User Manual

SL9003T1

Digital Studio Transmitter Link

Doc 602-14322-01 Rev. B

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SL9003T1 Manual Dwg # Revision Levels:

SECTION	DWG		ECO	REVISED/ RELEASED
2				6/22/05

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When all else fails…

READ THE MANUAL!

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Section 1: System Features and Specifications

1 System Features and Specifications

1.1 System Introduction

The Moseley SL9003T1 is an all-digital, open-architecture, modular system for CD-quality audio transmission over T1 or E1circuits. The versatility and power of the STARLINK 9000 comes from a complete range of “plug and play” personality modules.

AES/EBU digital audio I/O, combined with a built-in variable sample rate converter, provide seamless connection to the all-digital air chain without compression. Analog inputs are standard for those who have not yet upgraded to all-digital air chains. Plug-in MPEG audio modules and a digital multiplex allow for additional program, voice, FSK, async and sync data channels.

1.2 System Features

In addition to establishing a new industry standard for studio-transmitter link performance, the SL9003T1 incorporates many new and innovative features, including:

- Linear 16 bit digital audio performance.
- Degradation-free multiple hops.
- No crosstalk between channels.
- Built-in AES/EBU digital audio interface.
- Operation through fractional T1 networks.
- Peak-reading LED bargraph display for audio channels.
- Status functions displayed on external LED indicators.
- Modular construction that provides excellent shielding, high reliability, easy servicing, and upgrade capability
- Sample rate converters (SRC) for digital audio operation from 32 to 48 kHz.

1.3 Specifications

1.3.1 System Specifications

Audio Capacity Simplex or Duplex T1	1 linear stereo pair (44.1 kHz sample rate) + 1 data channel or 1 linear stereo pair (32 kHz sample rate) + 1 MPEG encoded stereo pair + data channels
Audio Frequency Response vs. Sample Rate:	
32 kHz:	5 Hz-15 kHz; -3 dB bandwidth, +/- 0.2 dB flatness
44.1 kHz:	5 Hz-20 kHz; -3 dB bandwidth, +/- 0.2 dB flatness
48 kHz:	5 Hz-22.5 kHz; -3 dB bandwidth, +/- 0.2 dB flatness
Audio Distortion	<0.01% <0.01% at 1 kHz (compressed)
Audio Dynamic Range	92 dB Digital (AES/EBU) IN/OUT 83 dB Analog IN/OUT
Audio Crosstalk	< -80 dB
Audio Data Coding Method	Linear ISO/MPEG (Layer II) or Sub-band ADPCM
Audio Sample Rate	Selectable 32, 44.1, 48 kHz; built-in rate converter
Audio Coding Time Delay	Linear: 0 ms ISO/MPEG: 22 ms
Async Data Channels	One for each audio pair
Aggregate Transmission Rates	Depends on number of audio channels
Temperature Range	Specification Performance: 0 to 50º C Operational: -20 to 60º C

1.3.2 Audio Encoder Specifications

Sample Rate	32/44.1/48 kHz selectable, built-in rate converter
Audio Inputs	XLR female
Analog Audio Level	-10 dBu to +18 dBu, rear panel accessible electronically balanced, 600/10k ohm selectable, CMRR > 60 dB
Digital Audio Input	AES/EBU: Transformer balanced, 110 ohm input impedance SPDIF: Unbalanced, 75 ohm input impedance
Data Input	9-pin D male RS-232 levels Async. 300 to 38400 bps selectable (4800 max for ADPCM)
ISO/MPEG Modes	Mono, dual channel, joint stereo, stereo (ISO/IEC 111172-3 Layer II) **Sample Rate** 32/44.1/48 kHz selectable **Output Rate** 32/48/56/64/80/96/112/128/160/192/224/256/320/384 kHz selectable

1.3.3 Audio Decoder Specifications

Sample Rate	32/44.1/48 kHz selectable, built-in rate converter
Audio Outputs	XLR male
Analog Audio Level	-10 dBu to +18 dBu, rear panel accessible electronically balanced, low Z/600 ohm selectable
Digital Audio Output	AES/EBU: Transformer balanced, 110 ohm output impedance SPDIF: Unbalanced, 75 ohm output impedance
Data Output	9-pin D male RS-232 levels Async. 300 to 38400 bps selectable (4800 max for ADPCM)
ISO/MPEG Modes	Mono, dual channel, joint stereo, stereo (ISO/IEC 111172-3 Layer II) **Sample Rate:** 32/44.1/48 kHz selectable **Input Rate:** 64/128/192/256/384 kHz selectable

1.3.4 Intelligent Multiplexer Specifications

Capacity	4 local Ports, can multiplex 8 audio cards
Aggregate Rates	Up to 1.536 or 2.048 Mbps
Resolution	8 kbps
Clocks	Internal, Derived, External
Local Port Interfaces	*Choice of:* Voice; Low Speed Async Data (RS-232), High Speed Sync Data (V.35, RS-449) Ethernet (802.1 Q tagged full size Ethernet Frames)
Data Rates	Low Speed 300-38400 bps; Voice 16, 24, 32, 64 kbps; High Speed to 2040 kbps Ethernet 10/100 Mbps I/O
Trunk	T1, E1 or V35 or RS449

1.4 Regulatory Notices

FCC Part 15 Notice
Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Any external data or audio connection to this equipment must use shielded cables.

Section 2: Quick Start

2 Quick Start

2.1 Unpacking

The following is a list of all included items for each terminal:

Description	Quantity
SL9003T1 Chassis	1
Rack Ears (w/hardware)	2
Power Cord (IEC 3 conductor)	1
Manual / Soft Copy	1
Test Data Sheet (customer documentation)	1

Be sure to retain the original boxes and packing material in case of return shipping. Inspect all items for damage and/or loose parts. Contact the shipping company immediately if anything appears damaged. If any of the listed parts are missing, call the distributor or Moseley immediately to resolve the problem.

2.2 Notices

! WARNING!

HIGH VOLTAGE IS PRESENT INSIDE THE POWER SUPPLY MODULE WHEN THE UNIT IS PLUGGED IN. REMOVAL OF THE POWER SUPPLY WILL EXPOSE THIS POTENTIAL TO SERVICE PERSONNEL.

TO PREVENT ELECTRICAL SHOCK, UNPLUG THE POWER CABLE BEFORE SERVICING.

UNIT SHOULD BE SERVICED BY QUALIFIED PERSONNEL ONLY.

PRE-INSTALLATION NOTES

- *Always pre-test the system on the bench in its intended configuration prior to installation at a remote site.*
- *Avoid cable interconnection length in excess of 1 meter in strong RF environments.*
- Do not allow the audio level to light the red “clip” LED on the front panel bar graph, as this causes severe distortion (digital audio overload).
- We **highly** recommend installation of lightning protectors to prevent line surges from damaging expensive components.

2.3 Rack Mount

The SL9003T1 is normally rack-mounted in a standard 19” cabinet. Leave space clear above (or below) the unit for proper air ventilation of the card cage. The rack ears are typically mounted as shown in Figure 2-1. Other mounting methods are possible, as outlined in Section 3, *Installation*.

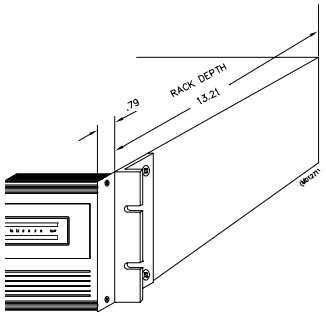


Figure 2.1 - SL9003T1 Typical Rack Mount Bracket Installation

2.4 Quick Start Guide

2.4.1 Overview

This guide is intended to provide you with information that will aid you in quickly getting your T1 system up and running.

A T1 system usually consists of two chassis and each chassis can contain these modules and plug-in cards:

- Audio Encoder Module
  - MPEG Encoder Card
- Audio Decoder Module
  - MPEG Encoder Card
- Intelligent Multiplexer Module – 4-port and/or 6-port
  - T1 Card
  - Ethernet Card
  - 4-W E&M (Order-wire) Card
  - FXS Card
  - FXO Card
  - Dual AES/EBU Card & I/O Panel
  - Sync (V.35 or RS-449/EIA-530) Card
  - Universal Serial Interface (Sync/Async) Card
- Unless otherwise specified, your system is pre-configured for B82Z with ESF - no network clock.

2.4.2 Connection Diagram

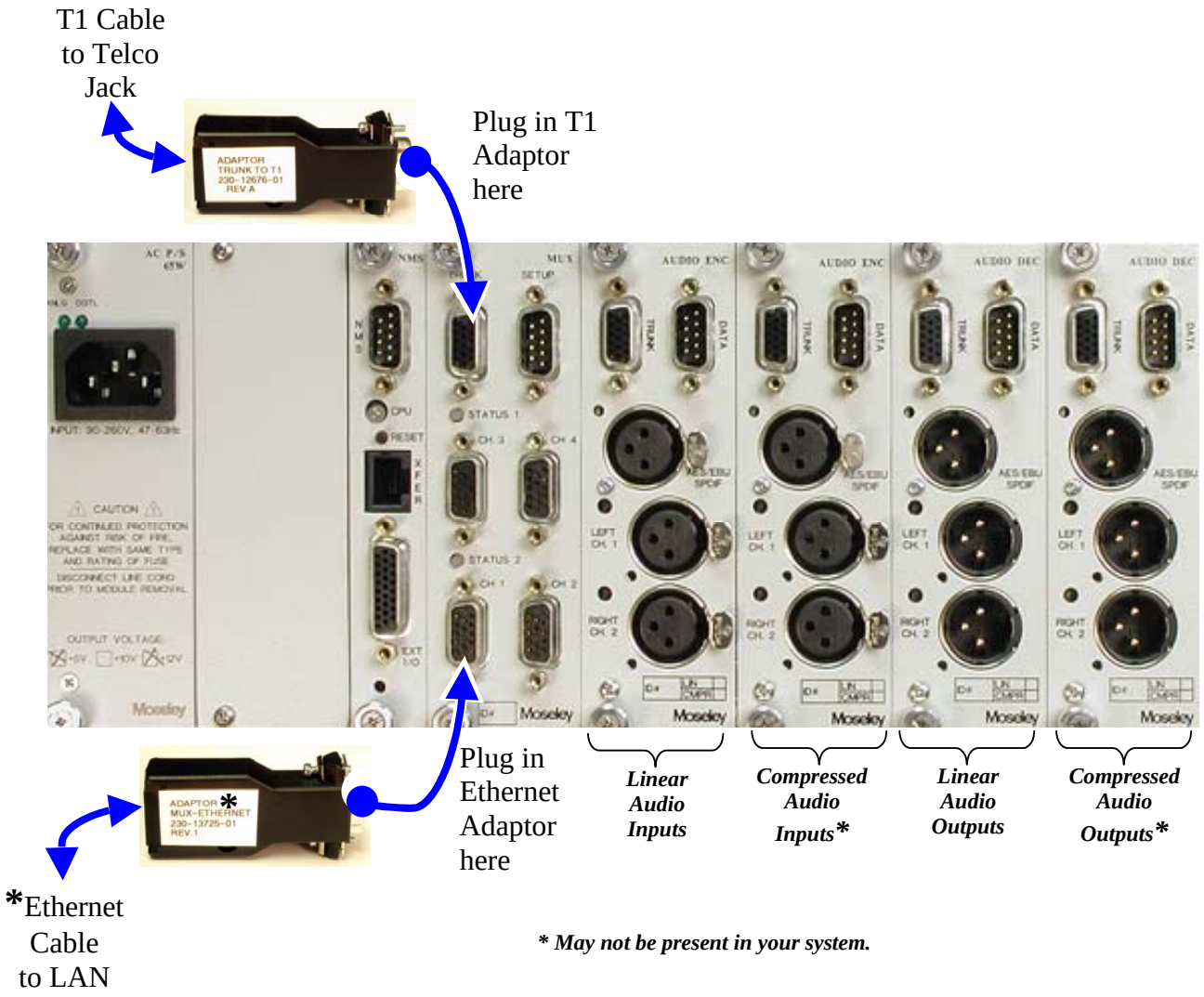


Figure 2.2 - T1 (4-Port Mux) Rear Panel Connections

Use a “straight-through” T1 cable to connect from the T1 adaptor jack to the TELCO jack. *Moseley recommends a B8ZS, ESF, “no clock” configuration for the TELCO T1 circuit.*

Use a “straight-through” CAT3 or CAT5 cable if the connected device is a LAN hub or switch. Otherwise, it should be a “crossover” CAT3 or CAT5 cable. *Moseley recommends using a hub or switch as some other devices are not able to correctly negotiate with the Moseley LAN card.*

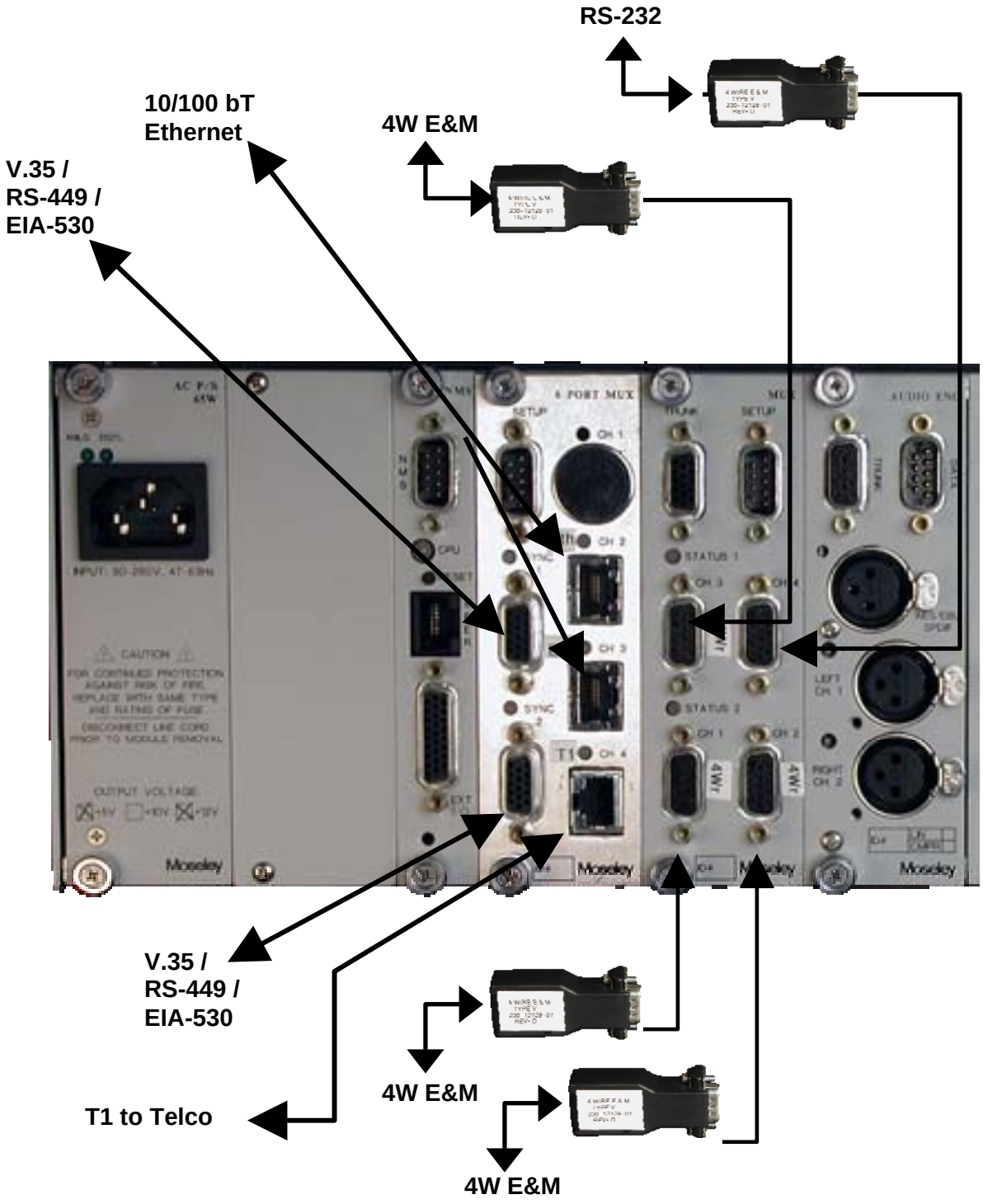


Figure 2.3 - T1 (6-Port Mux) Rear Panel Connections

The additional audio connections are not shown here; please see Figure 2.2.

Use a “straight-through” T1 cable to connect from the T1 adaptor jack to the TELCO jack. *Moseley recommends a B8ZS, ESF, “no clock” configuration for the TELCO T1 circuit.*

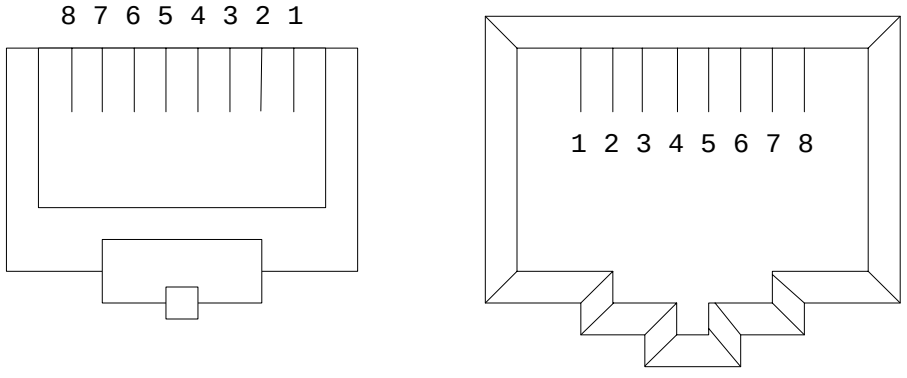
Use a “straight-through” CAT3 or CAT5 cable if the connected device is a LAN hub or switch. Otherwise, it should be a “crossover” CAT3 or CAT5 cable.

2.4.3 T1, Ethernet, 4-Wire E&M and All Those Connectors

Warning! Be sure to use the appropriate cable for each interface. Failure to observe this precaution can cause module damage.

So why are these all lumped together in the same title? Mostly because Moseley products use all of these interfaces and it is important to understand the similarities and differences so that we can understand how to connect the correct cables and equipment. We present enough information here to make you dangerous. There are a multitude of authoritative sources of information, both in print and available on the Internet by using your favorite search engine.

So what are the similarities? They all convey bi-directional, analog-encoded data over copper wires. More importantly, for this discussion, they all use the same connector, the modular RJ45 (or RJ48). The RJ45/48 plug looks like a modular RJ11 phone plug on the end of your phone cord, but bigger:



RJ-45 Plug, End View RJ-45 Jack, Looking Inside

Figure 2.4 - RJ45/RJ48 Connector Pins

Please note that wire colors vary depending on which standard is being used. The important thing is to pay attention to the pairs of pins (these are all differential signals) that get wired together.

So what are the differences? Well, that's where it gets interesting.

2.4.4 T1 Connector

A T1 (or DS1) circuit is used to convey up to 1536kb/s of digital information, typically measured in 64kb/s chunks, often called DS0s. There are up to 24 DS0s in a DS1 or T1 circuit. When you include framing, the aggregate rate is 1544kb/s.

The standard pin out of a T1 TELCO User connector is:

RJ45 Pin	Function	*DB15 Pin	Bantam
1	RX Ring (-)	11	Ring
2	RX Tip (+)	3	Tip
3	not used	-	
4	TX Ring (-)	9	Ring
5	TX Tip (+)	1	Tip
6	not used	-	
7	not used	-	
8	not used	-	

* The DB15 or Bantam connectors are found on some equipment instead of the RJ45.

T1 Pin Connections

A TELCO jack usually has the functions reversed, i.e. RX & TX are swapped, so that a straight-through cable can be used to connect the CSU/DSU/TSU jack to the TELCO jack.

To discern which connection you have, use a wide-band oscilloscope or DVM to measure across the TX and RX pairs. The TX pairs should have activity and the RX pairs should not. Note: Many T1 jacks provided by the phone company are terminated with a "smart jack". This jack has an automatic loopback feature built in, so that if no connector is inserted, the TX pair is connected to the RX pair. The phone company uses this feature to

test the line from the CO before turning it over to you. A common mistake during installation is to reverse the TX & RX pairs, so it is best to insert a plug/cable into the jack before you do your testing.

To connect two T1 jacks that have the same pin-out, you will need a T1 cross-over cable, which has these connections:

Cable End A RJ45 Pin	Cable End B RJ45 Pin
1	4
2	5
4	1
5	2

T1 Cross-over Cable

A T1 loop-back connector will have these connections all on the same jack or plug:

RJ45 Pins
1-4
2-5

T1 Loopback connector

2.4.4.1 Ethernet Connector

An Ethernet circuit is used to convey up to 10Mb/s or 100Mb/s of digital information, sent as packets of information. The packets are most often TCP or UDP packets. These are the protocols used for conveying information via the internet.

The standard pin out of an Ethernet User connector is:

RJ45 Pin	Function
1	TX +
2	TX -
3	RX -
4	not used
5	not used
6	RX +
7	not used
8	not used

Ethernet Pin Connections

An Ethernet Hub or Switch usually has the functions reversed, i.e. RX & TX are swapped, so that a straight-through cable can be used to connect the Hub or Switch jack to the PC or other equipment jack. Many new Switches have auto-sensing capabilities, so either a straight or crossover cable is useable.

To discern which connection you have, use a wide-band oscilloscope or DVM to measure across the TX and RX pairs. The TX pairs should have activity and the RX pairs should not.

To connect two Ethernet jacks that have the same pin-out, you will need a Ethernet cross-over cable, which has these connections:

Cable End A RJ45 Pin	Cable End B RJ45 Pin
1	3
2	6
3	1
6	2

Ethernet Cross-over Cable

An Ethernet loop-back connector will have these connections all on the same jack or plug:

RJ45 Pins
1-3
2-6

Ethernet Loopback connector

2.4.4.2 4-Wire E&M (Voice Connector)

A 4-Wire E&M or order-wire circuit is used to convey analog voice information and associated signaling.

The standard pin out of a 4-Wire E&M connector is:

RJ45 Pin	Function
1	M-return
2	M-lead
3	RX Ring (-)
4	TX Ring (-)
5	TX Tip (+)
6	RX Tip (+)
7	E-lead
8	E-return

4-Wire E&M Pin Connections

A PBX may have the functions reversed, i.e. RX & TX are swapped, so that a straight-through cable can be used to connect the PBX jack to the 4-W E&M jack.

To discern which connection you have, use a wide-band oscilloscope or DVM to measure across the TX and RX pairs. The TX pairs should have activity and the RX pairs should not.

To connect two 4-Wire E&M jacks that have the same pin-out, you will need a 4-Wire E&M cross-over cable, which has these connections:

Cable End A RJ45 Pin	Cable End B RJ45 Pin
3	4
6	5
4	3
5	6

4-Wire E&M Cross-over Cable

Signaling leads are not indicated here, as they vary according to the signaling standard used.

A 4-W E&M loop-back connector will have these connections all on the same jack or plug:

RJ45 Pin
3-4
6-5

4-Wire E&M Loopback connector

2.4.4.3 ATM

An ATM circuit is used to convey up to 155Mb/s of digital information, sent as packets of information.

The standard pin out of an ATM User Equipment connector is:

RJ45 Pin	Function
1	TX +
2	TX -
3	not used
4	not used
5	not used
6	not used
7	RX +
8	RX -

ATM Pin Connections

An ATM Switch usually has the functions reversed, i.e. RX & TX are swapped, so that a straight-through cable can be used to connect the Hub or Switch jack to the PC or other equipment jack. Many new Switches have auto-sensing capabilities, so either type of cable is useable.

To discern which connection you have, use a wide-band oscilloscope or DVM to measure across the TX and RX pairs. The TX pairs should have activity and the RX pairs should not.

To connect two ATM jacks that have the same pin-out, you will need a T1 cross-over cable, which has these connections:

Cable End A RJ45 Pin	Cable End B RJ45 Pin
1	7
2	8
7	1
8	2

ATM Cross-over Cable

An ATM loop-back connector will have these connections all on the same jack or plug:

RJ45 Pin
1-7
2-8

ATM Loopback connector

2.4.5 LED Indications

Please refer to Figures 2.2 and 2.3 for rear panel connections for LED locations.

2.4.5.1 Power Supply

The two LEDs on the power supply show the two power supply voltages, analog and digital. They should be both illuminated for proper operation.

2.4.5.2 NMS/CPU

The LED on the NMS/CPU board indicates that the CPU board is functioning. It should be lit at all times.

2.4.5.3 Intelli-Mux (4-port and 6-port)

Status 1 and Status 2 LEDs indicate the Multiplexer and Demultiplexer status, respectively on the 4-Port Mux. Sync 1 and Sync 2 LEDs indicate the Multiplexer and Demultiplexer status, respectively on the 6-Port Mux.

LED	Indication
Dark:	Problem with module
Yellow:	Module is working, not locked
Green	Module is working and clock and frame are locked

2.4.5.4 Fractional/Full T1

D5 Led on the T1 PCB indicates the status of the T1 link. This LED is mimicked on the rear panel of the Intelli-Mux on some systems.

2.4.5.4.1 T1 (v1.1 & later)

D5 LED Color	Full T1 Meaning	Fractional T1 Meaning	Notes
GREEN	T1 signal present, T1 clock present, data normal	T1 signal present, T1 clock present, data normal	Normal Operation
ORANGE	Incoming frequency out of tolerance (fifo over/under run)	Incoming frequency out of tolerance (fifo over/under run)	Check signal source
RED/OFF 1 pulse/sec	N/A	T1 Fractional Error	Check signal source or external link
RED/OFF 2 pulses/sec	N/A	FT1 Fractional Error	Check signal source or external link
RED/GREEN alternating	Bipolar Violation	Bipolar Violation	Check signal source
RED	Loss of Signal	Loss of Signal	Check cabling, this end
OFF	No power or no firmware	No power or no firmware	Check board seating

2.4.5.4.2 T1 (v1.0)

D5 LED Color	Meaning	Notes
RED	T1 signal present, no T1 clock or data (all 0s)	Check T1 circuit
GREEN	T1 signal present, T1 clock present, no data (all 1s)	Check cabling on far end or A1S error from far end
ORANGE (normal)	T1 signal present, T1 clock present, data present	Normal operation
OFF	No T1 signal or no power	Check cabling on this end

2.4.5.4.3 T1 (v0.5)

D5 LED Color	Meaning	Notes
RED	T1 signal present, no T1 clock or data (all 0s)	Check T1 circuit
GREEN	T1 signal present, T1 clock present, no data (all 1s)	Check cabling on far end or A1S error from far end
ORANGE (normal)	T1 signal present, T1 clock present, data present	Normal operation
OFF	No T1 signal or no power	Check cabling on this end

2.4.5.5 Audio Encoder

The LED above and to the left of the AES/EBU connector indicates the status of the Audio Encoder:

LED Condition	Meaning
Fast Flashing	Module problem or clock not locked
Slow Flashing	Clock locked, frame not locked
Steady	Clock and frame locked

2.4.5.6 Audio Decoder

The LEDs above and to the left of the AES/EBU connector indicates the status of the Audio Decoder:

LED Condition	Meaning
Fast Flashing	Module problem or clock not locked
Slow Flashing	Clock locked, frame not locked
Steady	Clock and frame locked

2.4.5.7 Ethernet

There are 3 LEDs associated with each of the two Ethernet connectors.

LED	Meaning
Round GRN (Chan x)	On = 100base-T, Off = 10base-T
Rectangular GRN (On RJ45)	On = Link Active, Off = Link Inactive
Rectangular ORG (On RJ45)	On = Activity Present, Off = No Activity

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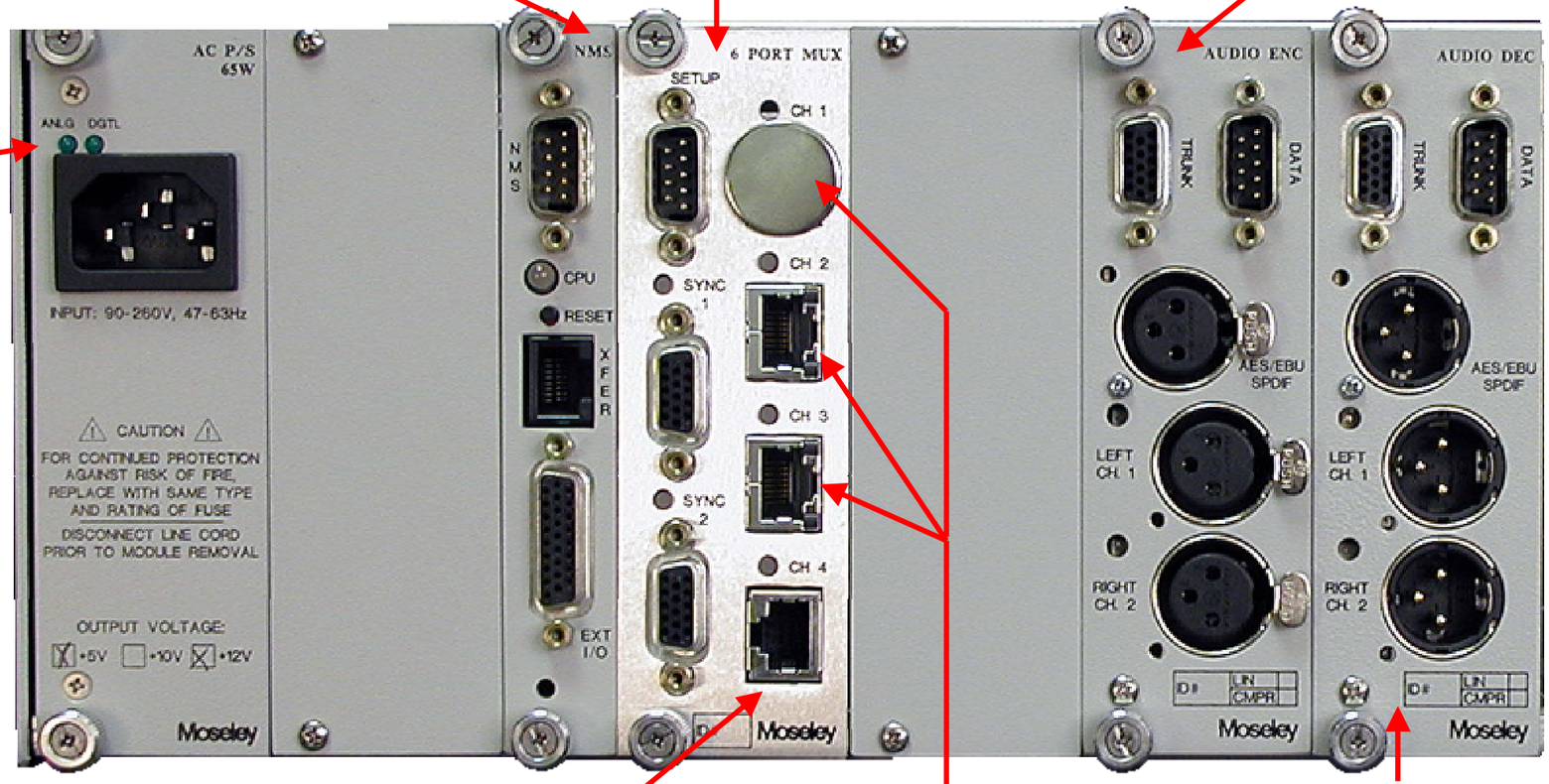
NMS CARD
Provides system CPU control, front panel interface
I/O Port
RS232 PC access
Status LED
Green LED indicates CPU OK
Reset Switch
Activates hard system reset

6-PORT MUX

AUDIO ENCODER
Audio input cards accept digital or analog audio. A/D conversion is performed for the analog inputs. The stereo digital audio is encoded for linear (or MPEG) operation. The resultant data stream is applied to the MUX inputs. An auxiliary data channel is available in linear mode only.
I/O Ports
DATA: Data inputs – RS232 levels, 9-pin D male. Asynchronous 300-38400 bps
TRUNK: Not used.
Audio Inputs
LEFT (CH-1) / RIGHT (CH-2) – Z_{in} 10 kohm, active balanced, +10dBu=O VU
AES/EBU/SPDIF - Z_{in} 110 ohm, transformer balanced, 30-50 kHz sample rate



POWER SUPPLY
Typical Power Consumption:
60 Watts for two audio boards
Input Options:
AC – Universal Input, 90-260V, 47-63Hz
DC – 24v/48v (Isolated Input)

T1 CONNECTION

LAN OR FIXED FXS/FXO/E&M OPTIONS

AUDIO DECODER
Audio output with both active AES and analog audio . An auxiliary data channel is available linear mode only.
I/O Ports:
DATA: Data inputs – RS232 levels, 9-pin D male. Asynchronous 300-38400 bps
TRUNK: Not used.
Audio Outputs:
LEFT (CH-1) / RIGHT (CH-2) – Zout 600Ω active balanced, +10dBu=O VU
AES/EBU/SPDIF - Zout 110 ohm, transformer balanced, 30-50 kHz sample rate

Figure 2.5 – System Description

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2.4.6 Default Settings and Parameters

Listed below are the typical default module settings and parameters. This gives the experienced user a brief rundown of the pertinent information required for system setup. These settings may be accessed through board jumpers or software switches. See Section 5, *Module Configuration*, of this manual for a detailed account of the various module settings and parameters.

2.4.6.1 Audio

Audio Source Input Switching	Digital Audio = Primary Analog Audio = Secondary (Automatic switch from AES to Analog Input when AES signal is not present)
Analog Audio Connectors	XLR female (input), XLR male (output)
Analog Audio Input	Electronically balanced, 10 kohm
Analog Audio Output	Electronically balanced, low-Z (<100 ohms)
Analog Audio I/O Levels	+10 dBu Note: 0 dBu = 0.7746 VRMS (1 mW @ Z=600 ohms)
Digital Audio I/O Parameters	AES/EBU: Transformer balanced, 110 ohm impedance 30-50 kHz input sample rate
Data Coding Method (System Dependent)	▪ Linear (16 bit) ▪ ISO/MPEG (Layer II)
ISO/MPEG Mode	Stereo (ISO/IEC 111172-3 Layer II)
ISO/MPEG Sample Rate	48 kHz
ISO/MPEG Output Rate	256 kbps

2.4.6.2 Identifying Audio Connection (4-channel)

In a 4 channel system, there are two physically identical encoders in the transmitter unit and two corresponding decoder modules in the receiver unit. The modules are identified with an ID # on the rear panel (ENC1, ENC2, DEC1, DEC2).

The audio configuration of the module can be checked on the Test Data Sheet supplied with the units.

2.4.6.3 Audio Data Channel

The normal serial data channels are located at the encoder/decoder modules (except for special configurations, see below). ENC1 contains Data Channel 1, and so on. Dip-switches located on the encoder/decoder modules configure the data channel rates and bit length (see Section 5, *Module Configuration,* for changing the data channel configuration). The following is the factory default rate unless it was specified at the time of order (check the Test Data Sheet for factory setting).

Data Channel	9-pin D male, RS-232 levels, Asynchronous 1200 baud, 8 bits, 1 start & 1-2 stop bits.

2.4.6.4 Identifying Data Channels on the MUX module

The default configuration for 4-channel systems has no I/O data channels present at the MUX module.

Note, however, that certain special factory configurations will require data channels to be stacked in the MUX module, and each MUX channel (1-4) can be configured differently (SYNC, ASYNC, voice, etc.). Consult the test data sheet for details regarding your system. Also see Section 5, *Module Configuration*, for more information.

2.4.7 External Communications Equipment

Customers that are installing a CSU for T1 backup applications may be required to configure the timing clock settings. Check the Appendix for typical settings.

2.4.8 Performance

After the link is installed, certain performance parameters may be interrogated through the front panel for verification. Section 4, *Operations*, contains an LCD Menu Flow Diagram and other useful information to assist in navigating to the appropriate screen.

2.4.9 Details, details, details

This “Quick Start” section was designed to give the experienced user enough information to get the studio-transmitter link up and running. Less experienced users may benefit by reading the manual all the way through prior to installation.

Also, many systems are specially configured for customers. Please check the Test Data Sheet for the exact shipping configuration you received.

The rest of this manual will provide many details regarding the installation and operation of the system, internal module configurations, troubleshooting and system theory. Be sure to browse the Appendix for further technical discussion that may be of help.

If problems still exist for your application, do not hesitate to call Moseley Technical Services for assistance.

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Section 3: Installation

3 Installation

3.1 Rear Panel Connections

Section 2, *Quick Start,* contains two fold-out diagrams showing the rear panel of the SL9003T1 transmitter (Fig 2-2) and receiver (Fig 2-3). Please refer to these figures for details regarding the rear panel connections.

3.2 Power Requirements

3.2.1 Power Supply Card Slot Details

The leftmost slot in the SL9003T1 card cage (as viewed from the rear of the unit) is designated as the “PRIMARY A” power supply. This is the default slot for the systems.

The main bus voltages (+5 and +12) are routed to the backplane and provide the supply of the plug-in modules.

NOTE:

The front panel LCD screen displays the system supply voltages and the nomenclature follows the physical location of the power supply modules.

3.2.2 AC Line voltage

The SL9003T1 uses a high reliability, universal input switching power supply capable of operating within an input range of:

90 – 260 VAC; 47-63 Hz

The power supply module is removable from the unit and a cage protects service personnel from high voltage.

! WARNING!

HIGH VOLTAGE IS PRESENT WHEN THE UNIT IS PLUGGED IN.

TO PREVENT ELECTRICAL SHOCK, UNPLUG THE POWER CABLE BEFORE SERVICING.

POWER SUPPLY MODULE SHOULD BE SERVICED BY **QUALIFIED** PERSONNEL ONLY.

3.2.3 DC Input Option

An optional DC input power supply is available for the SL9003T1 using a high reliability, DC-DC converter capable of operation within the following input ranges (dependent upon nominal input rating):

Nominal DC Input	Operating Input Range
24 Volt:	18 – 36 VDC
48 Volt:	36 – 72 VDC

The DC input is isolated from chassis ground and can be operated in a positive or negative ground configuration. The power supply module is removable from the unit and no high voltages are accessible.

3.2.4 Fusing

For AC modules, the main input fuse is located on the switching power supply mounted to the carrier PC board and the protective cage may be removed for access to the fuse.

For DC modules, all fusing is located on the carrier PC board.

Always replace any fuse with same type and rating. Other fuses are present on the board, and are designed for output fail-safe protection of the system. All output

fuse values are printed on the front or back side of the PC board to aid in replacement.

NOTE:

If a fuse does blow in operation, investigate the possible cause of the failure prior to replacing the fuse, as there is adequate built-in protection margin.

3.3 Site Installation

The installation of the SL9003T1 involves several considerations. A proper installation is usually preceded by a pre-installation site survey of the facilities. The purpose of this survey is to familiarize the customer with the basic requirements needed for the installation to go smoothly.

Before taking the SL9003T1 to the installation site verify that the audio connections are compatible with the equipment to be connected.

3.3.1 Installation

The T1 interfaces is set from the factory such that the T1 line from the TELCO should be ordered as B8ZS with ESF no network clock.

3.3.2 Power Requirements

The AC power supply uses a universal input switching supply that is adaptable to power sources found worldwide. The line cord is IEC (USA) compatible, and the user may need to adapt to the proper physical AC connector in use.

For DC input units, double-check the input voltage marking on the rear panel does indeed match the voltage range provided by the facility. Verify that the power system used at the installation site provides a proper earth ground. The DC option for the SL9003T1 have isolated inputs by default, but the user may hard-wire a positive or negative chassis ground inside the module, if desired.

An uninterruptible power supply backup (UPS) system is recommended for remote locations that may have unreliable source power. Lightning protection devices are highly recommended for the power sources and all critical inputs and outputs.

3.3.3 Rack Mount Installation

The SL9003T1 is designed for mounting in standard 19” rack cabinets, using the brackets (“rack ears”) included with the SL9003T1. The rack ear kit is designed to allow flush mount or telecom-mount (front extended). See Figure 3-3 for bracket

installation. Be sure to provide adequate air space near the ventilation holes of the chassis (top, bottom, and sides).

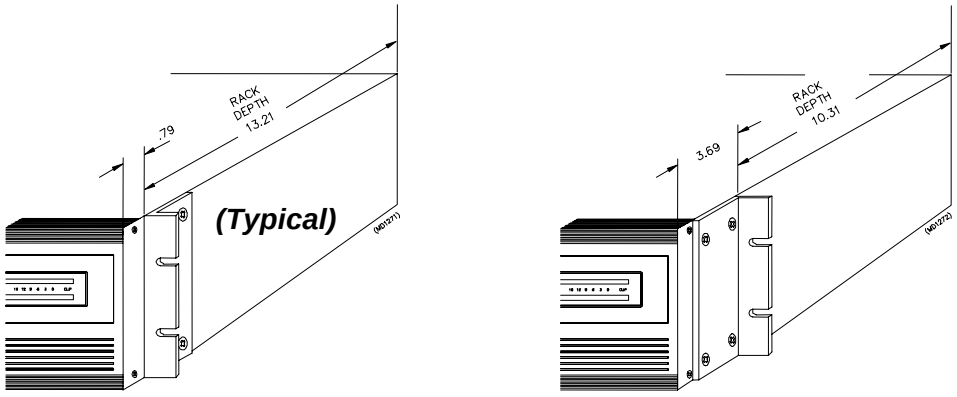

Figure 3.1 - Rack Mount Bracket Installation

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Section 4: Operation

4 Operation

4.1 Introduction

This section describes the front panel operation of the SL9003T1 digital radio/modem. This includes:

- LCD display (including all screen menus)
- Cursor and screen control buttons
- LED status indicators
- Bargraph Display

4.2 Front Panel Operation

A pictorial of the SL9003T1 front panel is depicted in Figure 4-1 below.

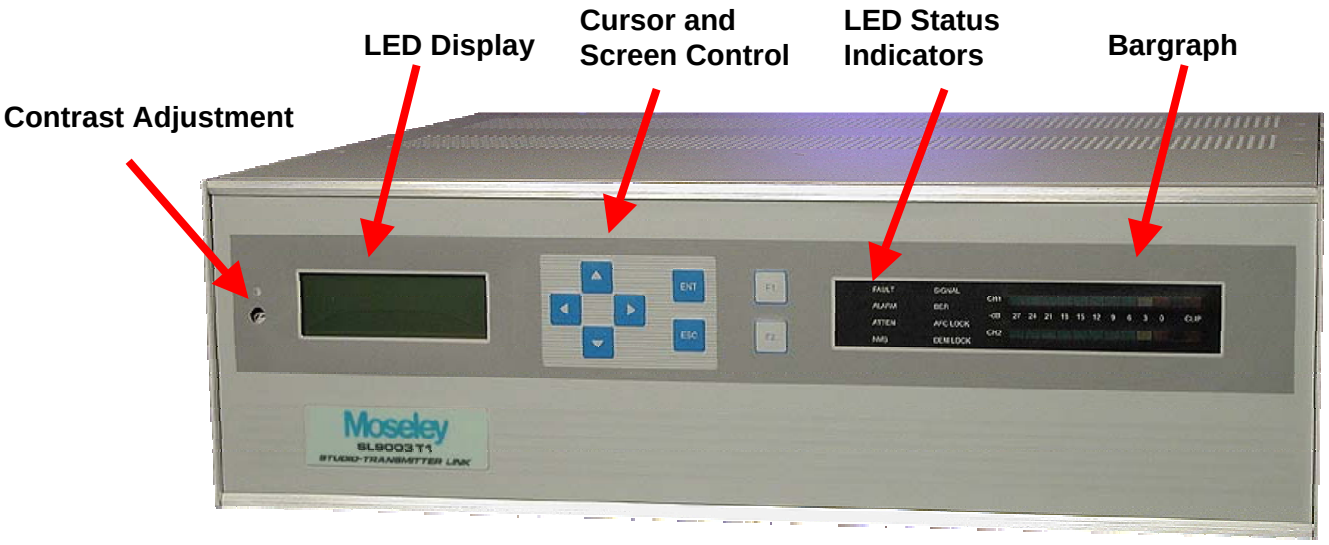

Figure 4.1 - SL9003T1 Front Panel

4.2.1 LCD Display

The Liquid Crystal Display (LCD) on the SL9003T1 front panel is the primary user interface and provides status, control, and calibration functionality. The menu navigation and various screens are explained in detail later in this section.

Backlight:
An automatic backlight is built-in to the LCD for better clarity under low-light conditions. This backlight is enabled on power-up and will automatically turn off if there is no button activity by the user. The backlight will automatically turn on as soon as any button is pressed.

Contrast Adjustment:
The contrast adjustment is front panel accessible (to the left of the LCD). A small flathead screwdriver may be used to adjust for optimum visual clarity.

4.2.2 Cursor and Screen Control Buttons

The buttons on the SL9003T1 front panel are used for LCD screen interface and control functions:

	<ENTER>	Used to accept an entry (such as a value, a condition, or a menu choice).
	<ESC>	Used to “back up” a level in the menu structure without saving any current changes.
 	<UP>,<DOWN>	Used in most cases to move between the menu items. If there is another menu in the sequence when the bottom of a menu is reached, the display will automatically scroll to that menu.
 	<LEFT>,<RIGHT>	Used to select between conditions (such as ON/OFF, ENABLED/DISABLED, LOW/HIGH, etc.) as well as to increase or decrease numerical values.
 	<F1>,<F2>	Software programmable buttons (to be implemented in a later software revision)

4.3 Screen Menu Tree Structure

The current software revision may be noted in the **SYSTEM** sub-menu (under **INFO**).

In general, <**ENTER**> will take you to the next screen from a menu choice, <**UP**> or <**DOWN**> will scroll through screens within a menu choice, and <**ESC**> will take you back up one menu level. Certain configuration screens have exceptions to this rule, and are noted later in this section.

CAUTION

DO NOT change any settings in the CONFIGURE or CALIBRATE screens. The security lock-out features of the software may not be fully implemented, and changing a setting will most likely render the system non-operational!

4.3.1 Main Menu

The main menu appears on system boot-up, and is the starting point for all screen navigation. Unlike most other screens in the software, the main menu scrolls up or down, one line item at a time.

4.3.2 Launch Screens

The **LAUNCH** screen allows the user to quickly get to a particular screen within a functional grouping in the unit. The logic is slightly different than other screens. Figure 4-x contains a “Launch Screen Navigation Guide” to assist the user in locating the desired screen.

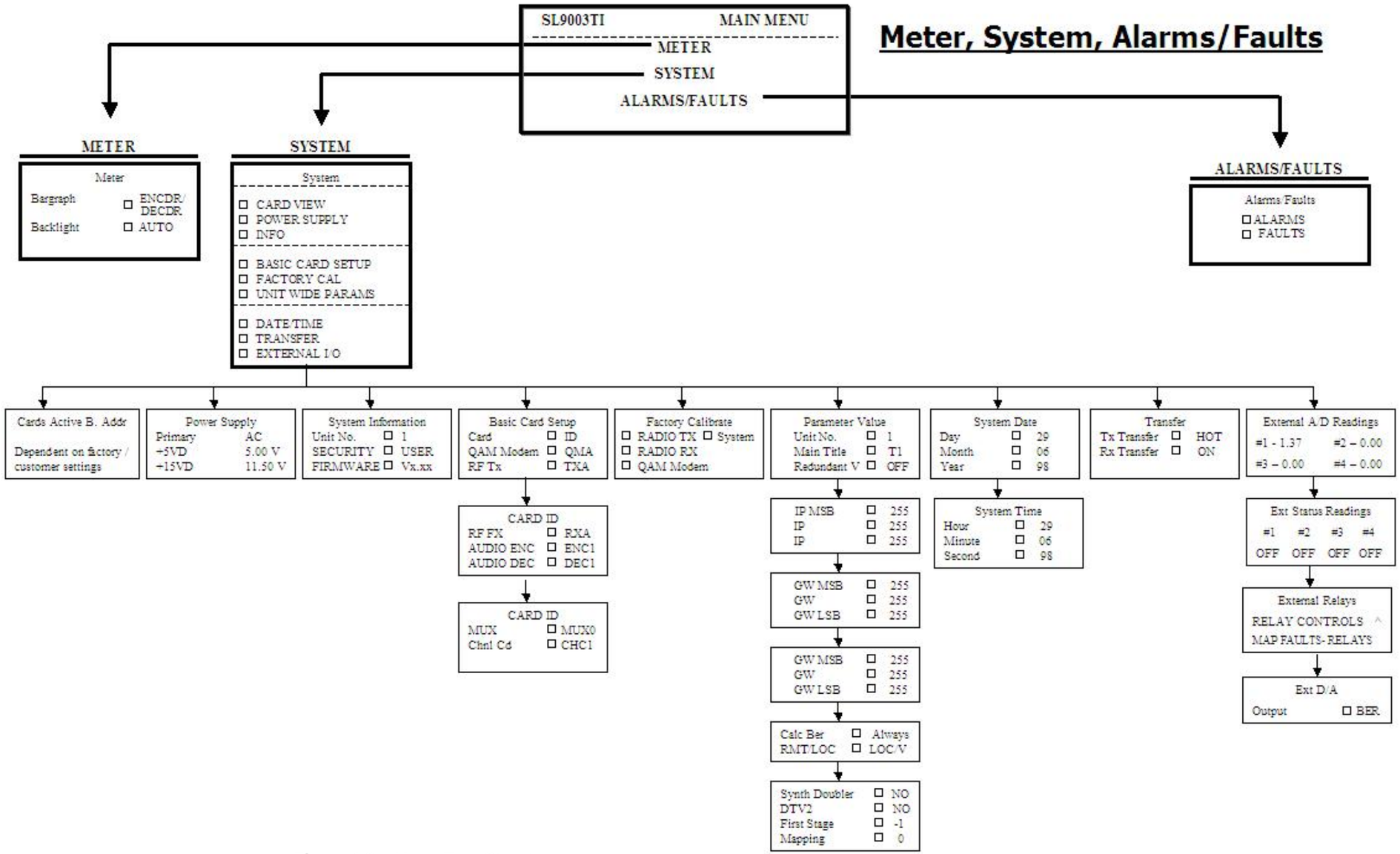

Figure 4.2 – Menu Tree Structure

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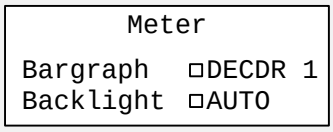
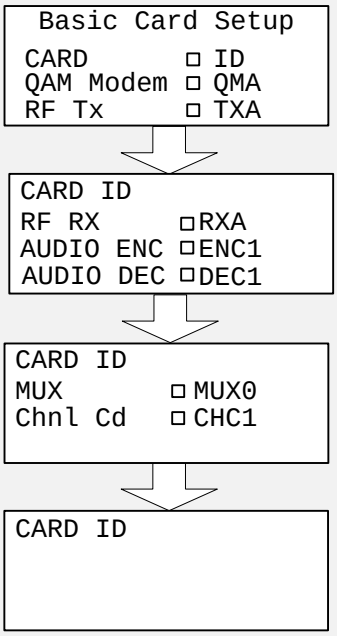
4.3.3 Meter



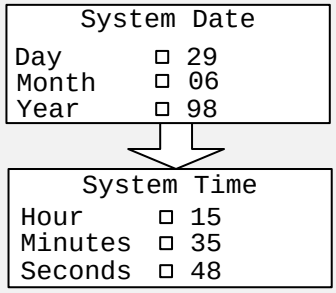
Function	Settings	Summary
Bargraph	ENCDR1, 2, etc… DECDR1, 2, etc… OFF	Selects the desired audio source for display on the audio level bargraph Turns off the bargraph
Backlight	AUTO (*default*) OFF	LCD Backlight will turn off after 5 minutes if there is no button activity on the front panel. Backlight off always

4.3.4 System: Basic Card Setup



Function	Settings	Summary
AUDIO ENC	ENC1,2,…	Audio Encoder installed and identified (affects meter selection of bargraph)
AUDIO DEC	DEC1,2,…	Audio Decoder installed and identified (affects meter selection of bargraph)
MUX	MUX 0, 1, …	Mux installed and identified
Chnl Cd	CHC 1,2,…	Channel Card installed and identified

4.3.5 System: Date/Time



Function	Settings	Summary
Day Month Year	01-31 01-12 00-99	Sets the system date used for NMS and Fault/Alarm logging After selection, press ENTER to save
Hour Minutes Seconds	00-23 00-59 00-59	Sets the system time used for NMS and Fault/Alarm logging After selection, press ENTER to save

4.3.6 Factory Calibration

The Factory Calibration Screens are documented in Figure 4-2c (Screen Menu Tree). The user can refer to this diagram when instructed to do so by Moseley customer service technicians.

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Section 5: Module Configuration

5 Module Configuration

5.1 Introduction

This section provides the experienced user with detailed information concerning the board level switches, jumpers and test points that may be necessary for configuring or troubleshooting modules in the SL9003T1.

This information is provided for advanced users only, or can be used in conjunction with a call to our Technical Services personnel. Changing of these settings may render the system unusable, proceed with caution!

5.2 Audio Encoder/Decoder

Switch and jumper settings for the Audio Encoder and Audio Decoder are shown in below. The following sections will clarify the particular groupings of switches.

	Encoder		**Decoder**							
Switch	T1 Mux	T1 noMux	T1 Mux	T1 noMux						
S52-1	Off	Off	Off	Off						
S52-2	Off	Off	Off	Off						
S52-3	Off	Off	Off	Off						
S52-4	Off	Off	Off	Off						
						32.0	**44.1**	**48.0**	**AES**	
S31-1	Off	Off	Off	Off	M1*	**On**	Off	Off	**On**	**user**
S31-2	Off	Off	Off	Off	M2*	Off	Off	**On**	**On**	**rate**
S31-3	Off	Off	Off	Off	M3					
S31-4	**On**	Off	**On**	Off	M4					
S31-5	**On**	**On**	**On**	Off	M5					
S31-6	**On**	**On**	**On**	**On**	M6	**32.0**	**N/A**	**48.0**	**44.0**	
S31-7	**On**	**On**	**On**	**On**	M7*	**On**	Off	Off	**On**	**internal**
S31-8	**On**	**On**	**On**	**On**	M8*	Off	Off	**On**	**On**	**rate**
S23-1	Off	Off	Off	Off	R1					
S23-2	Off	Off	**On**	**On**	R2					
S23-3	Off	Off	Off	Off	R3					
S23-4	**On**	**On**	Off	**On**	R4					
S23-5	Off	Off	Off	Off	R5					
S23-6	Off	Off	Off	Off	R6					
S23-7	Off	Off	Off	Off	R7					
S23-8	Off	Off	Off	Off	R8					
						Base Addr (for FP & Mux)				
S22-1	Off	Off	Off	Off	A2	1 (not valid with MUX)				
S22-2	**On**	**On**	**On**	**On**	A3	2				
S22-3	Off	Off	Off	Off	A4	4				
S22-4	Off	Off	Off	Off	A5	8				
S22-5	Off	Off	Off	Off	A6	16 (not valid with MUX)				

S22-6	Off	Off	Off	Off	A7	32		
S22-7	Off	Off	Off	Off	A8	64		
S22-8	Off	Off	Off	Off	A9			
						9-bit	**8-bit**	
S21-1	**On**	**On**	**On**	**On**	D1	**On**	**On**	
S21-2	**On**	**On**	**On**	**On**	D2	**On**	Off	
						300	**1200**	**9600**
S21-3	Off	Off	Off	Off	D3	Off	Off	**On**
S21-4	Off	Off	Off	Off	D4	Off	**On**	Off
S21-5	Off	Off	Off	Off	D5	Off	Off	**On**
S21-6	Off	Off	Off	Off	D6			
S21-7	Off	Off	Off	Off	D7			
S21-8	Off	Off	Off	Off	D8			
S81-1	Off	Off	**On**	**On**	A			
S81-2	Off	Off	**On**	**On**	B			
S81-3	Off	Off	Off	Off	C			
S81-4	Off	Off	Off	Off	D			
S81-5	**On**	**On**			E			
S81-6	Off	Off			VERF			
S81-7	**On**	**On**			ERF			
S81-8	Off	Off						
	2-ch	2-ch	2-ch	2-ch				

*These switch settings are for 44.1kHz sample rate for T1 (M1, M2, M7, M8). Alternate rates are shown on right. When using 44.1kHz user rate, always use 44.0kHz internal rate.

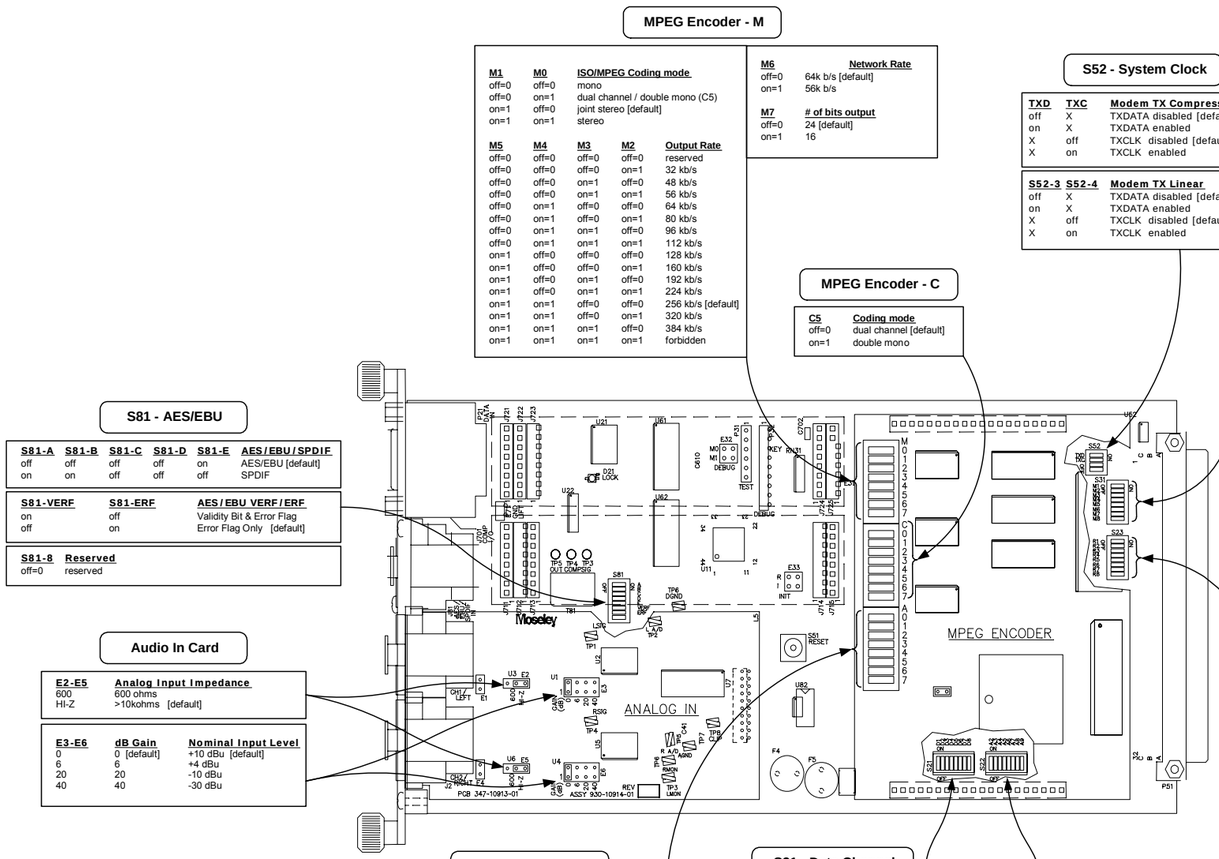
Address switch settings for multiple Encoders/Decoders in a single chassis without a mux:

	ENC1	ENC2	ENC3	ENC4	DEC1	DEC2	DEC3	DEC4	
S22-1	**On**	Off	Off	Off	**On**	Off	Off	Off	A2
S22-2	Off	**On**	Off	Off	Off	**On**	Off	Off	A3
S22-3	Off	Off	**On**	Off	Off	Off	**On**	Off	A4
S22-4	Off	Off	Off	**On**	Off	Off	Off	**On**	A5
S22-5	Off	Off	Off	Off	Off	Off	Off	Off	A6
S22-6	Off	Off	Off	Off	Off	Off	Off	Off	A7
S22-7	Off	Off	Off	Off	Off	Off	Off	Off	A8
S22-8	Off	Off	Off	Off	Off	Off	Off	Off	A9
Base Panel Addr	1	2	4	8	1	2	4	8	Front

The front panel is set up via SYSTEM BASIC CARD SETUP.
Be sure to save settings after entering the information.

The front panel is set up via SYSTEM BASIC CARD SETUP.

Be sure to save settings after entering the information.



MPEG Encoder - M

M1	M0	ISO/MPEG Coding mode
off=0	off=0	mono
off=0	on=1	dual channel / double mono (C5)
on=1	off=0	joint stereo [default]
on=1	on=1	stereo

M5	M4	M3	M2	Output Rate
off=0	off=0	off=0	off=0	reserved
off=0	off=0	off=0	on=1	32 kb/s
off=0	off=0	on=1	off=0	48 kb/s
off=0	off=0	on=1	on=1	56 kb/s
off=0	on=1	off=0	off=0	64 kb/s
off=0	on=1	off=0	on=1	80 kb/s
off=0	on=1	on=1	off=0	96 kb/s
off=0	on=1	on=1	on=1	112 kb/s
on=1	off=0	off=0	off=0	128 kb/s
on=1	off=0	off=0	on=1	160 kb/s
on=1	off=0	on=1	off=0	192 kb/s
on=1	off=0	on=1	on=1	224 kb/s
on=1	on=1	off=0	off=0	256 kb/s [default]
on=1	on=1	off=0	on=1	320 kb/s
on=1	on=1	on=1	off=0	384 kb/s
on=1	on=1	on=1	on=1	forbidden

M6	Network Rate
off=0	64k b/s [default]
on=1	56k b/s

M7	# of bits output
off=0	24 [default]
on=1	16

S52 - System Clock

TXD	TXC	Modem TX Compressed
off	X	TXDATA disabled [default]
on	X	TXDATA enabled
X	off	TXCLK disabled [default]
X	on	TXCLK enabled

S52-3	S52-4	Modem TX Linear
off	X	TXDATA disabled [default]
on	X	TXDATA enabled
X	off	TXCLK disabled [default]
X	on	TXCLK enabled

S31 - System Config

M1	M2	Input Rate (A/D & AES/EBU/SPDIF & SRC
off=0	off=0	44.1 kHz (internal osc)
off=0	on=1	48.0 kHz (internal osc)
on=1	off=0	32.0 kHz (internal osc) [default]
on=1	on=1	AES/EBU (variable from AES/EBU/SPDIF)

M3	AES/EBU_SPDIF mode
off=0	AES=master A/D=secondary [default]
on=1	No input switching (M1,M2=source)

M4	M5	M6	VCO Clock Source	Bus Clock
off=0	off=0	off=0	input mode (M1,M2)	ignore
off=0	off=0	on=1	internal oscillator	ignore
off=0	on=1	off=0	trunk compressed	ignore
off=0	on=1	on=1	trunk linear	ignore
on=1	off=0	off=0	reserved	input
on=1	off=0	on=1	reserved	input
on=1	on=1	off=0	mux compressed	input
on=1	on=1	on=1	mux linear	input

M7	M8	Linear Data Rate
off=0	off=0	44.1 kHz
off=0	on=1	48.0 kHz
on=1	off=0	32.0 kHz [default]
on=1	on=1	44.0 kHz

MPEG Encoder - C

C5	Coding mode
off=0	dual channel [default]
on=1	double mono

S81 - AES/EBU

S81-A	S81-B	S81-C	S81-D	S81-E	AES/EBU/SPDIF
off	off	off	off	on	AES/EBU [default]
on	on	off	off	off	SPDIF

S81-VERF	S81-ERF	AES/EBU VERF/ERF
on	off	Validity Bit & Error Flag
off	on	Error Flag Only [default]

S81-8	Reserved
off=0	reserved

Audio In Card

E2-E5	Analog Input Impedance
600	600 ohms
HI-Z	>10kohms [default]

E3-E6	dB Gain	Nominal Input Level
0	0 [default]	+10 dBu [default]
6	+4 dBu	
20	20	-10 dBu
40	40	-30 dBu

S23 - System Config

R1	R2	Sample Rate Converter Data Source
off=0	off=0	AES/EBU/SPDIF [default]
off=0	on=1	A/D Converter
on=1	off=0	Zeros (gnd)
on=1	on=1	Sine Generator

R3	Bus Master Clock
off=0	receive clock from mux bus [default]
on=1	supply clock to mux bus

R4	Aux RS-232 Data
off=0	Disabled
on=1	Enabled [default]

R5	R6	2-/4-Channel Select
off=0	off=0	2-Channel
off=0	on=1	reserved
on=1	off=0	4-Channel Master (1st pair)
on=1	on=1	4-Channel Slave (2nd pair)

R7	9003 LEDs & Metering
off=0	Disabled/FP Select [default]
on=1	Enabled/Forced On

R8	Debug
off=0	Normal [default]
on=1	Debug (B-bus=outputs)

MPEG Encoder - A

A7	A6	ISO/MPEG Input Rate
off=0	off=0	44.1 kHz
off=0	on=1	48.0 kHz
on=1	off=0	32.0 kHz [default]
on=1	on=1	reserved

A5	A4	A3	Aux Ch Format
off=0	off=0	off=0	Async 7E1
off=0	off=0	on=1	Async 7O1
off=0	on=1	off=0	Async 8N1 (default)
off=0	on=1	on=1	Async 8E1
on=1	off=0	off=0	Async 8O1
on=1	off=0	on=1	Sync 8 bits
on=1	on=1	off=0	reserved
on=1	on=1	on=1	reserved

A2	A1	A0	Aux Chan Rate
off=0	off=0	off=0	300
off=0	off=0	on=1	1200
off=0	on=1	off=0	2400
off=0	on=1	on=1	4800
on=1	off=0	off=0	9600 (default)
on=1	off=0	on=1	19200
on=1	on=1	off=0	reserved
on=1	on=1	on=1	reserved

S21 - Data Channel

D1	D2	Aux Data # of bits
off=0	off=0	6 (6N/5E/5O)
off=0	on=1	7 (7N/6E/6O)
on=1	off=0	8 (8N/7E/7O) [default]
on=1	on=1	9 (9N/8E/8O)

D3	D4	D5	Aux Data Rate
off=0	off=0	off=0	300
off=0	off=0	on=1	600
off=0	on=1	off=0	1200 [default]
off=0	on=1	on=1	2400
on=1	off=0	off=0	4800
on=1	off=0	on=1	9600 +
on=1	on=1	off=0	19200 +
on=1	on=1	on=1	38400 +

+ MUST use CTS line

D6	Reserved
off=0	Reserved [default]
on=1	Reserved

D7	Test
off=0	Disabled [default]
on=1	Enabled

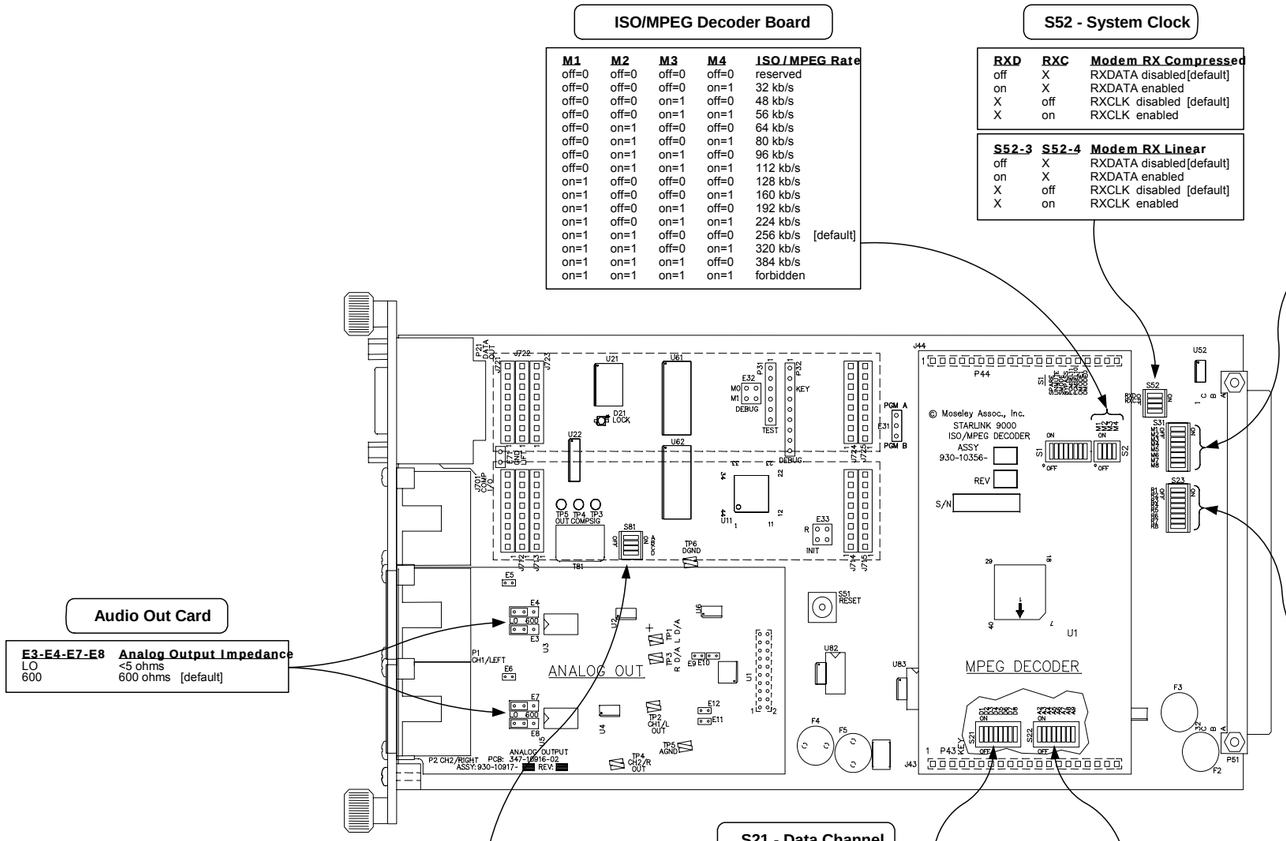
D8	Debug
off=0	Normal [default]
on=1	Enabled

S22 - Board ID

A2	A3	A4	A5	A6	A7	A8	A9	Board #	Base Addr
off	off	off	off	off	off	off	off	0	0
on	off	off	off	off	off	off	off	1*	4
off	on	off	off	off	off	off	off	2	8
off	off	on	off	off	off	off	off	3	16
off	off	off	on	off	off	off	off	4	32
off	off	off	off	on	off	off	off	5*	64
off	off	off	off	off	on	off	off	6	128
off	off	off	off	off	off	on	off	7	256
off	off	off	off	off	off	off	on	8	512

** not allowed when used with 4-port/6-port mux*

Figure 5.1
Audio Encoder
Switch and Jumper Settings



ISO/MPEG Decoder Board

M1	M2	M3	M4	ISO/MPEG Rate	
off=0	off=0	off=0	off=0	reserved	
off=0	off=0	off=0	on=1	32 kb/s	
off=0	off=0	on=1	off=0	48 kb/s	
off=0	off=0	on=1	on=1	56 kb/s	
off=0	on=1	off=0	off=0	64 kb/s	
off=0	on=1	off=0	on=1	80 kb/s	
off=0	on=1	on=1	off=0	96 kb/s	
off=0	on=1	on=1	on=1	112 kb/s	
on=1	off=0	off=0	off=0	128 kb/s	
on=1	off=0	off=0	on=1	160 kb/s	
on=1	off=0	on=1	off=0	192 kb/s	
on=1	off=0	on=1	on=1	224 kb/s	
on=1	on=1	off=0	off=0	256 kb/s	[default]
on=1	on=1	off=0	on=1	320 kb/s	
on=1	on=1	on=1	off=0	384 kb/s	
on=1	on=1	on=1	on=1	forbidden	

S52 - System Clock

RXD	RXC	Modem RX Compressed
off	X	RXDATA disabled [default]
on	X	RXDATA enabled
X	off	RXCLK disabled [default]
X	on	RXCLK enabled

S52-3	S52-4	Modem RX Linear
off	X	RXDATA disabled [default]
on	X	RXDATA enabled
X	off	RXCLK disabled [default]
X	on	RXCLK enabled

S32 - System Config

M1	M2	Input Rate (A/D,AES/EBU/SPDIF,SRC)
off=0	off=0	44.1 kHz (internal osc)
off=0	on=1	48.0 kHz (internal osc)
on=1	off=0	32.0 kHz (internal osc) [default]
on=1	on=1	Linear Rate (M7, M8)

M3	VCO Test
off=0	Normal (external)
on=1	Test (internal)

M4	FIFO data source
off=0	trunk
on=1	mux

M5	M6	VCO Source
off=0	off=0	trunk compressed
off=0	on=1	trunk linear
on=1	off=0	mux compressed
on=1	on=1	mux linear

M7	M8	VCO Rate	Clk Freq
off=0	off=0	44.1 kHz	11.2896 MHz
off=0	on=1	48.0 kHz	12.2880 MHz
on=1	off=0	32.0 kHz	8.1920 MHz [default]
on=1	on=1	44.0 kHz	11.2640 MHz

S23 - System Config

R1	R2	Sample Rate Cnvtr Data Source
off=0	off=0	Compressed
off=0	on=1	Linear
on=1	off=0	Zeros (gnd)
on=1	on=1	Sine

R3	Trunk Compressed Input Clock
off=0	Normal [default]
on=1	Inverted

R4	Trunk Linear Input Clock
off=0	Normal [default]
on=1	Inverted

R5	R6	2-/4-Channel Select
off=0	off=0	2-Channel
off=0	on=1	reserved
on=1	off=0	4-Channel Master (1st pair)
on=1	on=1	4-Channel Slave (2nd pair)

R7	9003 LEDs & Metering
off=0	Disabled/FP Select [default]
on=1	Enabled/Forced On

R8	Debug (B-Bus)
off=0	diable [default]
on=1	enabled

Audio Out Card

E3-E4-E7-E8	Analog Output Impedance
LO	<5 ohms
600	600 ohms [default]

S81 - AES/EBU

S81-A	S81-B	S81-C	S81-D	S81-E	AES/EBU/SPDIF
off	off	off	off	on	AES/EBU [default]
on	on	off	off	off	SPDIF

S21 - Data Channel

D1	D2	Aux Data # of bits
off=0	off=0	6 (6N/5E/5O)
off=0	on=1	7 (7N/6E/6O)
on=1	off=0	8 (8N/7E/7O) [default]
on=1	on=1	9 (9N/8E/8O)

D3	D4	D5	Aux Data Rate
off=0	off=0	off=0	300
off=0	off=0	on=1	600
off=0	on=1	off=0	1200 [default]
off=0	on=1	on=1	2400
on=1	off=0	off=0	4800
on=1	off=0	on=1	9600 +
on=1	on=1	off=0	19200 +
on=1	on=1	on=1	38400 +

+ MUST use CTS line

D6	Reserved
off=0	Reserved [default]
on=1	Reserved

D7	Test
off=0	Disabled [default]
on=1	Enabled

D8	Debug
off=0	Normal [default]
on=1	Enabled

S22 - Board ID

A2	A3	A4	A5	A6	A7	A8	A9	Board #	Base Addr
on	off	off	off	off	off	off	off	0	0
off	on	off	off	off	off	off	off	1*	4
off	off	on	off	off	off	off	off	2	8
off	off	off	on	off	off	off	off	3	16
off	off	off	off	on	off	off	off	4	32
off	off	off	off	off	on	off	off	5*	64
off	off	off	off	off	off	on	off	6	128
off	off	off	off	off	off	off	on	7	256
off	off	off	off	off	off	off	off	8	512

** not allowed when used with 4-port/6-port mux*

Figure 5.2
Audio Decoder
Switch and Jumper Settings

AES/EBU and SPDIF

Switch S81 configures the digital audio input (Encoder) or output (Decoder) for the AES/EBU “professional” standard (3 wire XLR balanced) or SPDIF “consumer” standard (2 wire unbalanced). The AES/EBU setting is the factory default. The following wiring shown in Figures 5-3 through 5-6 should be followed for the proper level and phasing:

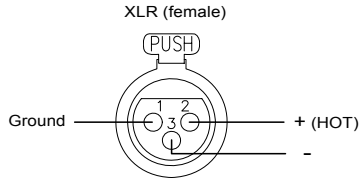


Figure 5.3 - AES/EBU-XLR Encoder Connection

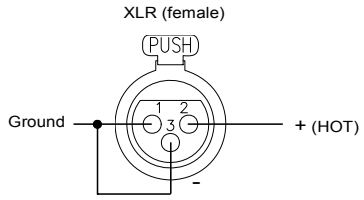


Figure 5.4 - SPDIF-XLR Encoder Connection

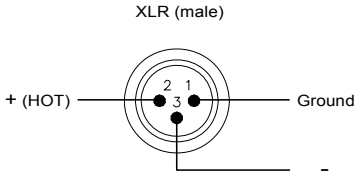


Figure 5.5 - AES/EBU-XLR Decoder Connection

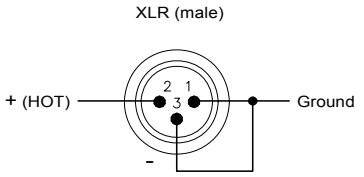


Figure 5.6 - SPDIF-XLR Decoder Connection

5.2.1 Analog Audio Gain and Input Impedance

Encoder (Analog In Card):

Jumpers E2 and E5 set the left and right channel input impedance. HI-Z is default (shown) and the user may set it to 600 ohm for external equipment compatibility.

Jumpers E3 and E6 set the gain for the analog input stage. 0 dB is default (shown) and the user may set the unit for up to 40 dB of additional gain if the external equipment has a low output level.

Decoder (Analog Out Card):

Jumpers E3/E4 and E7/E8 set the left and right channel output impedance. LO-Z is default (shown) and the user may set it to 600 ohm for external equipment compatibility.

5.2.1.1 Analog Input and Output Adjustment

The gain is set at the factory using the ports accessible on the rear panel of the audio boards as follows:

1) On the decoder:

Turn on the internal sine generator. [digital full scale]

Adjust the decoder output level on both channels to +12dBu. [2dB above nominal]

Turn off the internal sine generator.

2) On the encoder

Apply +10dBu sine wave to the encoder inputs.

Monitor the decoder outputs.

Adjust the encoder so that the decoder output levels are +10dBu. Do not change the decoder pots.

In this way, the headroom is always set to 2dB above nominal +10dBu. Since the clip circuitry is approximately 1 dB above nominal & 1 dB below full scale, the clip light is always set correctly.

5.2.2 Data Channel Rate

Switch S21 sets up the data channel parameters for the card. Follow the charts in the figure for details of the settings. Figure 5-7 below details the serial data connection:

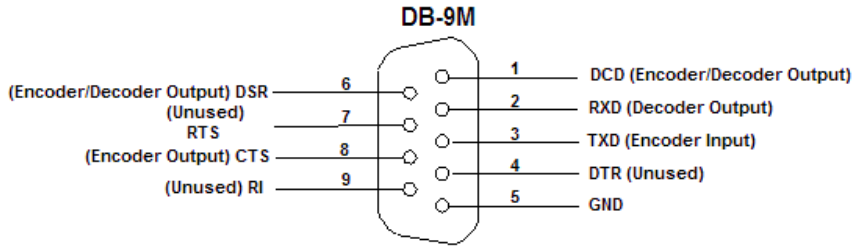


Figure 5.7 - Data Channel Connector- DSUB (9-pin)

Note: CTS must be used for data rates above 4800 baud on the encoder.

5.2.3 Board ID

Switch S22 sets the Board ID number and Base Address. These are not to be changed by the user.

5.2.4 System Configuration

Switches S23, S31, and S52 set the board configuration for operation in the system. These are not to be changed by the user.

5.3 NMS/CPU Module

There are no user adjustments on this card. All calibrations are factory-set, and configuration settings are controlled remotely by software (via the front panel or serial port).

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Section 6: Customer Service

6 Customer Service

6.1 Introduction

Moseley Associates will assist its product users with difficulties. Most problems can be resolved through telephone consultation with our technical service department. When necessary, factory service may be provided. If you are not certain whether factory service of your equipment is covered, please check your product Warranty/Service Agreement.

Do not return any equipment to Moseley without prior consultation.

The solutions to many technical problems can be found in our product manuals; please read them and become familiar with your equipment.

We invite you to visit our Internet web site at **http://www.moseleysb.com/**.

6.2 Technical Consultation

Please have the following information available prior to calling the factory:

Model number and serial number of unit;

Shipment date or date of purchase of an Extended Service Agreement;

Any markings on suspected subassemblies (such as revision level); and

Factory test data, if applicable.

Efficient resolution of your problem will be facilitated by an accurate description of the problem and its precise symptoms. For example, is the problem intermittent or constant? What are the front panel indications? If applicable, what is your operating frequency?

Technical consultation is available at (805) 968-9621 from 8:00 a.m. to 5:00 p.m., Pacific Time, Monday through Friday. During these hours a technical service representative who knows your product should be available. If the representative for your product is busy, your call will be returned as soon as possible. Leave your name, station call letters if applicable, type of equipment, and telephone number(s) where you can be reached in the next few hours.

Please understand that, in trying to keep our service lines open, we may be unable to provide “walk-through” consultation. Instead, our representative will usually suggest the steps to resolve your problem; try these steps and, if your problem remains, do not hesitate to call back.

After-Hours Emergencies

Emergency consultation is available through the same telephone number from 5:00 p.m. to 10:00 p.m. Pacific Time, Monday to Friday, and from 8:00 a.m. to 10:00 p.m. Pacific Time on weekends and holidays. Please do not call during these hours unless you have an emergency with installed equipment. Our representative will not be able to take orders for parts, provide order status information, or assist with installation problems.

6.3 Factory Service

Arrangements for factory service should be made only with a Moseley technical service representative. You will be given a Return Authorization (RA) number. This number will expedite the routing of your equipment directly to the service department. Do not send any equipment to Moseley Associates without an RA number.

When returning equipment for troubleshooting and repair, include a detailed description of the symptoms experienced in the field, as well as any other information that well help us fix the problem and get the equipment back to you as fast as possible. Include your RA number inside the carton.

If you are shipping a complete chassis, all modules should be tied down or secured as they were originally received. On some Moseley Associates equipment, printing on the underside or topside of the chassis will indicate where shipping screws should be installed and secured.

Ship equipment in its original packing, if possible. If you are shipping a subassembly, please pack it generously to survive shipping. Make sure the carton is packed fully and evenly without voids, to prevent shifting. Seal it with appropriate shipping tape or nylon-reinforced tape. Mark the outside of the carton "Electronic Equipment - Fragile" in large red letters. Note the RA number clearly on the carton or on the shipping label, and make sure the name of your company is listed on the shipping label. Insure your shipment appropriately. All equipment must be shipped prepaid.

The survival of your equipment depends on the care you take in shipping it.

Address shipments to:

MOSELEY ASSOCIATES, INC.

Attn: Technical Services Department
111 Castilian Drive
Santa Barbara, CA 93117-3093

Moseley Associates, Inc. will return the equipment prepaid under Warranty and Service Agreement conditions, and either freight collect or billed for equipment not covered by Warranty or a Service Agreement.

6.4 Field Repair

Some Moseley Associates equipment will have stickers covering certain potentiometers, varicaps, screws, and so forth. Please contact Moseley Associates technical service department before breaking these stickers. Breaking a tamperproof sticker may void your warranty.

When working with Moseley's electronic circuits, work on a grounded antistatic surface, wear a ground strap, and use industry-standard ESD control.

Try to isolate a problem to a module or to a specific section of a module. Then compare actual wave shapes and voltage levels in your circuit with any shown on the block and level diagrams or schematics. These will sometimes allow the problem to be traced to a component.

Spare Parts Kits

Spare parts kits are available for all Moseley Associates products. We encourage the purchase of the appropriate kits to allow self-sufficiency with regard to parts. Information about spares kits for your product may be obtained from our sales department or technical service department.

Module Exchange

When it is impossible or impractical to trace a problem to the component level, replacing an entire module or subassembly may be a more expedient way to correct the problem. Replacement modules are normally available at Moseley Associates for immediate shipment. Arrange delivery of a module with our technical services representative. If the shipment is to be held at your local airport with a telephone number to call, please provide an alternate number as well. This can prevent unnecessary delays.

Field Repair Techniques

If an integrated circuit is suspect, carefully remove the original and install the new one, observing polarity. Installing an IC backward may damage not only the component itself, but the surrounding circuitry as well. ICs occasionally exhibit temperature-sensitive characteristics. If a device operates intermittently, or appears to drift, rapidly cooling the component with a cryogenic spray may aid in identifying the problem.

If a soldered component must be replaced, do the following:

- Use a 40W maximum soldering iron with an 1/8-inch maximum tip. Do not use a soldering gun. Excessive heat can damage components and the printed circuit.

Surface mount devices are especially heat sensitive, and require a lower power soldering iron. If you are not experienced with surface mount components, we suggest that you do not learn on critical equipment.

- Remove the solder from the component leads and the printed circuit pads. Solder wicking braid or a vacuum de-solderer is useful for this. Gently loosen the component leads and extract the component from the board.

- Form the leads of the replacement component to fit easily into the circuit board pattern.

- Solder each lead of the component to the bottom side of the board, using a good brand of rosin-core solder. We recommend not using water soluble flux, particularly in RF portions of the circuit. The solder should flow through the hole and form a fillet on both sides. Fillets should be smooth and shiny, but do not overheat the component trying to obtain this result.

- Trim the leads of the replacement component close to the solder on the pad side of the printed circuit board with a pair of diagonal cutters.

- Completely remove all residual flux with a cotton swab moistened with flux cleaner.

- For long term quality, inspect each solder joint – top and bottom – under a magnifier and rework solder joints to meet industry standards. Inspect the adjacent components soldered by the Moseley Associates production line for an example of high reliability soldering.

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Section 7: System Description

7 System Operation

7.1 Audio Encoder

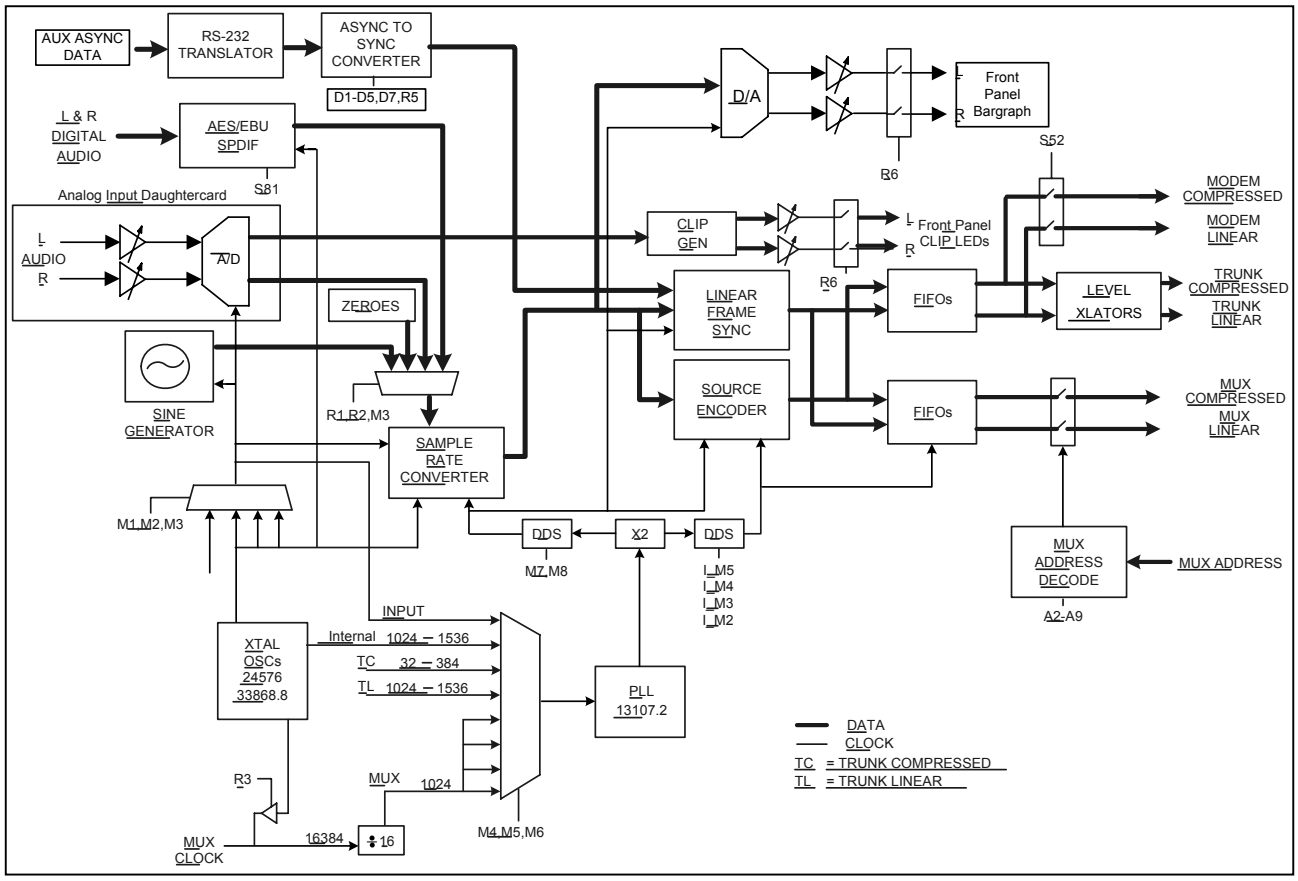

Figure 7.1 - Audio Encoder Block Diagram

The Audio Encoder module directly receives and decodes the AES/EBU digital audio into a digital stereo audio data stream. Optionally, the analog audio inputs can be used

(located on the Analog Input daughtercard), and these inputs are converted to 16 bit digital stereo data. The SRC (sample rate converter) passes the digital audio data stream to a data multiplexer while synchronizing/converting the incoming sample rate (30-50 kHz) to the internal sample rate clock (32, 44.1, 48 kHz selectable). For example, data could be provided by a CD player at 44.1 kHz, while the internal sample rate to be transmitted across the link is at 32 kHz (the default rate).

The digital audio is optionally compressed (using MPEG or ADPCM) in the Audio Encoder module to allow for higher bandwidth efficiency (more audio channels per RF channel) at the expense of aural masking compression disadvantages. However, some users may require the compression algorithm for existing system compatibility.

Sine wave and “zeroes” test signal generators are available on the card (switch selectable) for system testing. The stereo D/A converter transforms the signal back to analog for use in monitoring the signal from the front panel. This conveniently allows for level monitoring of the digital AES/EBU audio inputs on the bar graph.

The digital audio data (linear or compressed) and the auxiliary data channel are subsequently coded into a single data stream. In a 2 channel system, this data stream can be sent to the T1 module directly.

7.1.1 Intelligent Multiplexer

In a 4 channel system, two Audio Encoders provide two data streams to the Intelligent Multiplexer (MUX). The MUX frames and multiplexes the data to form an aggregate data stream for the T1 Link. The MUX can also provide additional data channels for the link, multiplexed into the aggregate data stream.

7.2 Receiver

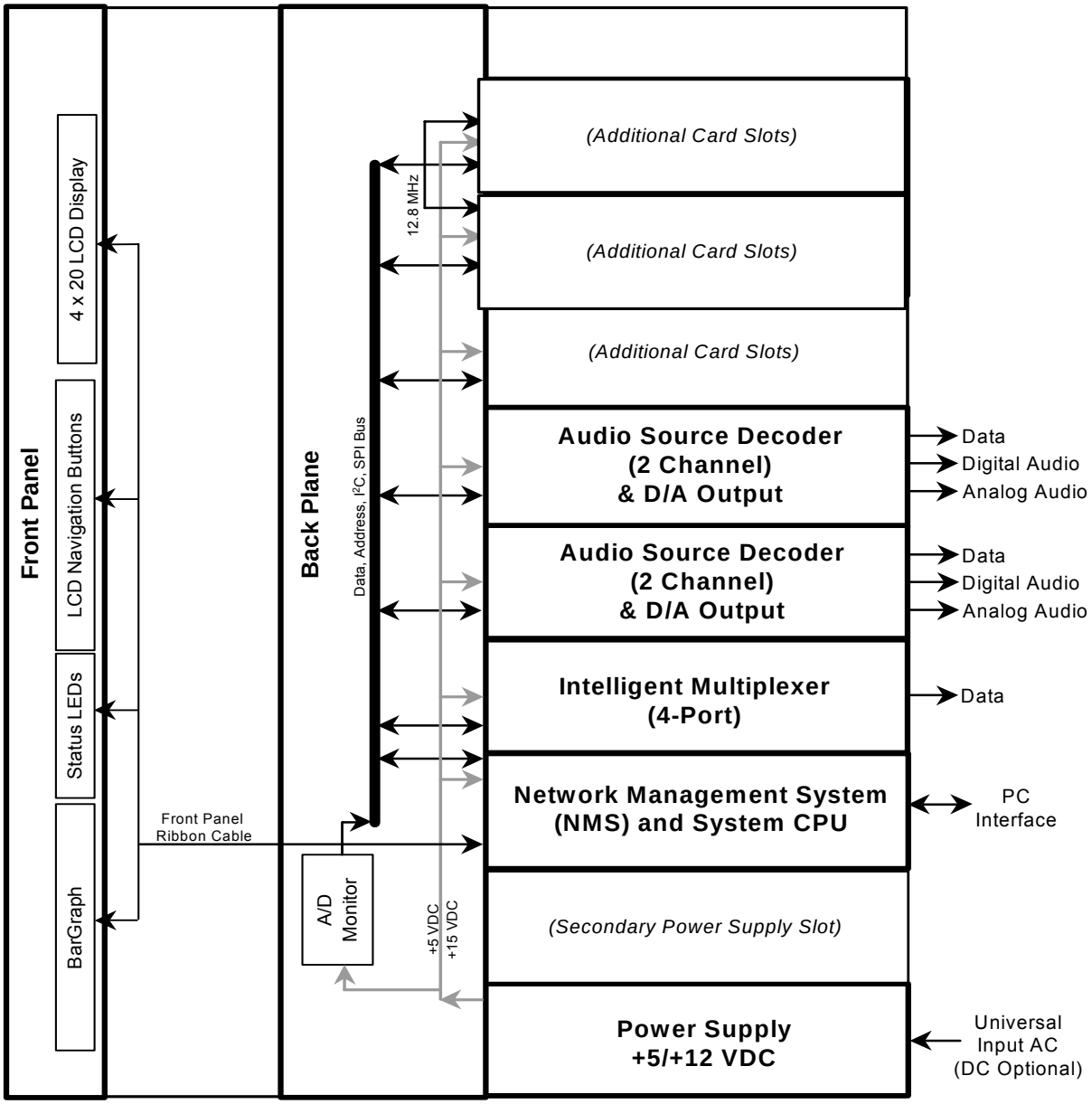

Figure 7.2 -SL9003T1 Receiver System Block Diagram

The NMS/CPU card incorporates microprocessor and FPGA logic to configure and monitor the overall operation of the system via front panel controls, LCD screen menus, status LEDs and the bar graph display. Module settings are loaded into the installed

cards and power-up default settings are stored in non-volatile memory. LCD screen menu software is uploaded into memory, providing field upgrade capability. A Windows-based PC interface is available for connection at the rear panel DATA port.

7.2.1 Intelligent Multiplexer

In a 4 channel system, the MUX de-multiplexes the aggregate data stream, from the QAM Modulator, into its separate components, typically providing two data streams to the two Audio Decoders. The MUX can also de-multiplex any other data that was added to the data stream in the link, directing these to the data channels on the MUX card I/O.

7.2.2 Audio Decoder

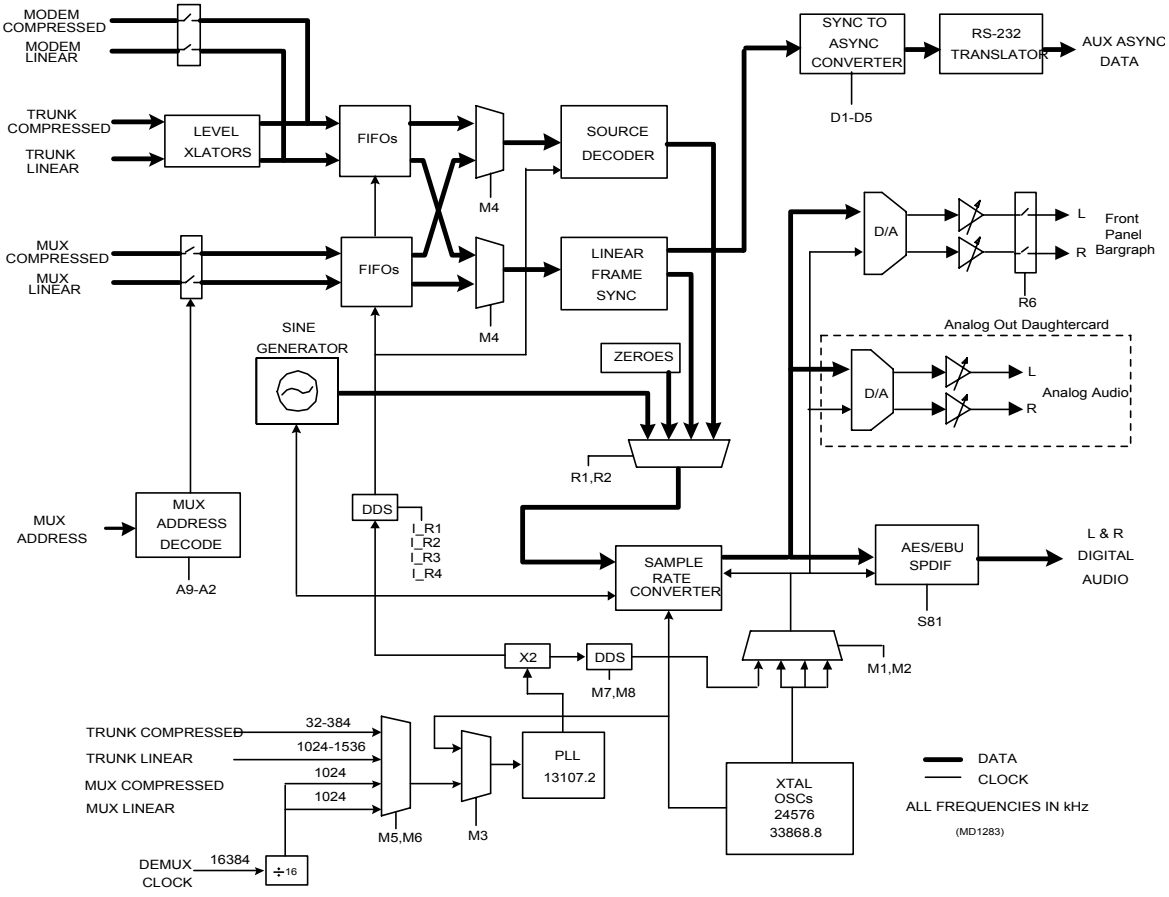

Figure 7.3 - Audio Decoder Block Diagram

The Audio Decoder module accepts the data stream and the recovered clock from the backplane (MUX or T1 card). This data (compressed or linear) is fed to the FIFOs (First In. First Out) buffers. The data is then passed through the FIFOs to an initial data multiplexer. Sine wave and “zeros” test signal generators are available on the card (switch selectable) for system testing.

Compressed: The audio decoder add-on card decodes the compressed data per the appropriate algorithm (ISO/MPEG or ADPCM). This decoded information is then passed on to the Sample Rate Converter (SRC) via a second data multiplexer.

Linear: Using embedded coding, the linear inputs received are analyzed and then synchronized for transmission to the Sample Rate Converter via a second data multiplexer.

The second data multiplexer chip selects which of the three inputs (Compressed Audio Decoder, Linear Frame Sync, or Internal Sine Generator) will be sent to the SRC. As an option, zeros can also be sent through the multiplexer chip to test the noise floor.

The SRC receives the data stream via the second data multiplexer. This information is compared to the clock rate determined at switches M7 and M8 for conversion to the final output decoding segment.

From the SRC, the data is bussed to the AES/EBU encoder for left and right digital audio output, to the 16 bit D/A converter (located on the Analog Out daughtercard) for the main analog channel outputs, and to a 12 bit D/A converter that provides an analog output to the bargraph monitor on the front panel.

The clock source provides the ability to synchronize the various components of the system with a single device, such as the on-board crystal oscillator, the internal multiplexer clock, the bus, the AES/EBU input, the trunk, etc. The user can determine whether the card will generate its own clock or whether it will use a different source’s clock as reference. This information is then sent to the SRC for conversion of the incoming data to the rate of desired output.

Appendices

Appendix A: Audio Considerations

A.1 Units of Audio Measurement

A.1.1 Why dBm?

In the early years of broadcasting and professional audio, audio circuits with matched terminations and maximum power transfer were the common case in studios and for audio transmission lines between facilities. Console and line amplifier output impedances, implemented with vacuum tube and transformer technology, were typically 600 Ohms. Equipment input impedances, again usually transformer-matched, were also typically 600 Ohms. Maximum power transfer takes place when the source and load impedances are matched. For such systems, the dBm unit (dB relative to one milliwatt) was appropriate since it is a power unit.

A.1.2 Audio Meters

However, actual power-measuring instruments are extremely rare in audio. Audio meters and distortions analyzers are voltmeters, measuring voltage across their input terminals. They do not know the power level, current value, nor source impedance across which they are measuring, Since the audio industry had “grown up” with 600 Ohm power-transfer systems in common use, audio test instrument manufacturers typically calibrated their voltmeters for this situation. Most audio test instruments and systems manufactured before approximately 1985 used only Volts and the dBm unit on their meter scales and switch labels. The dBm unit was calibrated with the assumption that the meter would always be connected across a 600 Ohm circuit when measuring dBm. Since the voltage across a 600 Ohm resistor is 0.7746 Volts when one milliwatt is being dissipated in that resistor, the meters were actually calibrated for a zero “dBm” indication with 0.7746 Volts applied. But, they were not measuring power; change the circuit impedance, and the meter is incorrect.

A.1.3 Voltage-Based Systems

Modern audio equipment normally has output impedances much lower than input impedances. Output impedance values from zero up to 50 Ohms are typical, and input impedances of 10 kilohms are typical. Such equipment, connected together, transfers negligible power due to the large impedance mismatch. However, nearly all the source voltage is transferred. As noted earlier, a 10 kilohm load reduces the open-circuit voltage from a 50 Ohm source by only 0.5%, or 0.05 dB. Thus, modern systems typically operate on a voltage transfer basis and the dBm, as a power unit, is not appropriate. A proper unit for voltage-based systems is the dBu (dB relative to 0.7746 Volts). The dBu is a voltage unit and requires no assumptions about current, power, or impedance. Those older audio meters calibrated in “dBm” are really dBu meters.

A.1.4 Old Habits Die Hard

Unfortunately, the “dBm” terminology has hung on long after its use is generally appropriate. Even some of the most competent manufactures of high-technology digital and analog professional audio equipment still use the dBm unit in their setup instructions. Users are told to apply an input signal of “+4 dBm” and then to adjust trim pots for an exact 0 VU indication on a 24-track digital audio tape recorder, for example. Yet, the line input impedances of that tape recorder are 10 kilohms. What the manufacturer clearly wants is a +4 dBu input level (1.22 Volts). If we truly applied +4 dBm to that 10,000 Ohm input, the resulting 5.0 Volts would probably not even be within the trim pot adjustment range for 0 VU. So, a good general rule when working with modern audio equipment unless you know it to be terminated in 600 Ohms is to read the manufacturer’s “dBm” as “dBu”.

(Reprinted from the ATS-1 User’s Manual, published in July 1994,

with permission from Audio Precision, Inc., located in Beaverton, Oregon)

Appendix B: Glossary of Terms

A/D, ADC	Analog-to-Digital, Analog-to-Digital Converter
ADPCM	Adaptive Differential Pulse Code Modulation
AES/EBU	Audio Engineering Society/European Broadcast Union
AGC	Auto Gain Control
ATM	Asynchronous Termination Module
BER	Bit Error Rate
CMRR	Common Mode Rejection Ratio
Codec	Coder-Decoder
CPFSK	Continuous-Phase Frequency Shift Keying
CSU	Channel Service Unit
D/A, DAC	Digital-to-Analog, Digital-to-Analog Converter
dB	Decibel
dBc	Decibel relative to carrier
dBm	Decibel relative to 1 mW
dBu	Decibel relative to .775 Vrms
DCE	Data Circuit-Terminating Equipment
DSP	Digital Signal Processing
DSTL	Digital Studio-Transmitter Link
DTE	Data Terminal Equipment
DVM	Digital Voltmeter
EMI	Electromagnetic Interference
ESD	Electrostatic Discharge/Electrostatic Damage
FET	Field effect transistor

FMO	Frequency Modulation Oscillator
FPGA	Field Programmable Gate Array
FSK	Frequency Shift Keying
FT1	Fractional T1
IC	Integrated circuit
IEC	International Electrotechnical Commission
IF	Intermediate frequency
IMD	Intermodulation Distortion
ISDN	Integrated-Services Digital Network
Kbps	Kilobits per second
kHz	Kilohertz
LED	Light-emitting diode
LO, LO1	Local oscillator, first local oscillator
LSB	Least significant bit
MAI	Moseley Associates, Inc.
Mbps	Megabits per second
Modem	Modulator-demodulator
ms	Millisecond
MSB	Most significant bit
MUX	Multiplex, Multiplexer
μs	Microsecond
μV	Microvolts
NC	Normally closed
NMS	Network Management System

NO	Normally open
PCB	Printed circuit board
PCM	Pulse Code Modulation
PGM	Program
PLL	Phase-Locked Loop
QAM	Quadrature Amplitude Modulation
R	Transmission Rate
RF	Radio Frequency
RPTR	Repeater
RSL	Received Signal Level (in dBm)
RSSI	Received Signal Strength Indicator/Indication
RX	Receiver
SCA	Subsidiary Communications Authorization
SCADA	Security Control and Data Acquisition
SNR	Signal-to-Noise Ratio
SRD	Step Recovery Diode
STL	Studio-Transmitter Link
TDM	Time Division Multiplexing
THD	Total harmonic distortion
TP	Test Point
TTL	Transistor-transistor logic
TX	Transmitter
Vrms	Volts root-mean-square
Vp	Volts peak

Vp-p	Volts peak-to-peak
VRMS	Volts, root-mean-square
VSWR	Voltage standing-wave ratio
ZIN	Input Impedance
ZOUT	Output Impedance

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Addendum: 6-Port Mux and Optional Cards