 and SW2-9, which are configuration dependant, need to be set. All other switches are typically set to the OFF position.

DS1 Fiber Switch Settings

The following switches are involved with configuring the DS1 Fiber mode: SW1-5, SW1-6, SW1-11, SW1-12, SW2-1, SW2-4, SW2-5, SW2-6, and SW2-7. Additionally, the timing switches SW2-8 and SW2-9, which are configuration dependant, need to be set. All other switches are typically set to the OFF position

DS1 MIL-188-114 Switch Settings

The following switches are involved with configuring the DS1 MIL-188-114 mode: SW1-5, SW1-6, SW2-1, SW2-4, SW2-5, SW2-6, and SW2-7. The timing switches SW2-8 and SW2-9, which are configuration dependant, need to be set. Also SW2-10 selects the Resync timing. In addition, switches SW1-11 and SW1-12 must be set to the ON position. All other switches are typically set to the OFF position

UMUX-II Examples

Example 1: Group 4, DS1 Electrical, Master UDLT timing, Slave line timing, ESF/B8ZS

This example, set up for Group 4 operation, configures the UMUX-II Switch to derive timing off a UDLT channel. The UMUX will use the first active UDLT channel it finds, searching sequentially through the UDLT channels until it finds a valid timing source. The UMUX-II Phone is configured for line timing. ESF/B8ZS framing/line coding is used for this example; however, four different line-coding schemes (determined by SW1-11 and SW1-12 settings) are supported: D4 AMI, D4 B8ZS, ESF AMI, and ESF B8ZS. Zero code suppression is off. The example configures the units for short haul cabling of less than 133 feet. Various cabling distances are accommodated with other SW1-1 thru SW1-4 settings. See Figure 8 for a diagram of this set up.

Set the front panel configuration controls on the UMUX units as follows:

Front Panel Setup (Modify Settings):

- **Modify Mode - Both UMUX-II Units Set To Legacy Norm**
- **Modify Config - One Unit Configured for Switch end; One Unit Configured for Phone end**
- **Legacy Mode Edit – Set Switch Banks per Below:**

UMUX-II SWITCH		UMUX-II PHONE	
SW1-1: OFF	SW2-1: OFF	SW1-1: OFF	SW2-1: OFF
SW1-2: OFF	SW2-2: OFF	SW1-2: OFF	SW2-2: OFF
SW1-3: ON	SW2-3: OFF	SW1-3: ON	SW2-3: OFF
SW1-4: OFF	SW2-4: OFF	SW1-4: OFF	SW2-4: OFF
SW1-5: ON	SW2-5: OFF	SW1-5: ON	SW2-5: OFF
SW1-6: ON	SW2-6: OFF	SW1-6: ON	SW2-6: OFF
SW1-7: OFF	SW2-7: OFF	SW1-7: OFF	SW2-7: OFF
SW1-8: OFF	SW2-8: OFF	SW1-8: OFF	SW2-8: OFF
SW1-9: OFF	SW2-9: ON	SW1-9: OFF	SW2-9: OFF
SW1-10: OFF	SW2-10: OFF	SW1-10: OFF	SW2-10: OFF
SW1-11: OFF	SW2-11: OFF	SW1-11: OFF	SW2-11: OFF
SW1-12: OFF	SW2-12: OFF	SW1-12: OFF	SW2-12: OFF

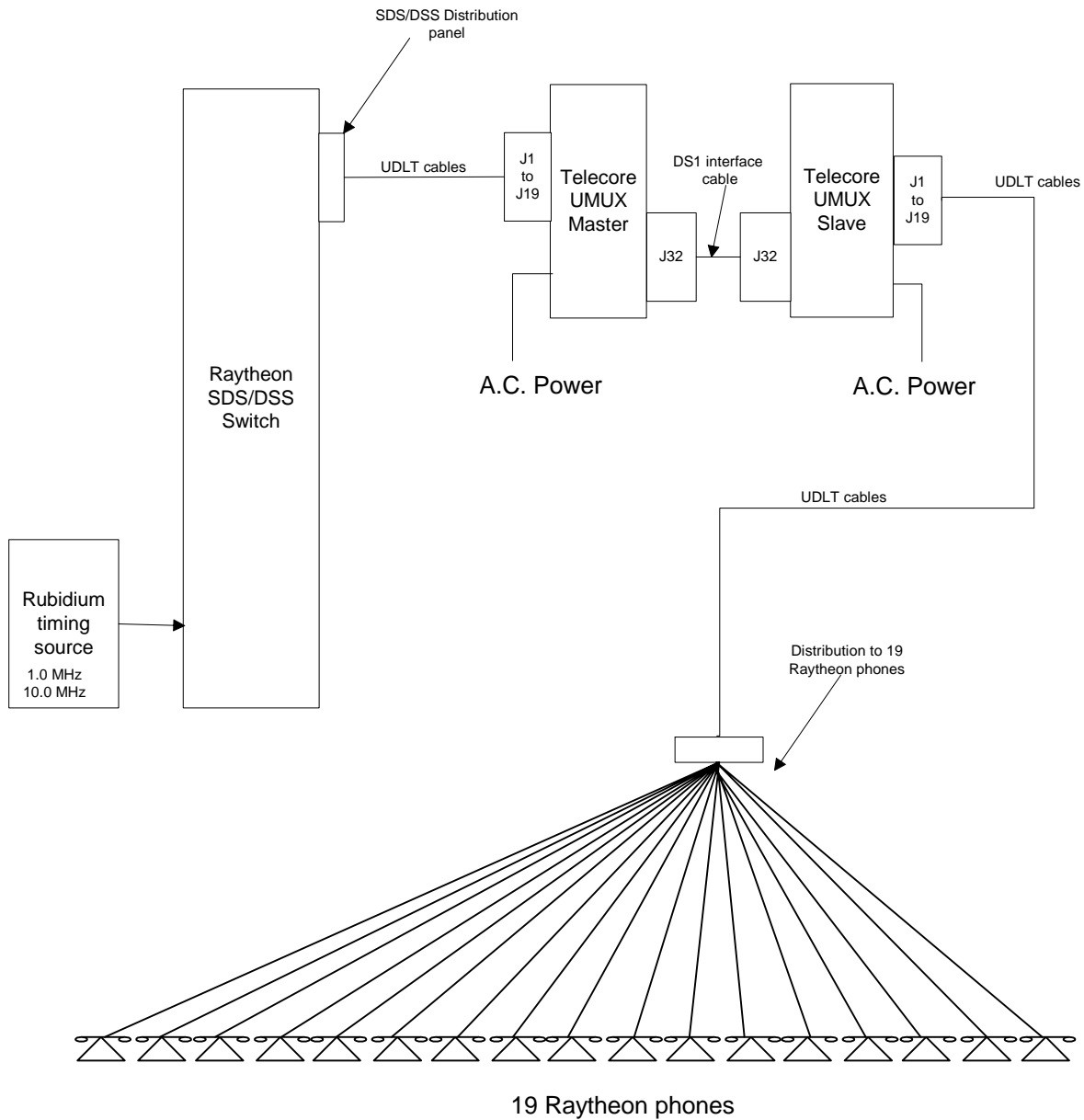


Figure 8: Group 4, DS1 Electrical, Master UDLT timing, Slave line timing set up diagram

Example 2: Group 4, DS1 Electrical, Master External, Slave External Timing, D4/AMI

This example set up for Group 4 operation configures the UMUX-II Switch and UMUX-II Phone to derive timing from an external source and uses D4/AMI framing format/line coding. Zero code suppression is off. The example configures the units for short haul cabling of less than 133 feet. See Figure 9 for a diagram of this set up.

Set the front panel configuration controls on the UMUX units as follows:

Front Panel Setup (Modify Settings):

- **Modify Mode - Both UMUX-II Units Set To Legacy Norm**
- **Modify Config - One Unit Configured for Switch end; One Unit Configured for Phone end**
- **Legacy Mode Edit – Set Switch Banks per Below:**

UMUX-II SWITCH

SW1-1: OFF	SW2-1: OFF
SW1-2: OFF	SW2-2: OFF
SW1-3: ON	SW2-3: OFF
SW1-4: OFF	SW2-4: OFF
SW1-5: ON	SW2-5: OFF
SW1-6: ON	SW2-6: OFF
SW1-7: OFF	SW2-7: OFF
SW1-8: OFF	SW2-8: ON
SW1-9: OFF	SW2-9: OFF
SW1-10: OFF	SW2-10: OFF
SW1-11: ON	SW2-11: OFF
SW1-12: ON	SW2-12: OFF

UMUX-II PHONE

SW1-1: OFF	SW2-1: OFF
SW1-2: OFF	SW2-2: OFF
SW1-3: ON	SW2-3: OFF
SW1-4: OFF	SW2-4: OFF
SW1-5: ON	SW2-5: OFF
SW1-6: ON	SW2-6: OFF
SW1-7: OFF	SW2-7: OFF
SW1-8: OFF	SW2-8: ON
SW1-9: OFF	SW2-9: OFF
SW1-10: OFF	SW2-10: OFF
SW1-11: ON	SW2-11: OFF
SW1-12: ON	SW2-12: OFF

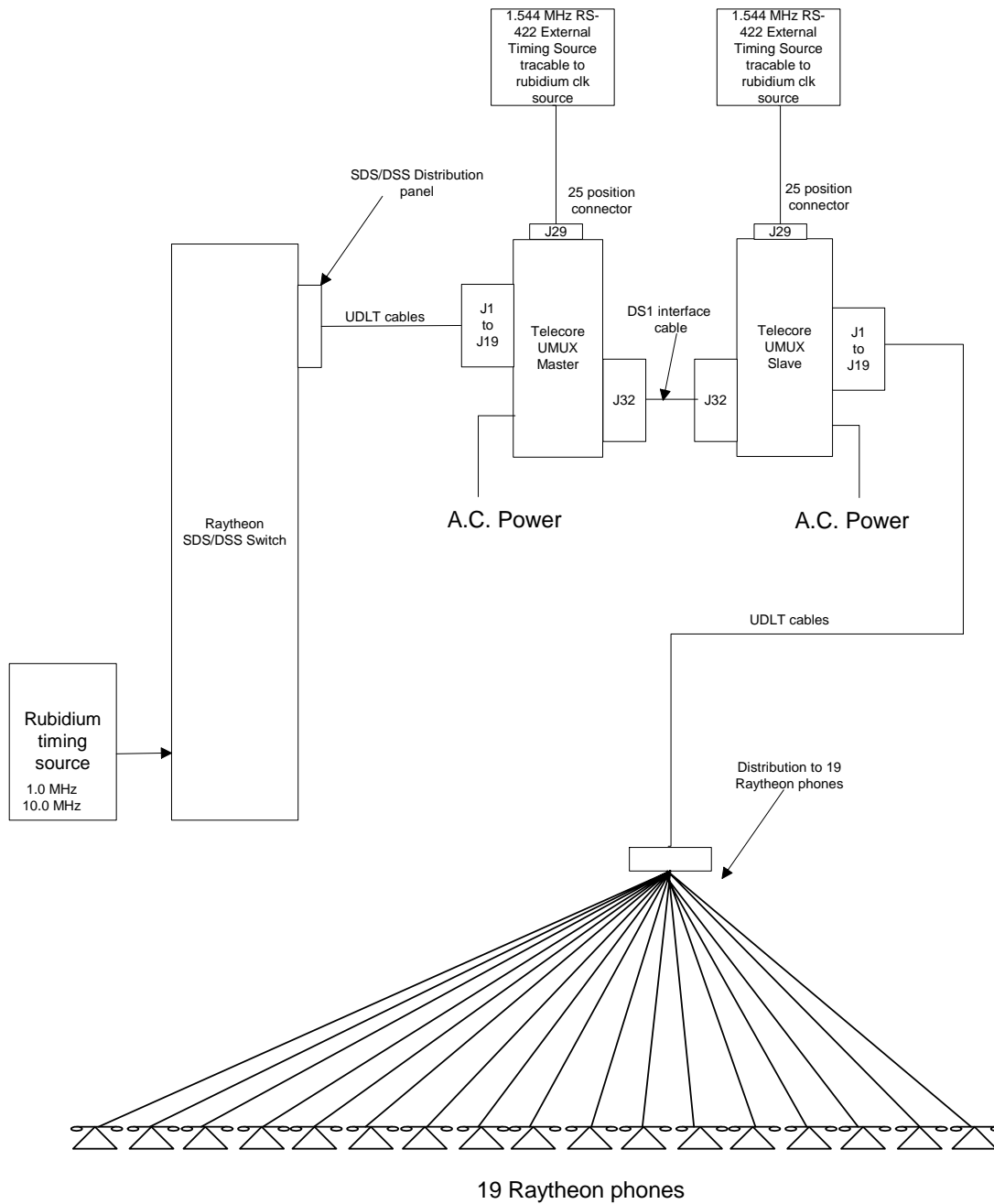


Figure 9: Group 4, DS1 Electrical, Master External, Slave External timing set up diagram

Example 3: Group 4, 1.544 Mbps MIL-188 Interface, Master External, Slave External Timing

The following example set up for Group 4 operation shows the 1.544 Mbps MIL-188 interface with MIL-188 timing selected on both the UMUX-II SWITCH and UMUX-II PHONE devices. This interface uses the legacy T1 framer chip, requiring that the unit be set for D4/AMI. Zero code suppression is off. Resync is set for 10 seconds. See Figure 10 for a diagram of this set up.

Set the front panel configuration controls on the UMUX units as follows:

Front Panel Setup (Modify Settings):

- **Modify Mode - Both UMUX-II Units Set To Legacy Norm**
- **Modify Config - One Unit Configured for Switch end; One Unit Configured for Phone end**
- **Legacy Mode Edit – Set Switch Banks per Below:**

UMUX-II SWITCH		UMUX-II PHONE	
SW1-1: OFF	SW2-1: OFF	SW1-1: OFF	SW2-1: OFF
SW1-2: OFF	SW2-2: OFF	SW1-2: OFF	SW2-2: OFF
SW1-3: OFF	SW2-3: OFF	SW1-3: OFF	SW2-3: OFF
SW1-4: OFF	SW2-4: OFF	SW1-4: OFF	SW2-4: OFF
SW1-5: ON	SW2-5: OFF	SW1-5: ON	SW2-5: OFF
SW1-6: ON	SW2-6: ON	SW1-6: ON	SW2-6: ON
SW1-7: OFF	SW2-7: OFF	SW1-7: OFF	SW2-7: OFF
SW1-8: OFF	SW2-8: ON	SW1-8: OFF	SW2-8: ON
SW1-9: OFF	SW2-9: OFF	SW1-9: OFF	SW2-9: OFF
SW1-10:OFF	SW2-10:OFF	SW1-10:OFF	SW2-10:OFF
SW1-11:ON	SW2-11:OFF	SW1-11:ON	SW2-11:OFF
SW1-12:ON	SW2-12:OFF	SW1-12:ON	SW2-12:OFF

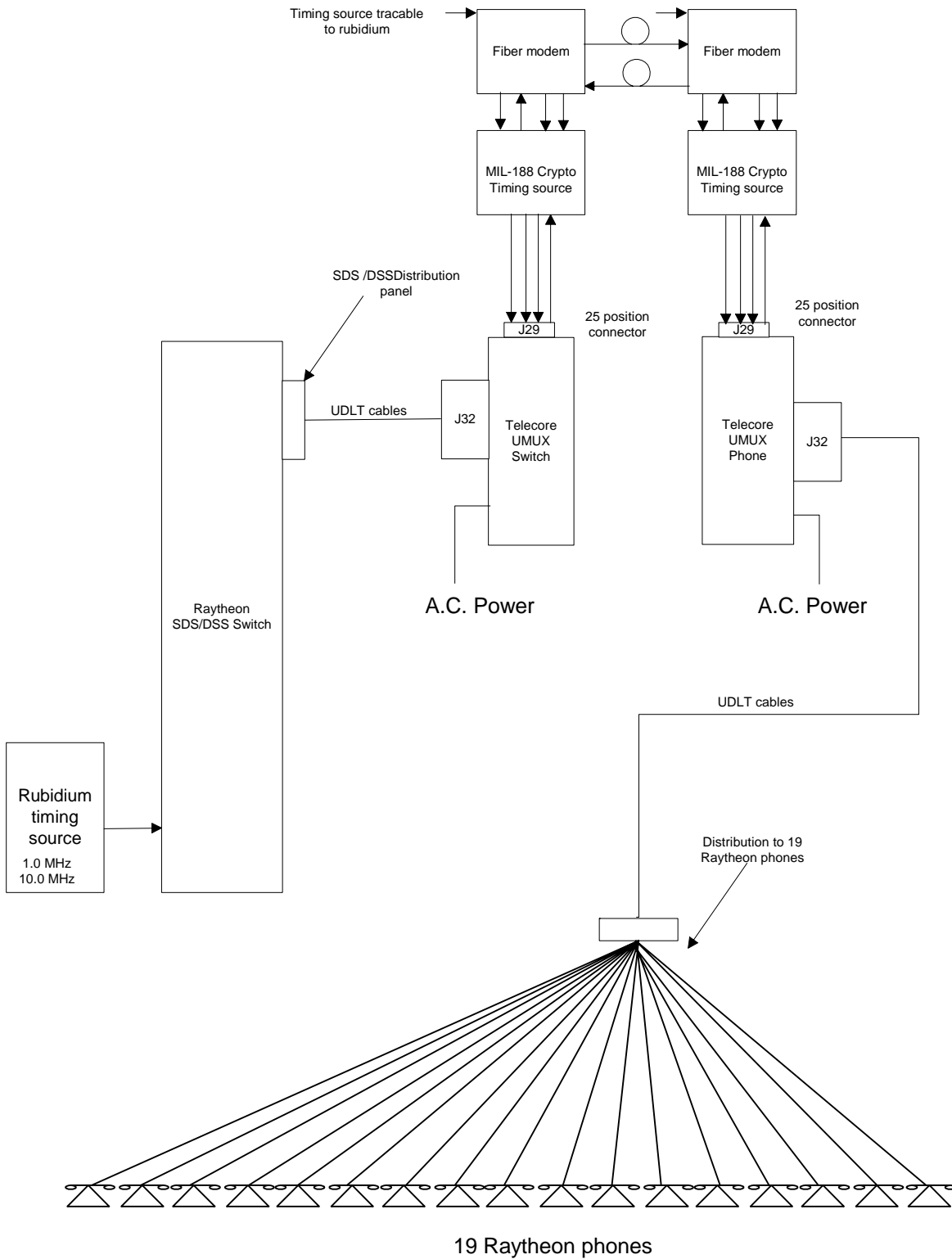


Figure 10: MIL-188 Interface, Master External, Slave External timing set up diagram

Example 4: Group 4, Fiber Optic Interface, Master UDLT, Slave line timing, D4/AMI

This example set up for Group 4 operation shows the fiber optic interface with UDLT timing selected on the UMUX-II SWITCH and line timing selected on the UMUX-II PHONE. In Fiber optic mode, always use D4/AMI. Zero code suppression is off. See Figure 11 for a diagram of this set up.

Set the front panel configuration controls on the UMUX units as follows:

Front Panel Setup (Modify Settings):

- **Modify Mode - Both UMUX-II Units Set To Legacy Norm**
- **Modify Config - One Unit Configured for Switch end; One Unit Configured for Phone end**
- **Legacy Mode Edit – Set Switch Banks per Below:**

UMUX-II SWITCH		UMUX-II PHONE	
SW1-1: OFF	SW2-1: OFF	SW1-1: OFF	SW2-1: OFF
SW1-2: OFF	SW2-2: OFF	SW1-2: OFF	SW2-2: OFF
SW1-3: OFF	SW2-3: OFF	SW1-3: OFF	SW2-3: OFF
SW1-4: OFF	SW2-4: OFF	SW1-4: OFF	SW2-4: OFF
SW1-5: ON	SW2-5: OFF	SW1-5: ON	SW2-5: OFF
SW1-6: OFF	SW2-6: OFF	SW1-6: OFF	SW2-6: OFF
SW1-7: OFF	SW2-7: ON	SW1-7: OFF	SW2-7: ON
SW1-8: OFF	SW2-8: OFF	SW1-8: OFF	SW2-8: OFF
SW1-9: OFF	SW2-9: ON	SW1-9: OFF	SW2-9: OFF
SW1-10: OFF	SW2-10: OFF	SW1-10: OFF	SW2-10: OFF
SW1-11: ON	SW2-11: OFF	SW1-11: ON	SW2-11: OFF
SW1-12: ON	SW2-12: OFF	SW1-12: ON	SW2-12: OFF

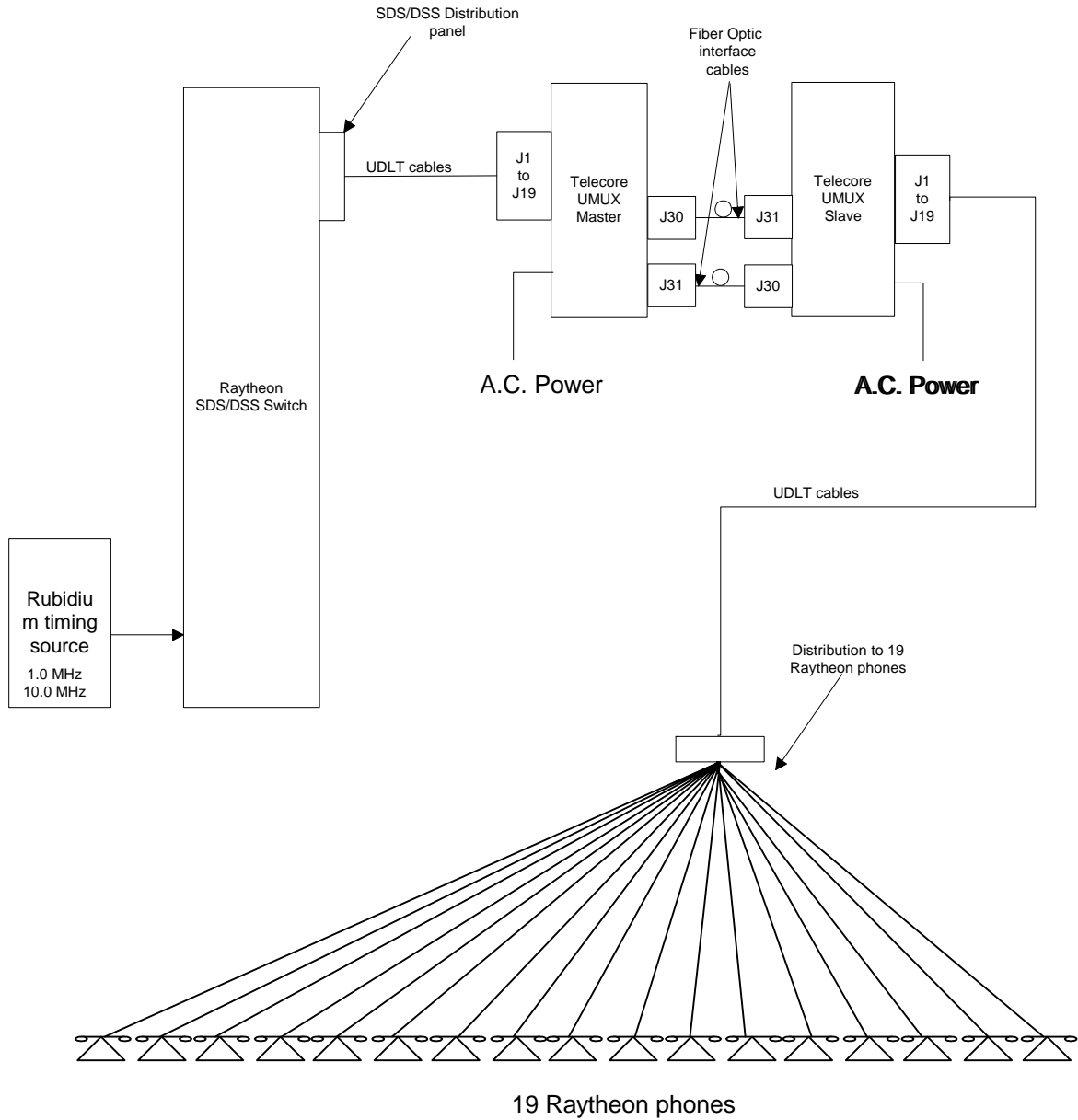


Figure 11: Fiber Optic Interface, Master UDLT, Slave line timing set up diagram

Example 5: Group 4, Legacy Mode with 1.536Mbps Interface, MIL-188-114 Timing

This example set up for Group 4 operation shows the Legacy Mode 1.536Mbps interface with MIL-188-114 timing selected at both ends. Zero code suppression is off. Resync is set for 10 seconds. This setup is the recommended configuration when two UMUX-II units are interconnected via encryption devices since it provides a more reliable detection of an out-of-sync condition on the cipher side of the crypto. See Figure 12 for a diagram of this set up.

Set the front panel configuration controls on the UMUX units as follows:

Front Panel Setup (Modify Settings):

- **Modify Mode - Both UMUX-II Units Set To Legacy 1.536**
- **Modify Config - One Unit Configured for Switch end; One Unit Configured for Phone end**
- **Legacy Mode Edit - Set Switch Banks per Below:**

UMUX-II SWITCH		UMUX-II PHONE	
SW1-1: OFF	SW2-1: OFF	SW1-1: OFF	SW2-1: OFF
SW1-2: OFF	SW2-2: OFF	SW1-2: OFF	SW2-2: OFF
SW1-3: OFF	SW2-3: OFF	SW1-3: OFF	SW2-3: OFF
SW1-4: OFF	SW2-4: OFF	SW1-4: OFF	SW2-4: OFF
SW1-5: ON	SW2-5: OFF	SW1-5: ON	SW2-5: OFF
SW1-6: ON	SW2-6: ON	SW1-6: ON	SW2-6: ON
SW1-7: OFF	SW2-7: OFF	SW1-7: OFF	SW2-7: OFF
SW1-8: OFF	SW2-8: ON	SW1-8: OFF	SW2-8: ON
SW1-9: OFF	SW2-9: OFF	SW1-9: OFF	SW2-9: OFF
SW1-10:OFF	SW2-10:OFF	SW1-10:OFF	SW2-10:OFF
SW1-11:OFF	SW2-11:OFF	SW1-11:OFF	SW2-11:OFF
SW1-12:OFF	SW2-12:OFF	SW1-12:OFF	SW2-12:OFF

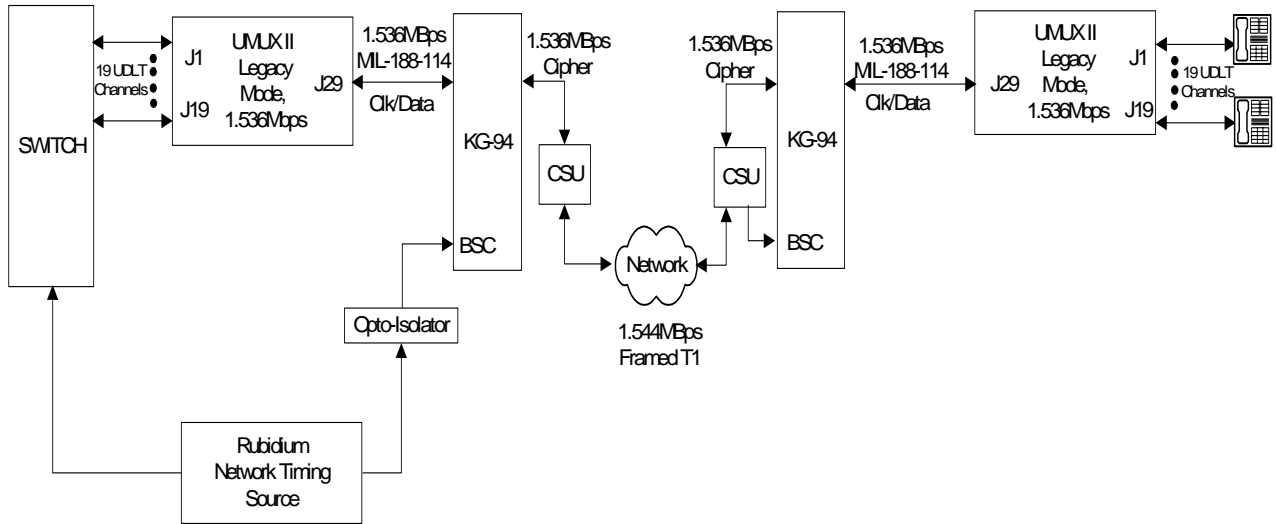


Figure 12: UMUX-II Legacy 1.536 Mbps Mode, Master UDLT, Slave line timing set up diagram

UMUX-III Operations

The UMUX-III may be configured via the front panel controls as a UMUX-III unit in support of Digital Phone Multiplexer (DPM) operations. When configured as a UMUX-III unit, the unit settings are summarized as:

- 1) Ingress link definition,
- 2) Egress link definition,
- 3) Instrument Add/Drop list,
- 4) Reference Timing selection,
- 5) Crypto Resync times,
- 6) Crypto Resync Inversion,
- 7) Power Adjustment,
- 8) Zero Code Suppression,
- 9) Sync Channel location (MIL-188-114)
- 10) Sync Bit location (MIL-188-114)

UMUX-III Indicators

The front panel display provides real time operational status for the UMUX-III. Figure 13 shows the Operational Status screen of the UMUX-III LCD screen. The bottom line of the displays the operational status of the 23 UDLT interfaces as indicated in the figure. The status of each UDLT interface is given identifying the interface as being configured “0” or not configured “.” for use in the switch database, an indication that the UDLT link is up “1” and its current RX/TX audio connection. A “2” indicates that the RX audio (audio from phone to switch) is enabled, a “3” indicates that TX audio is enabled and a “4” indicates that both RX and TX audio are enabled. This line also displays the status of the Egress link, should one be defined. This display includes the (1) the Egress link’s configured mode; (2) the communications status of both the physical layer and the LAPD (Link Access Protocol on the D-channel) layer; and (3) the status of any detected alarms. The top line of the display provides the operational status of the Ingress interface. The operational status provided includes: (1) the unit’s configured mode; (2) the communications status of both the physical layer and the LAPD (Link Access Protocol on the D-channel) layer; (3) the state of the Resync signal; (4) the timing reference; and (5) the status of any detected alarms.

In the event that the UMUX-III detects a critical failure during power up self tests, the UMUX-III will not proceed into the normal operational mode. A critical failure has been defined as a failure of the SDRAM memory, a failure of the Flash memory, a failure of the Time Slot Interchange (TSI) Connection RAM circuitry or the –48 VDC supply voltage. The front panel display will indicate the detected critical failure as shown in Figure 14 (assuming the failure itself does not affect the ability of the unit to display the critical failure).

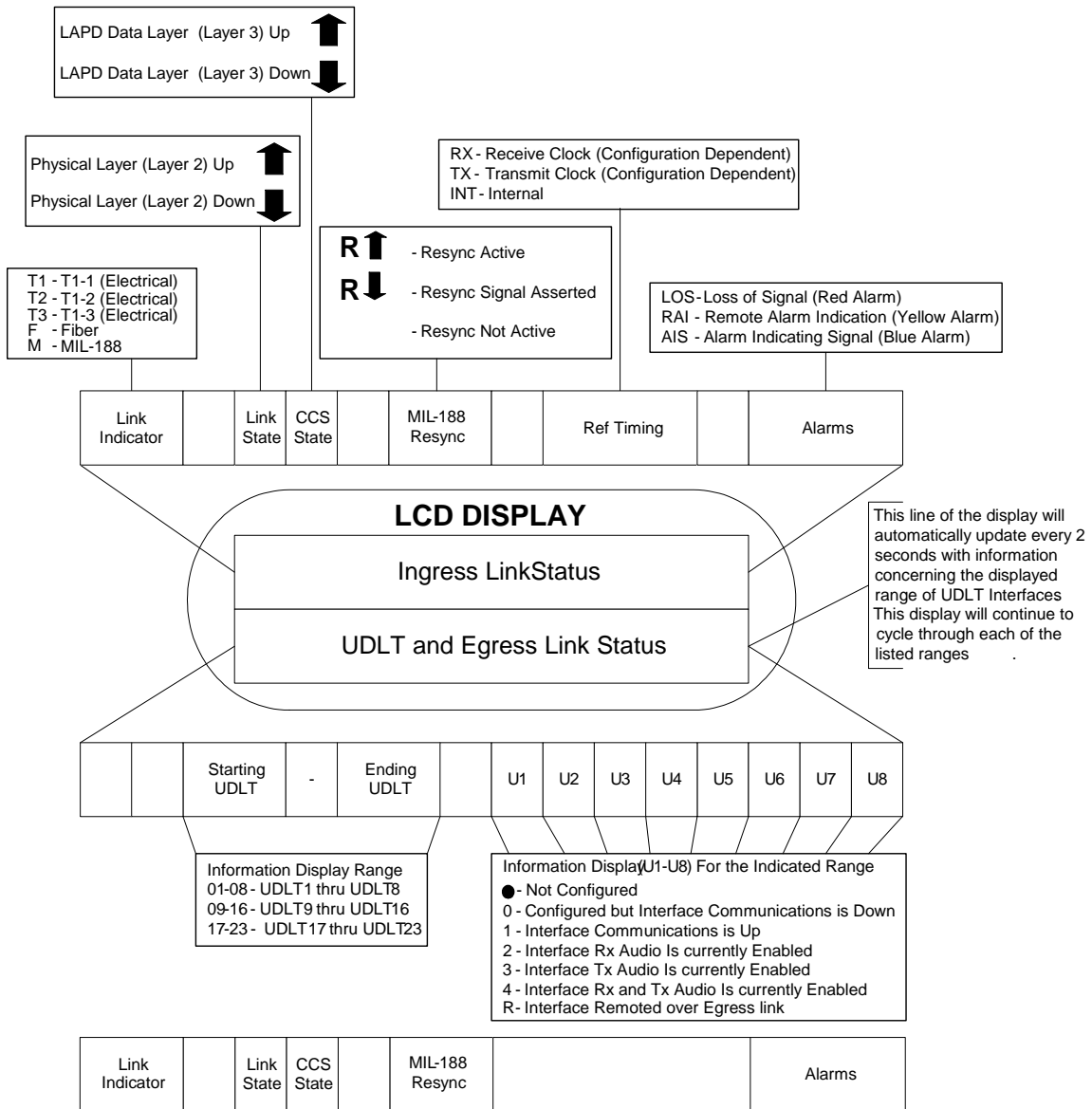


Figure 13: UMUX-III Status Display

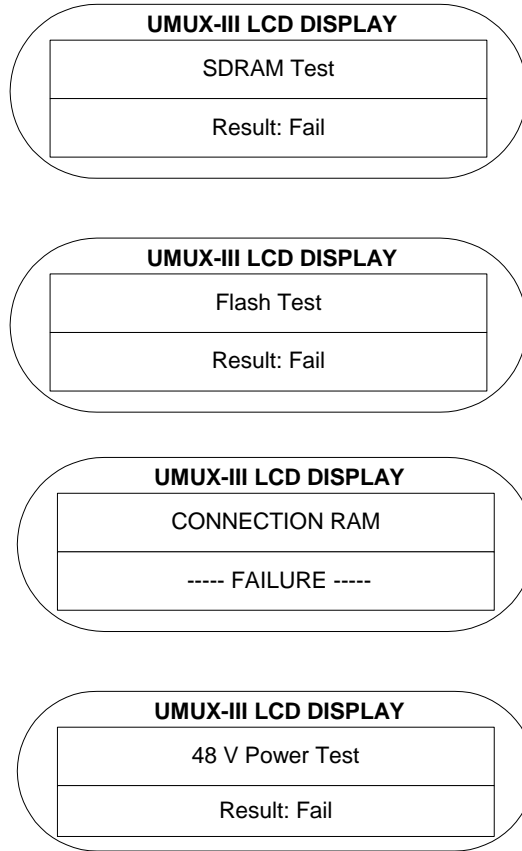


Figure 14: UMUX-III Critical Failure Status Display

UMUX-III Configuration

The UMUX-III unit is configured for UMUX-III operation via the front panel keypad and LCD display as was shown in Figure 15. Once configured as a UMUX-III unit (using the Mod Unit Config menu), additional menus allow selections for modifying the configuration of the unit (Modify Settings menu) and the display of software/firmware revisions and self test status (Status Info) and configuration status (Show Config). In general, when scrolling through multiple configuration options, the sub-menus will rotate through all options in a circular fashion. The initial sub-menu displayed when selected from the main menu will be the its current setting.

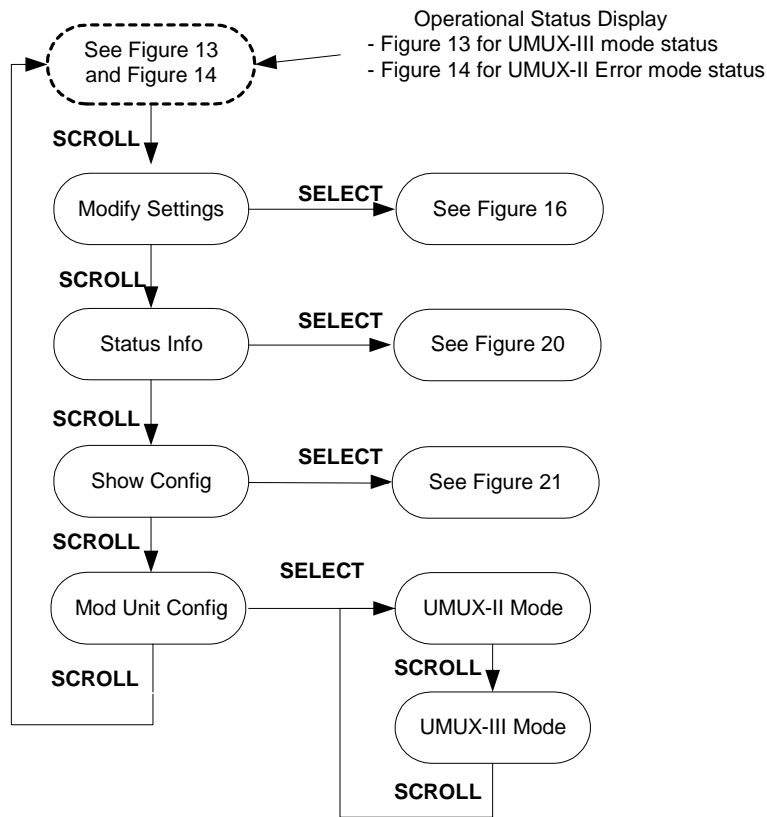


Figure 15: UMUX-III Configuration Menus

UMUX-III Setup Controls

The Modify Settings menu allows the configuration of the UMUX-III operating parameters as shown in Figure 16. Most parameters are self explanatory; however, some additional discussions are provided.

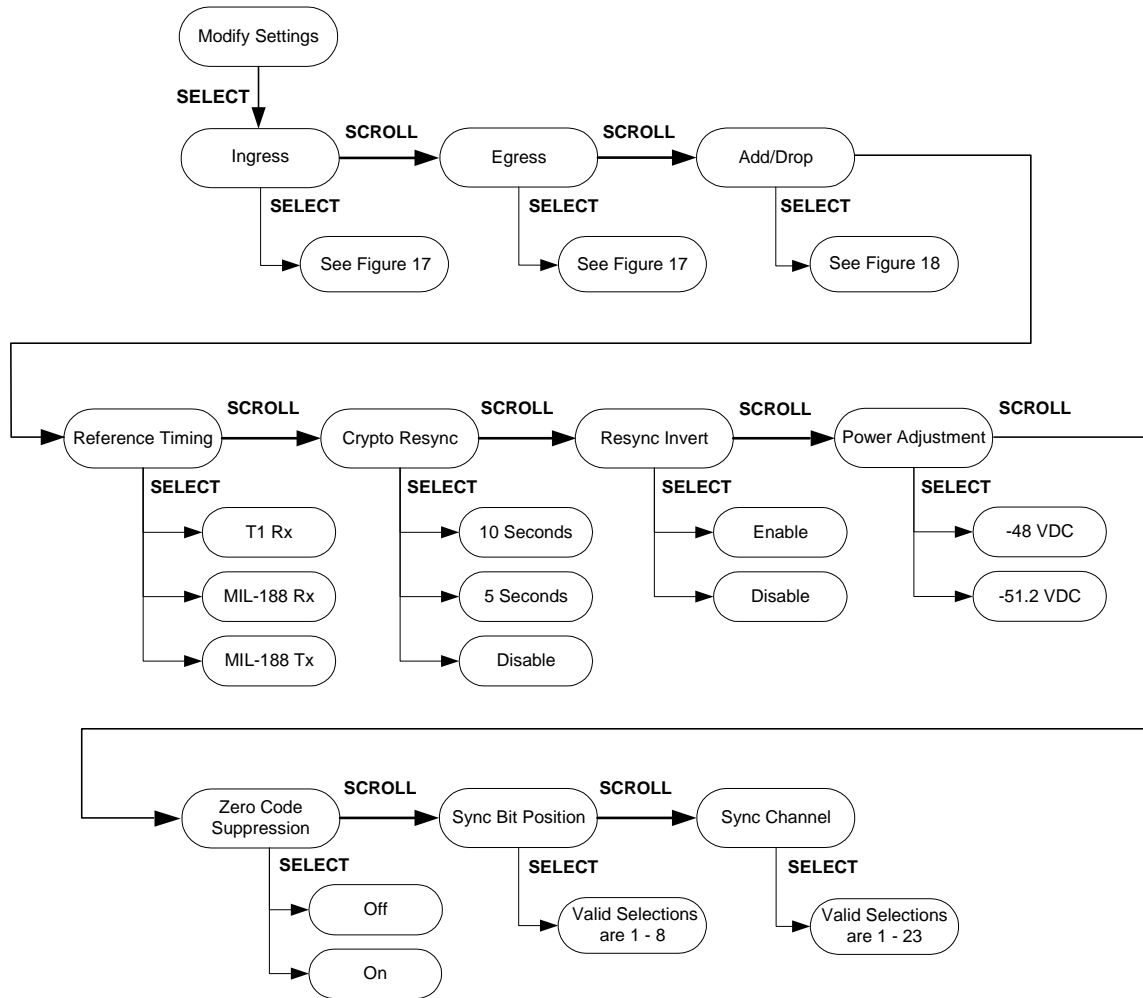


Figure 16: UMUX-III Modify Settings Menus

Ingress Link Definition

The Ingress Link defines the Command and Control link to the UMUX-III. This link can be any available UMUX-III link and must be configured on each UMUX-III.

Egress Link Definition

The Egress Link defines a link to a remote UMUX-III. Configuration of this link assumes that a remote UMUX-III will be on the “other” end. The usage of this link is optional and any available UMUX-III links can be used to accomplish the remote operation. This assumes that the desired link is not already defined as the Ingress link.

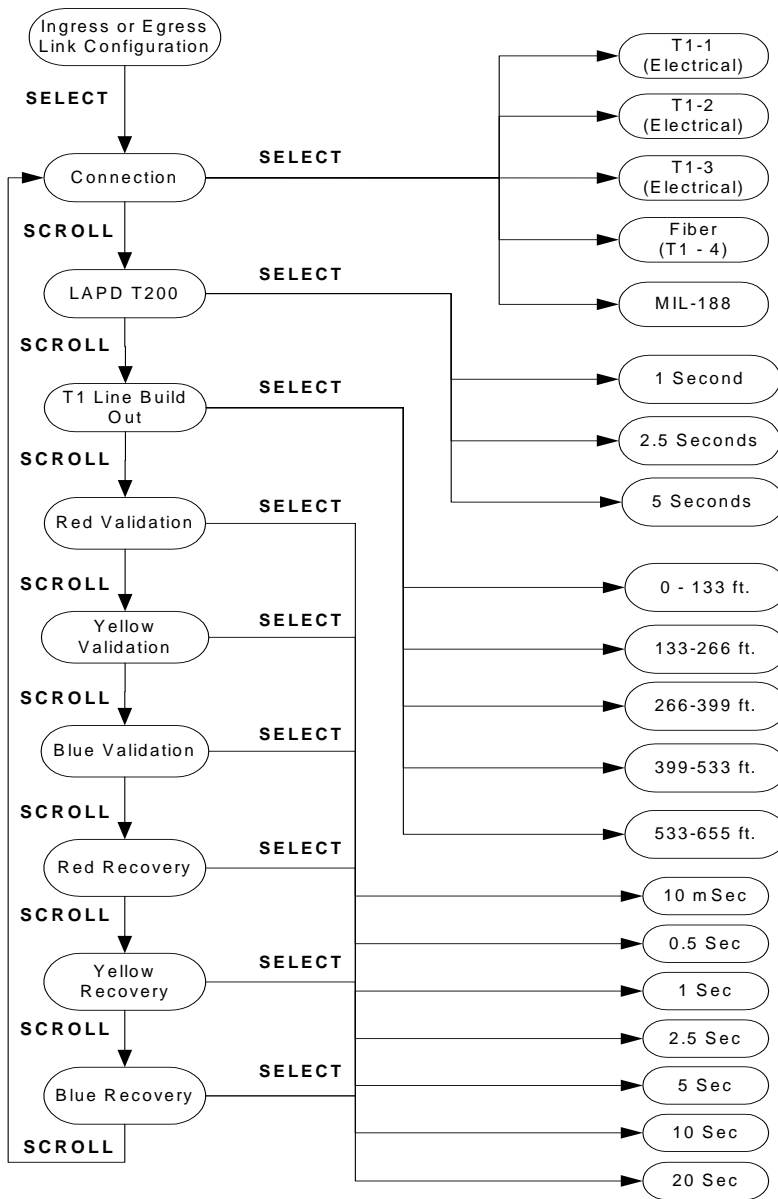


Figure 17: UMUX-III Ingress/Egress Link Configuration Menu

Connection -When defining an Ingress or Egress link, this selection presents the UMUX-III resources available for selection.

LAPD T200 Timer – this menu is used to accommodate varying delays (e.g., satellite hop delays) through the network link for the LAPD link signaling protocol. The LAPD T200 timer has menu options for 1 second, 2.5 seconds and 5 seconds. This parameter setting would only be applicable to a Direct Phone unit and a Network Phone unit where LADP signaling is processed.

T1 Line Build Out – this menu is used to accommodate various T1 cable lengths from the unit to the switch. This would only be applicable to a Direct Phone unit and a Network Link unit.

Alarm Validation and Recovery Times - menu selections allow for setting validation and recovery times for each alarm on the physical link layer of a given link. The validation time is the time that the alarm state must exist before it is registered by the UMUX-III as a valid alarm. The recovery time is the time that the alarm state must be absent before it is registered by the UMUX-III as having cleared. These alarms apply to each UMUX-III unit, regardless of the configured operational mode. A Red alarm is a Loss of Signal (LOS) alarm, detected when the UMUX-III loses synchronization on its link input circuit. A Yellow alarm, also known as a Remote Alarm Indicator (RAI), is an indication that the far end of the connected link has lost synchronization. A Blue alarm, also known as Alarm Indicating Signal (AIS), is passed to a downstream link if the upstream link has failed. Typical alarm validation time for Red and Blue alarms are 2.5 seconds while recovery times are 10 seconds. Yellow alarm validation and recovery times are much shorter and normally each is set to 10 milliseconds.

Add/Drop List Definition

The Add/Drop List for each UMUX-III defines the subscriber instruments that are to be connected to that UMUX-III (Dropped users) and the subscriber instruments that are located on a remote UMUX-III (Added users).

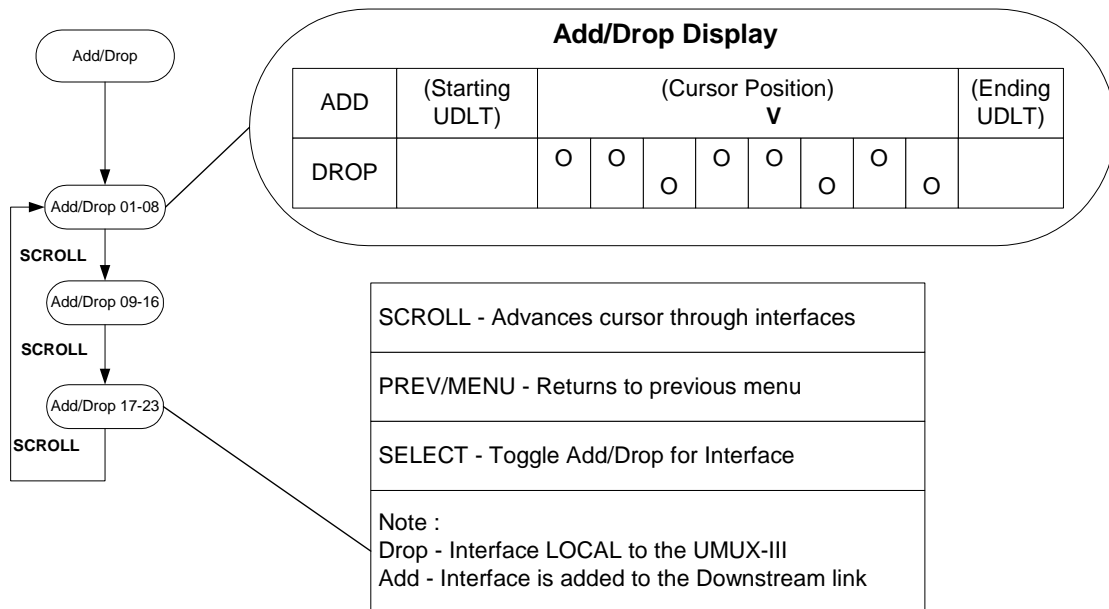


Figure 18: UMUX-III Add/Drop List Configuration Menu

Reference Timing

The Reference Timing selection allows for the selection of the timing source to synchronize the internal clocks of the unit. In a typical application, the defined Ingress link (T1 #1) would default to using T1 Rx Clock as the timing reference. However, an external clock input exists allowing an alternate form of timing reference. Using the MIL TX or the MIL RX clock can be configured allowing an external clock to be connected to the UMUX-III. This implementation depends upon the timing distribution design for a given system configuration. In the event that the Ingress link is defined to be MIL-188, typically used for an encrypted application, the MIL TX (or MIL RX) would normally be used and is selected as the default. For a fiber optic Ingress link, the T1 RX clock would be used because the fiber optic link has been implemented using the fourth T1 interface of the quadFALC chip chipset.

Crypto Resync

The Crypto Resync selection allows for the configuration of the crypto resync signal timer for units utilized the encrypted MIL-188 interface as the Ingress or Egress link. The resync signal is activated whenever there is a loss of synchronization on the MIL-188 interface. The 5 second option provides a one second active (contact closure) to the crypto followed by a 5 second inactive state (contact open). The 10 second option provides a one second active (contact closure) to the crypto followed by a 10 second inactive state (contact open). A menu option also allows disabling this signal (continuously inactive).

Resync Invert

The Resync Invert selection allows the configuration of the state inversion of the Crypto Resync signal. Normally this will be set for “off”. If set for “on”, a 5-second crypto resync option will result in a one second inactive (contact open) followed by a 5 second active state (contact closed).

Power Adjustment

The Power Adjustment selection allows the adjustment of the –48 VDC power supply voltage within the unit. This voltage is the power feed to the end instruments and consequently it is applicable only to the Direct Phone unit and Network Phone unit. For normal applications, the units will be –48 VDC; however, for some applications involving long cable runs (with resultant voltage IR drops) the voltage can be set for 51.2 VDC, extending cable distances somewhat. It should be noted that the Digital Speaker Assembly (DSA) is voltage sensitive and may have difficulty operating at 51.2 VDC for short cable runs.

Zero Code Suppression

The Zero Code Suppression (ZSC) selection for the UMUX-III mode implements the identical capability as mentioned under UMUX-II DIP switch settings, some networks cannot pass the “00” code for voice data as inserted by the phone (PTT not active). When ZCS is set to “on”, the UMUX-III will substitute “FF” for “00” for voice data from the UDLT to the network to accommodate the network equipment. When doing voice compression with IDNX, ZCS should be enabled.

Sync Bit Position

The Sync Bit Position allows configuration of the location of the MIL-188 sync bit. This setting is the bit position in a channel. Channel configuration is a separate setting. In an encrypted MIL-188 application, the link operates at a 1.536 Mbps rate, where T1 framing has been stripped from the link. In order to maintain synchronization/framing between the two units, the UMUX-III incorporates an in-band framing capability by replacing a voice data bit on a selected channel with an embedded framing bit. The menu selection, used in conjunction with the Sync Channel selection menu, allows for setting any of the 8 voice data bits as the framing bit. Normally, the LSB bit (bit 1) is used to minimize the PCM u-law voice audio distortion. In general, the greater the bit value selected, the more the audio will be distorted. It should be noted that for the selected bit/channel data mode operations may/will be affected for the IST-130 and IST-2 connected to that channel. For low speed data operations (9.6 kbaud or less), the LSB bit is used for the data. Consequently, data mode for that particular channel/phone will not operate if the sync bit is also set to bit 1 (the LSB). Setting the Sync Bit to bit 2 would allow low speed data operation for that phone. However, high speed data (19.2 kbaud and 57.6 kbaud) for IST-2 phones which uses all 8 bits for data will not work on the selected sync channel, regardless of the selected bit position.

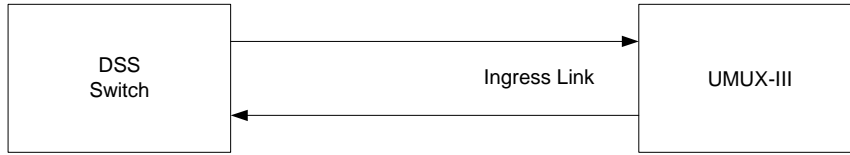
Sync Channel

The Sync Channel setting, as discussed above, allows sync channel selection to operate in conjunction with the sync bit to designate the channel and bit used for embedded framing for MIL-188 links.

UMUX-III Alarm Processing

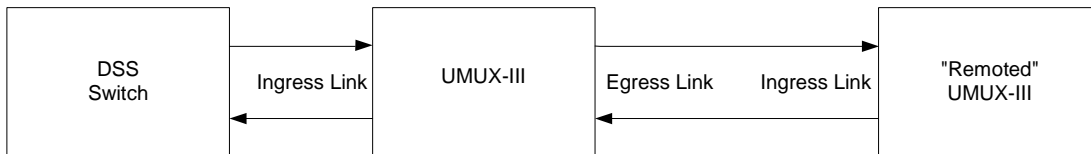
As presented earlier, a Red alarm is a Loss of Signal (LOS) alarm, detected when the UMUX-III loses synchronization on its link input circuit. A Yellow alarm, also known as a Remote Alarm Indicator (RAI), is an indication that the far end of the connected link has lost synchronization. A Blue alarm, also known as Alarm Indicating Signal (AIS), is passed to a downstream link if the upstream link has failed. Typical alarm validation time for Red and Blue alarms are 2.5 seconds while recovery times are 10 seconds. Yellow alarm validation and recovery times are much shorter and normally each is set to 10 milliseconds. The following illustrates the alarm processing performed by the UMUX-III.

Note: Blue alarm would not be created by DSS but could be by connecting network equipment



- Detect LOS (Red alarm) on Ingress side
- Send Yellow alarm to Ingress side
- Detect Yellow alarm on Ingress side
- Send no alarm to Ingress side
- Detect Blue alarm on Ingress side
- Send Yellow alarm to Ingress side

Note: This link may be MIL-188, fiber T1, or electrical T1



- Detect LOS (Red alarm) on Ingress side
- Send Blue alarm to Egress side
- Send Yellow alarm to Ingress side
- Detect Yellow alarm on Ingress side
- Send Yellow alarm to Egress side
- Detect Blue alarm on Ingress side
- Send Blue alarm to Egress side
- Send Yellow to Ingress side

Subscribers dropped

- Detect LOS (Red alarm) on Egress side
- Report failures for remote instruments to Ingress side
- Send Yellow alarm to Egress side
- Detect Yellow alarm on Egress side
- Report failures for remote instruments to Ingress side
- Detect Blue alarm on Egress side
- Report failures for remote instruments to Ingress side
- Send Yellow alarm to Egress side

No subscribers dropped

- Detect LOS (Red alarm) on Egress side
- Send Blue alarm to Ingress side
- Send Yellow alarm to Egress side
- Detect Yellow alarm on Egress side
- Send Yellow alarm to Ingress side
- Detect Blue alarm on Egress side
- Send Blue alarm to Ingress side
- Send Yellow alarm to Egress side

- Detect LOS (Red alarm) on Ingress side
- Send Yellow alarm to Ingress side
- Detect Yellow alarm on Ingress side
- Send no alarm to Ingress side
- Detect Blue alarm on Ingress side
- Send Yellow alarm to Ingress side

Figure 19: UMUX-III Alarm Processing

UMUX-III Status Displays

The UMUX-III provides extension status information to the user. The operational status is the normal top-level status as previously discussed and as shown in Figures 13, 14 or 15 above. The specific display will be dependent upon configuration of the unit and whether a critical fault has been detected.

In addition to the top-level status, the UMUX-III has two separate menus to provide additional front panel status information. One menu (Status Info) as shown in Figure 19 provides general status of the unit including part number and revision status of each soft and firmware component of the UMUX-III. Submenus also provide the results of the power up self tests for non-critical equipment failures and the IP address of the Ethernet maintenance port (J26). Although the power up self-tests and their results are shown on the front display while the tests are being performed, the test results are stored and made available for review using the submenus. The second status menu (Show Config) as shown in Figure 20 provides status of the configuration/setup of the unit. Submenus provide the current configuration of the unit (i.e., UMUX-III unit) and its operating mode (e.g., Net Phone MIL-188) along with the setup of all parameters as configured using the Modify Settings menus.

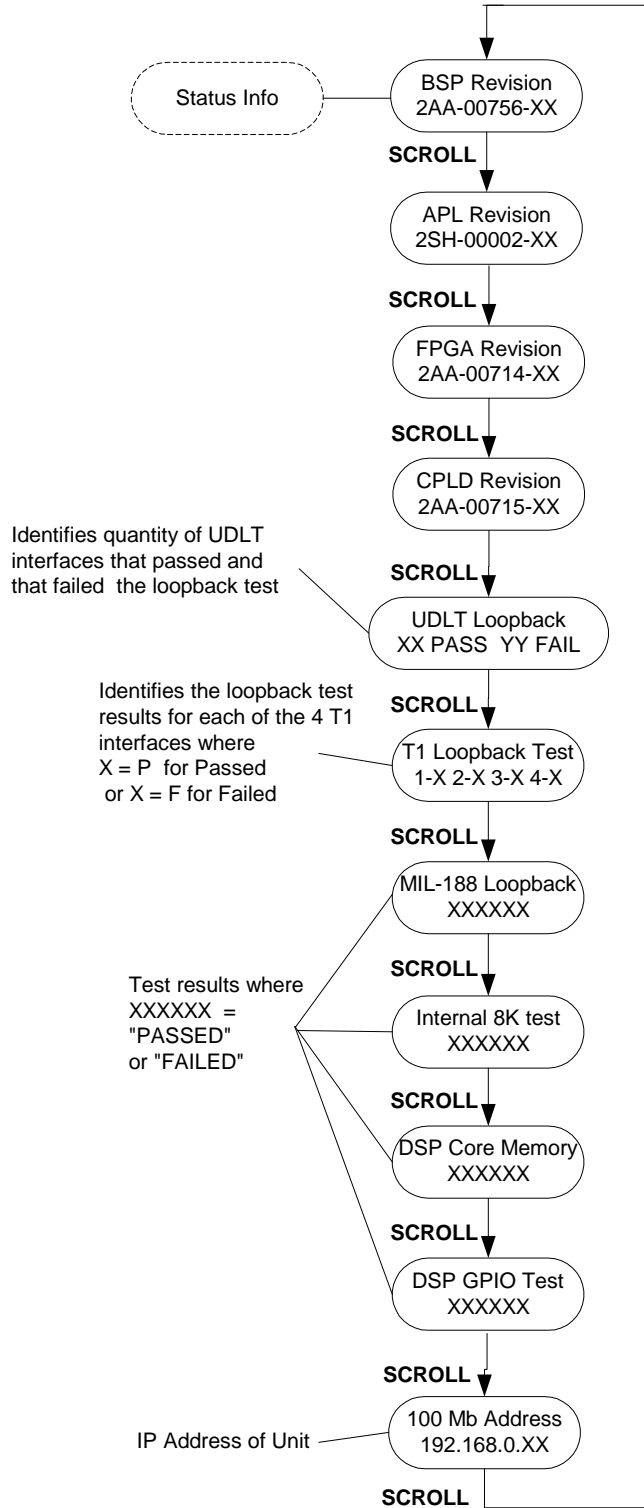
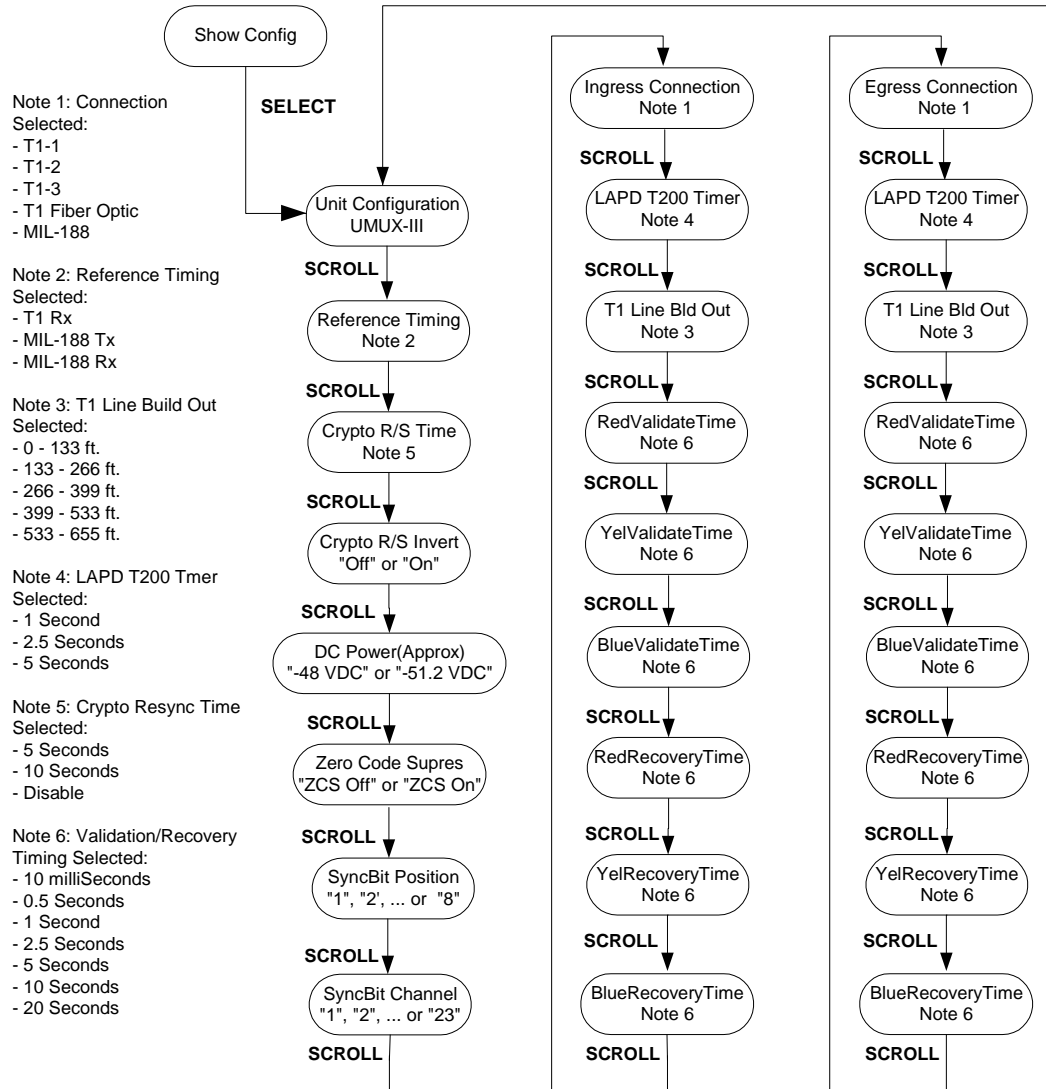


Figure 20: Status Information Sub-Menu



Note 1: Connection Selected:
 - T1-1
 - T1-2
 - T1-3
 - T1 Fiber Optic
 - MIL-188

Note 2: Reference Timing Selected:
 - T1 Rx
 - MIL-188 Tx
 - MIL-188 Rx

Note 3: T1 Line Build Out Selected:
 - 0 - 133 ft.
 - 133 - 266 ft.
 - 266 - 399 ft.
 - 399 - 533 ft.
 - 533 - 655 ft.

Note 4: LAPD T200 Tmer Selected:
 - 1 Second
 - 2.5 Seconds
 - 5 Seconds

Note 5: Crypto Resync Time Selected:
 - 5 Seconds
 - 10 Seconds
 - Disable

Note 6: Validation/Recovery Timing Selected:
 - 10 milliSeconds
 - 0.5 Seconds
 - 1 Second
 - 2.5 Seconds
 - 5 Seconds
 - 10 Seconds
 - 20 Seconds

Figure 21: Show Configuration Sub-Menu

UMUX-III Example Configurations

A. Basic Mode:

Figure 22 provides connection diagrams illustrating both a direct T1 copper interface between the UMUX-III and the switch and the use of T1 modems to interconnect the UMUX-III with the switch. Information below identifies typical setup parameters (including defaults) and configuration options using Figure 17 and Figure 18 front panel menus.

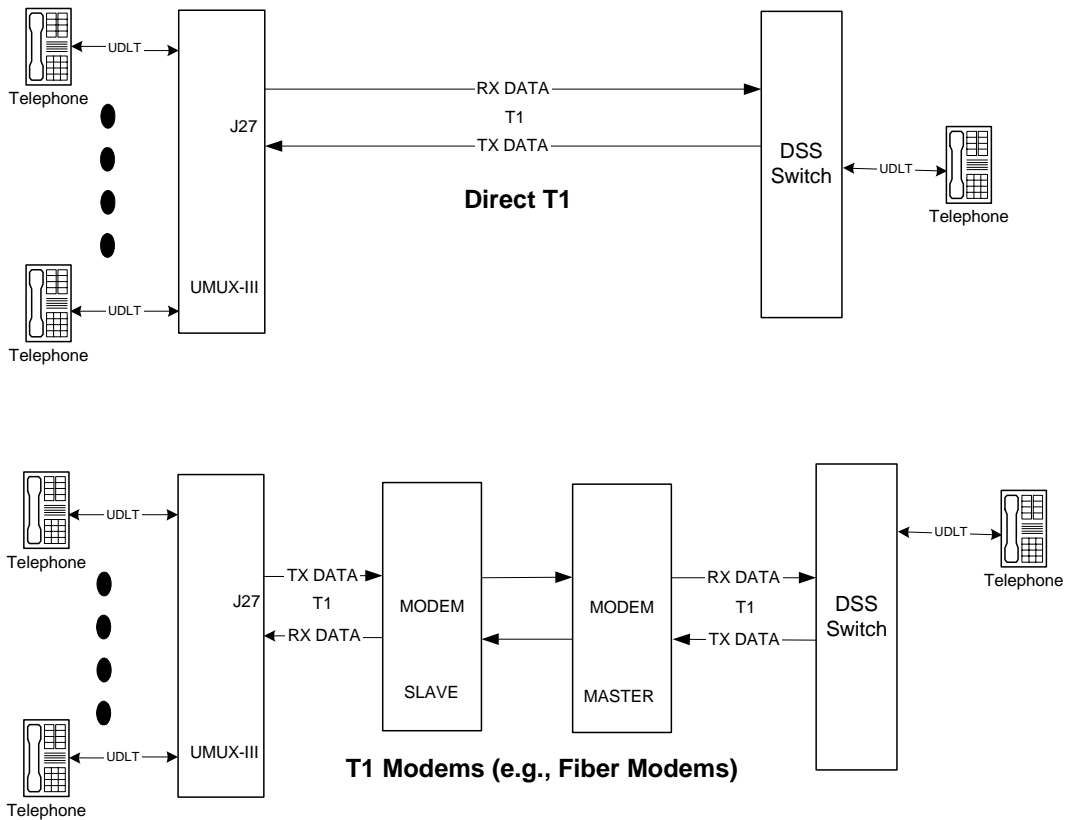


Figure 22: Basic Mode Diagrams

When configured for Basic Mode, the Ingress link can be T1 #1 – T1 #3 (Electrical) T1 #4 (Fiber) or MIL-188. This example shows T1 #1 as the Ingress link.

a. Defaults are:

- Reference Timing is RX clock on T1-1 interface (FALC T1-1)
- If Loss of Sync (LOS), the timing will switch to internal. See “Timing Defaults and Fallback” Table 7 below
- Ingress LAPD T200 is 5 Sec
- Ingress T1 Line Build Out is 0 to 133 ft
- Zero Code Suppression is off
- -48 VDC Supply Voltage is -48 VDC

- Ingress Alarm Validation and Recovery times on T1
 - Red Validation is 2.5 Sec
 - Yellow Validation is 10 mSec
 - Blue Validation is 2.5 Sec
 - Red Recovery is 10 Sec
 - Yellow Recovery is 10 mSec
 - Blue Recovery is 10 Sec
- b. Other Valid Configurable Options are:
 - Timing reference changes
 - LAPD T200 timer changes
 - T1 Line Build Out changes
 - Zero Code Suppression change
 - Alarm Validation and Recovery Time changes
 - -48 VDC Supply Voltage
- c. Configuration Options having no affect on the Basic Mode of operation:
 - Sync Bit Position
 - Sync Channel
 - Crypto Resync Timing
 - Resync Invert
- d. Caution: Reference Timing in “UMUX-III Setting Modifications” must remain (or be set) for T1 RX Clock unless an external clock synchronized to the switch timing is connected to either the MIL TX Clock or the MIL RX Clock.

B. Cascaded UMUX-III Mode - Fiber Link:

Figure 23 provides a connection diagram illustrating two UMUX-III's in a cascaded configuration. The link between the two UMUX-III's utilizes the fiber optic interfaces with a cable interconnect between the two UMUX-III units. Information below for each unit identifies typical setup parameters (including defaults) and configuration options using Figure 17, Figure 18 and Figure 19 front panel menus. The placement of subscribers is not limited but this example shows 11 subscribers connected to one UMUX-III and 12 subscribers connected to the other UMUX-III.

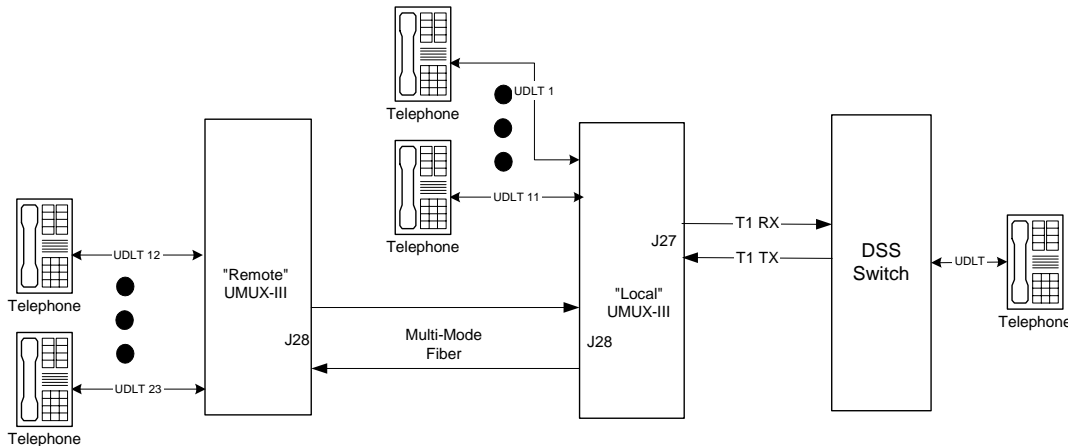


Figure 23: Cascaded UMUX-III Mode Diagram

(1) For “Local” UMUX-III

- The Ingress link is T1-1 (FALC T1-1)
- The Egress link is T1 Fiber (FALC T1-4)
- The Add/Drop List reflects the first 11 instruments as Dropped
- The Add/Drop list reflects the last 12 interfaces to be “Passed” to the Egress Link
 - a. Defaults are:
 - Reference Timing is RX clock on T1-1 interface (FALC T1-1)
 - If LOS, the timing will switch to internal. See “Timing Defaults and Fallback” Table 7 below
 - T1 Line Build Out is 0 to 133 ft (Ingress)
 - LAPD T200 Timer is 5 Sec (Ingress and Egress)
 - Zero Code Suppression is off
 - Alarm Validation and Recovery times (Ingress and Egress)
 - Red Validation is 2.5 Sec
 - Yellow Validation is 10 mSec
 - Blue Validation is 2.5 Sec
 - Red Recovery is 10 Sec
 - Yellow Recovery is 10 mSec
 - Blue Recovery is 10 Sec
 - b. Other Valid Configurable Options are:
 - Reference Timing (see “Timing Defaults and Fallback” table below for timing fallback when another timing option is selected)

1. T1 RX Clock (default per above)
 2. MIL TX Clock
 3. MIL RX Clock
- T1 Line Build Out changes (Ingress)
 - LAPD T200 Timer (Ingress and Egress)
 - Zero Code Suppression
 - Alarm Validation and Recovery Time changes
 - -48 VDC Supply Voltage
- c. Configuration Options having no affect on the Local UMUX-III - Fiber operation:
- Sync Bit
 - Sync Channel
 - Crypto Resync Timing
 - Resync Invert

(2) For “Remote” UMUX-III

- The Ingress link is T1-Fiber (T1-4)
- The Egress link is None
- The Add/Drop list reflects the last 12 interfaces to be “Dropped”.

a. Defaults are:

- Reference Timing is RX clock on T1-4 interface (FALC T1-4)
 - If LOS, see “Timing Defaults and Fallback” Table 7 below
- Zero Code Suppression is off
- LAPD T200 is 5 Sec (Ingress)
- -48 VDC Supply Voltage is -48 VDC
- Alarm Validation and Recovery times on network side (Ingress)
 - Red Validation is 2.5 Sec
 - Yellow Validation is 10 mSec
 - Blue Validation is 2.5 Sec
 - Red Recovery is 10 Sec
 - Yellow Recovery is 10 mSec
 - Blue Recovery is 10 Sec

b. Other Valid Configurable Options are:

- Reference Timing (see “Timing Defaults and Fallback” Table 7 below for timing fallback when another timing option is selected)
 1. T1 RX Clock (default per above)
 2. MIL TX Clock
 3. MIL RX Clock
- Zero Code Suppression
- LAPD T200 timer changes

- -48 VDC Supply Voltage
 - Alarm Validation and Recovery Time changes (Ingress)
- c. Configuration Options having no affect on the Remote UMUX_III - Fiber operation:
- T1 Line Build Out
 - Resync Timing
 - Resync Invert
 - Sync Bit
 - Sync Channel

C. Cascaded UMUX-III Mode – MIL-188:

Figure 24 provides a connection diagram illustrating two UMUX-III’s in a cascaded configuration. This configuration uses a MIL-188 interface using a bulk encrypted link between the two UMUX-III units. The diagram shows a Red 1.536 MHz clock (derived from the switch T1 link) being supplied to the KG crypto device by the UMUX-III at the Network Link side. Information below for each unit identifies typical setup parameters (including defaults) and configuration options using Figure 17, Figure 18 and Figure 19 front panel menus.

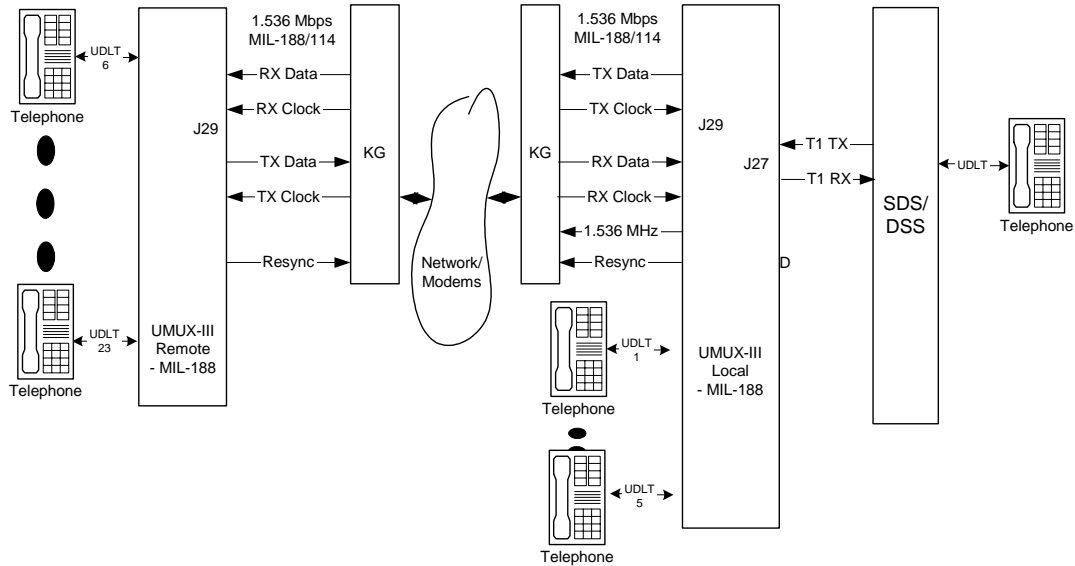


Figure 24: Local/Remote UMUX-III – MIL-188 Diagram

(1) For “Local” UMUX-III

- The Ingress link is T1-1 (FALC T1-1)
- The Egress link is MIL-188
- The Add/Drop List reflects the first 5 instruments as Dropped
- The Add/Drop list reflects the last 18 interfaces to be “Passed” to the Egress Link
 - a. Defaults are:
 - Reference Timing is RX clock on T1-1 interface (FALC T1-1)
 - If LOS, the timing will switch to internal. See “Timing Defaults and Fallback” Table 7 below
 - T1 Line Build Out is 0 to 133 ft (Ingress)
 - LAPD T200 Timer is 5 Sec (Ingress and Egress)
 - Zero Code Suppression is off
 - Sync Bit is 1
 - Sync Channel is 23
 - Resync Timing is 5 Sec
 - Resync Invert is off
 - -48 VDC Supply Voltage is -48 VDC

- Alarm Validation and Recovery times (Ingress and Egress)
 - Red Validation is 2.5 Sec
 - Yellow Validation is 10 mSec
 - Blue Validation is 2.5 Sec
 - Red Recovery is 10 Sec
 - Yellow Recovery is 10 mSec
 - Blue Recovery is 10 Sec
- b. Other Valid Configurable Options are:
 - Reference Timing (see “Timing Defaults and Fallback” table below for timing fallback when another timing option is selected)
 1. T1 RX Clock (default per above)
 2. MIL TX Clock
 3. MIL RX Clock
 - T1 Line Build Out changes (Ingress)
 - Zero Code Suppression
 - Sync Bit changes
 - Sync Channel changes
 - Crypto Resync Timing
 - Resync Invert
 - Alarm Validation and Recovery Time changes (Ingress and Egress)
- c. Configuration Options having no affect on the Local UMUX-III - MIL operation:
 - None

(2) For “Remote” UMUX-III

- The Ingress link is MIL-188
- The Egress link is None
- The Add/Drop list reflects the last 18 interfaces to be “Dropped”.
 - a. Defaults are:
 - Reference Timing is MIL TX Clock
 - If LOS, see “Timing Defaults and Fallback” Table 1 below
 - Zero Code Suppression is off
 - Sync Bit is 1
 - Sync Channel is 23
 - Resync Timing is 5 Sec
 - Resync Invert is off
 - LAPD T200 is 5 Sec
 - -48 VDC Supply Voltage is -48 VDC
 - Alarm Validation and Recovery times
 - Red Validation is 2.5 Sec
 - Yellow Validation is 10 mSec
 - Blue Validation is 2.5 Sec
 - Red Recovery is 10 Sec
 - Yellow Recovery is 10 mSec

- Blue Recovery is 10 Sec
- b. Other Valid Configurable Options are:
 - Reference Timing (see “Timing Defaults and Fallback” table below for timing fallback when another timing option is selected)
 1. MIL TX Clock (default per above)
 2. MIL RX Clock
 3. T1 RX Clock
 - Zero Code Suppression
 - Sync Bit changes
 - Sync Channel changes
 - Crypto Resync Timing
 - Resync Invert
 - LAPD T200 timer changes
 - -48 VDC Supply Voltage
 - Alarm Validation and Recovery Time changes
- c. Configuration Options having no affect on the Remote UMUX-III -MIL operation:
 - T1 Line Build Out changes

Table 7: Timing Defaults and Fallback

INGRESS LINK	REF TIMING SELECT	PRIMARY TIMING SOURCE	SECONDARY TIMING SOURCE	TERTIARY TIMING SOURCE	FALLBACK TIMING SOURCE
T1 – 1	T1-Rx	T1 – 1 RX	MIL-188 Tx	MIL-188 Rx	Internal
T1 – 1	MIL-Tx	MIL-188 Tx	T1 – 1 RX	MIL-188 Rx	Internal
T1 – 1	MIL-Rx	MIL-188 Rx	T1 – 1 RX	MIL-188 Tx	Internal
T1 – 2	T1-Rx	T1 – 2 RX	MIL-188 Tx	MIL-188 Rx	Internal
T1 – 2	MIL-Tx	MIL-188 Tx	T1 – 2 RX	MIL-188 Rx	Internal
T1 – 2	MIL-Rx	MIL-188 Rx	T1 – 2 RX	MIL-188 Tx	Internal
T1 – 3	T1-Rx	T1 – 3 RX	MIL-188 Tx	MIL-188 Rx	Internal
T1 – 3	MIL-Tx	MIL-188 Tx	T1 – 3 RX	MIL-188 Rx	Internal
T1 – 3	MIL-Rx	MIL-188 Rx	T1 – 3 RX	MIL-188 Tx	Internal
T1 – 4	T1-Rx	T1 – 4 RX	MIL-188 Tx	MIL-188 Rx	Internal
T1 – 4	MIL-Tx	MIL-188 Tx	T1 – 4 RX	MIL-188 Rx	Internal
T1 – 4	MIL-Rx	MIL-188 Rx	T1 – 4 RX	MIL-188 Tx	Internal
MIL-188	T1-Rx	Invalid	Invalid	Invalid	Internal
MIL-188	MIL-Tx	MIL-188 Tx	MIL-188 Rx		Internal
MIL-188	MIL-Rx	MIL-188 Rx	MIL-188 Tx		Internal

Acronyms and Abbreviations

Table 8: List of Acronyms and Abbreviations

AMI	Alternate Mark Inversion
B8ZS	Bipolar 8 Zero Suppression
BER	Bit Error Rate
CCSS	Command and Control Switching Systems
DPM	Digital Phone Multiplexer
DSS	Digital Small Switch
ESF	Extended Super Frame
FAC	Facility
LAPD	Link Access Protocol
LBT1	Limited Bandwidth T1
LCD	Liquid Crystal Display
LIU	Line Interface Unit
LOS	Loss of Sync
QRSS	Quasi-Random Signaling Source
SDS	Secure Digital Switch
TAOS	Transmit All Ones
TSI	Time Slot Interchange
UDLT	Universal Digital Loop Transceiver
UMUX	UDLT Multiplexer
UMUX-II	UMUX – second generation
UMUX-III	UMUX – third generation
UMUX-M	UMUX-Master
UMUX-S	UMUX-Slave
ZCS	Zero Code Suppression

Warranty Terms and Conditions

Telecore, Inc. provides a manufacturer's warranty that for a period of ninety days 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 to repair or alter the Goods in any way 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. The RMA Number shall be placed on the exterior packaging of all returns. Telecore will pay shipping costs to return repaired or replacement 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