Telecast Fiber Solutions

Adder II User Guide

M4046-9900-102

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grass valley
A **BELDEN** BRAND

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Adder II System Overview

This chapter provides an overview of the Adder II system by presenting the system components and identifying the main component items.

About the Adder II system

The Adder II is a high-performance link for transporting analog and digital audio, two and four wire intercoms, and various data formats using lightweight fiber optic cable. As a modular system, the Adder II is highly configurable and scalable for use as a point-to-point signal transport.

The Adder II features include:

- Up to 64 bi-directional channels of audio
- Four intercom module slots providing up to eight intercom channels
- Data and GPI capabilities
- Remote audio gain control
- Phantom mic power
- Industry leading latency and signal-to-noise specifications

An Adder II system is constructed from single RU frames that interface to a common backplane, allowing the system to be sized to various requirements. Analog and AES TX and RX frames can be combined with Intercom and Data frames to create an audio system that is perfectly suited to your particular application. Whether you need 32 x 32 analog or 32 analog to 16 AES signals in just one direction, with or without intercoms and data, Adder II gives you maximum flexibility.

Analog modules come in rows of 16 while AES modules are in rows of 8 and 16. In this way, an AES TX can interface to an analog RX, thus bypassing the need for expensive D-A and A-D converters. With ultra-low latency, delay is never an issue.

Analog TX modules feature preamps that allow 0, 10, 20, 30, 40, and 50 dB of gain adjustments plus 12/48V phantom power via a convenient faceplate controls and LED display. The Adder II includes remote control of these functions. With an optical budget exceeding 25 dB, the Adder II can operate across the theater or across town.

Operation can be on one or two fibers or two standard coaxial cables. It is dual-wavelength and can be easily converted to WDM single-fiber operation. GPI's and data channels are on DB-9 connectors with RS-232, RS-422, and RS-485 ports. A built-in signal analyzer features an LED bar graph and signal generator with three different tone frequencies and three level choices in both the analog and digital domains.

The Adder II ships pre-configured and requires minimal onsite configuration.

Adder II Components

Base Unit

Each end of an Adder system consists of at least two parts: One base frame with control unit and one or more input/output (I/O) modules.

Fig. 1-1: Adder II *Base Control Unit Front Panel*

Base units are common to all Adder II's no matter how large or small. This is the optical I/O and the first building block of all systems. The base frame also has the on/off switch for the system, the local gain controller, the data I/O's, and to thetone generator/analyzer.

Input/Output Modules

Each Adder II can be configured with one to nine input/output modules depending upon the frame size selected. All I/O modules are one RU high.

Fig. 1-2: Input and Output modules

The input /output modules, also referred to as "banks", can be any of a range of input or output modules including analog or digital audio and intercom.

- For analog signals, banks are 16 wide.
- For AES signals, banks are 8 wide (16 channels).
- Otherwise, the base is always bank 0.

The next row up is Bank 1, etc. as long as all signaling is analog. If intercom modules are installed, this module would always be the top-most module.

Systems are delivered pre-configured and each frame will be a mirror image of the other, so that if Bank 2 on one end is a TX module, then Bank 2 on the other end will be an RX

module. It is possible to do analog to digital conversion between frames, so one end can be analog and the other end can be digital/AES.

Each Adder II can accommodate one or two 12 VDC power inputs @ 3 Amps via 4-pin XLR or terminal strip. Grass Valley's ADAP-AC-04 is an acceptable external DC power supply.

Depending on version, there may be a third 12-18VDC input for intercoms.

If you require re-configuration of your Adder II system, it should be returned to Grass Valley. Call our support department (see Contact Us on page 37) and request an RMA (Return Materials Authorization) number.

When removing the Adder II from the shipping boxes, check everything over for any damage, including missing optical caps, bent metal or pins, and case scratches. Be assured that the utmost care was taken in building and packing your Adder II, so report any damage to the carrier and to Grass Valley.

Front Panel

I/O Module, Bank 4
When Intercom module is installed it is always in the top position

I/O Module Bank 3

I/O Module Bank 2

I/O Module Bank 1

Base System Control Unit (always lowest module)
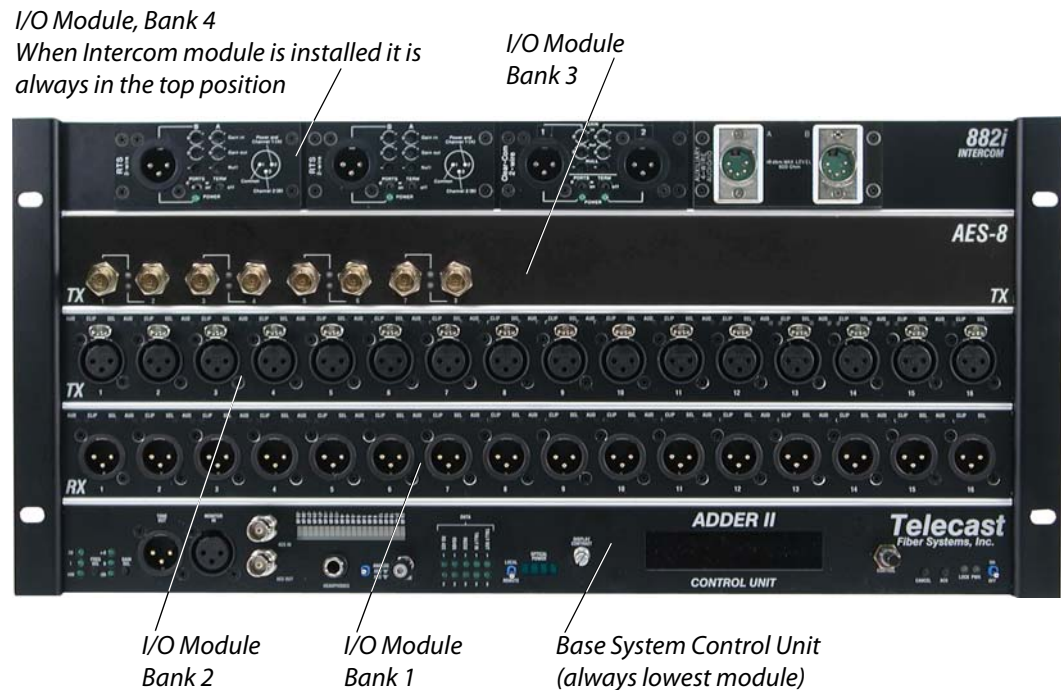
Fig. 1-3: Adder II 5RU System Front Panel

Rear Panel

I/O Module, Bank 2 and up
Blank rears

Intercom (wet) Power   Redundant DC Power   Speaker   Redundant fiber System interconnection   Coax system interconnection

Base System Control Unit (always lowest module)   Remote Bus (not supported)   Speaker on/off switch   Audio level standard

AES Sync In   GPIO and Serial Data Ports
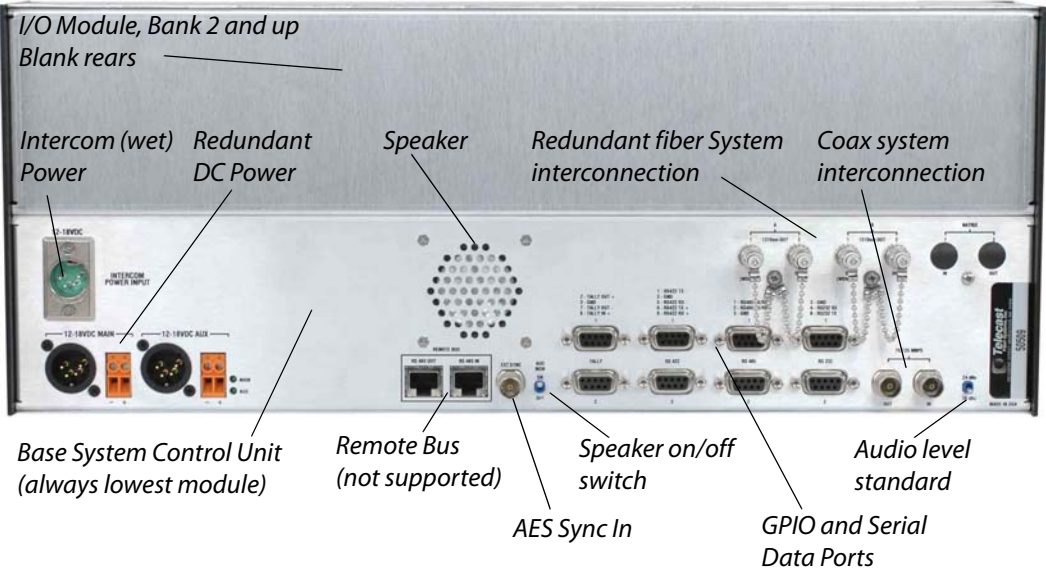
Fig. 1-4: Adder II *4RU System Rear Panel*

Laser Safety

WARNING: Class 1 Laser. Do not stare into a connector port or fiber.

Laser Radiation

The unit is a CDRH Class 1 laser device. Although this means it is Eye Safe, you must avoid looking directly at, or staring into, the laser beam located on an ST connector or on the end of a fiber.

Infrared radiation is produced at the fiber connection port on the front of the unit and at the end of unterminated optical fibers that are attached to this port. Avoid any direct exposure to the light that comes from these sources.

Do not enable the laser when there is no fiber attached to the fiber connection port.

Do not attempt any type of service to this instrument other than what is instructed in this manual. Refer any servicing needs to Grass Valley, a Belden Brand (see Contact Us on page 37).

FCC Part A Manual Notice

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 must correct the interference at their own expense.

CE Approved

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate corrective measures.

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Setting Up an Adder II System

This chapter provides an overview of the Adder II components and features and explains how to set them up.

Installing and Configuring the Adder II System

To install and configure the Adder II system, follow these steps

1 Connect the power cables (see Power Requirements on page 9).

2 Connect the fiber and coaxial cables (see Connections on page 10).

3 Configure the data transport protocols (see Data Transport on page 13).

4 Configure the audio levels (see +18/+24 Audio Level Reference Settings on page 14).

5 Configure the Signal Generator (see Analog TR Modules on page 16).

6 Configure the Analog TR, TX, and RX modules (see Analog TX and RX Modules on page 16).

7 Configure the Gain Control and Analog audio modules (see Local and Remote Gain Control of Analog Audio Modules on page 18).

8 Configure the AES 8 TX and RX modules (see AES 8 TX and RX Modules on page 20).

9 Connect the Intercom modules (see Intercom Modules on page 21).

10 Interface with Legacy systems (see Legacy Systems on page 26).

11 Wire the Intercom cables (see IntercomCable Wiring on page 28).

Power Requirements

Adder II Systems are largely "Plug and Play", but there are several steps that must be followed to ensure the reliability of your system. Providing reliable DC power and having properly installed fiber optic cables are critical in maintaining reliable operation.

Any power supply used with your Adder II must provide a minimum of 3 amperes, continuous, at 12 to 18 VDC. Power input is either through two 4-pin XLR-M connectors or two terminal strips located on the left side of the rear panel that provide for full power redundancy; see the table below for pinout and Figure 2-1 for location. Be sure that AC outlets are within reach of their six-foot power cords.
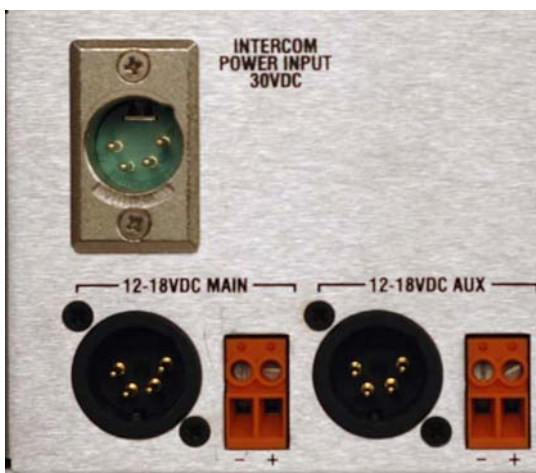
Fig. 2-1: Power Input Location

Pin	Description
Pin 1	Ground
Pin 2	No connection
Pin 3	No connection
Pin 4	+ VDC

Grass Valley's ADAP-AC-04 meets the power requirements for Adder II, but any other suitable DC supply may be used. Note that a fully loaded 125 Mb/sec system (64 bi-directional channels) can draw up to 5 Amps.

Once power is applied to the rear panel, the front-right mounted switch on the Base unit is used to "power-on" the system.

- A Green LED near the input XLR's indicates the presence of DC power.
- ARed LED next to the power switch on the front panel indicates that DC is present.
- A Green LED indicates that power is On.

Frames equipped with an 882i intercom bank will require it's own 12-18 VDC power connection to the INTERCOM POWER INPUT 30VDC above the MAIN input. The same wiring conventions apply.

Connections

Fiber Connections

WARNING:
Never look directly into the unit of a connected optical fiber while any component of the system is operating. Eye damage is possible.

Use the onboard optical power meter as a means of testing the optical signal at both ends of your optical link.

An infrared laser diode that is coupled to the fiber generates the optical output from each TX. User connections are made at bulkhead ST type connector s on the rear panel (see Figure 2-2). You can use either single mode or multimode fiber, but take care to never mix types of fiber in a given run. Once you employ WDMs into the system, their type will dictate the type of fiber to use.

The RX inputs use an InGaAs pin diode and amplifier to convert the optical signal back into an electrical signal.

1310 NM Fiber I/O

1550 NM Fiber I/O

Coaxial I/O
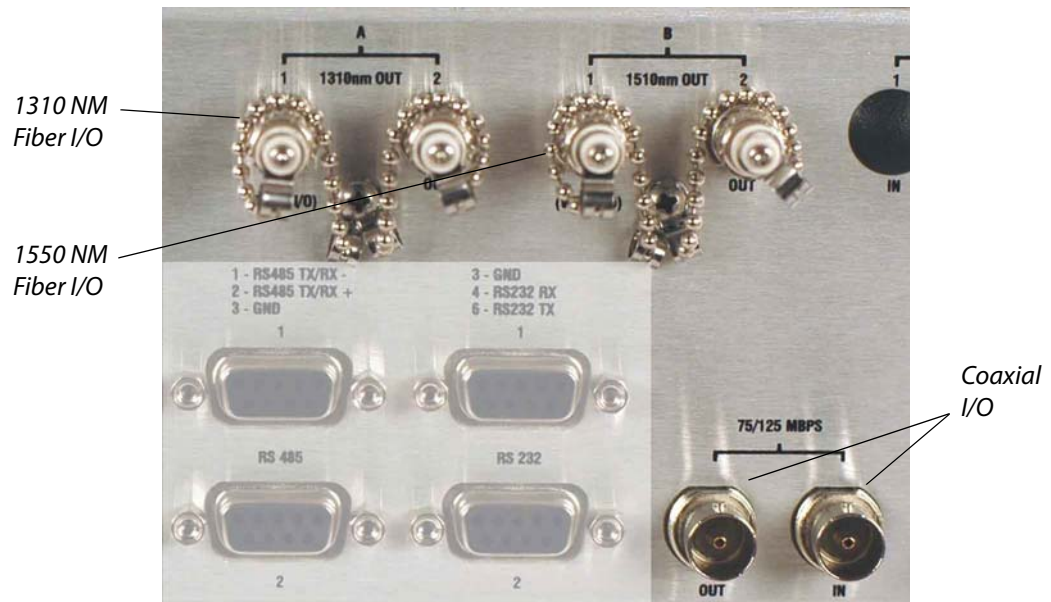
Fig. 2-2: Fiber and Coax I/O Locations, Rear Panel

There are several ways to configure fiber in your Adder II systems:

- **1310 only**: two fibers connect the IN's of each to the OUT's of the other in the 1310nm optical window.
- **1550 only**: two fibers connect the IN's of each to the OUT's of the other in the 1550nm optical window.
- **1310 in one direction and 1550 in the other**: requires only one fiber per link but requires the addition of either an internal or an external WDM.

In either scenario, you can make two links and the Adder II will automatically switch links should one fail. This solution offers complete and automatic optical redundancy (see Figure 1-1).

Once you choose your method of connection, inspect the fiber ends and clean them with Kim-Wipes that have been wet with pure isopropyl alcohol. Fingerprints or other dirt on the optical connector end surfaces will reduce the received optical signal level.

Note that, unlike previous Adder systems, the fiber has priority in the Adder II. This means that the system will always look for a link on the fiber ports first and then on the coaxial ports. But also note that the coax path can be used as a redundant path.

Verifying Optical Link

Once both ends are powered up and your fiber connections are made, it becomes a simple matter to verify how you are connected and the status of your optical link.

In the center of each Base faceplate there is a 4-Segment display labeled **OPTICAL POWER**. The actual location is indicated in Figure 2-3.

Optical Power Display

LINK LED

Fig. 2-3: Optical Power Display and LINK LED Location, Front panel

- With the switch to the **REMOTE** position, the display will indicate the optical power at the other end of the link if the link is good. Otherwise it will display N/A as shown in Figure 2-1.

- With the switch in the **LOCAL** position, the display will indicate both the INPUT that the frame is linked to and the received optical power in dBm's. The second two photos, in Figure 2-4, show that the box is looking at both inputs A and B, but that there is no optical power present. If the link is good, a value for the optical power would be indicated. An optical power reading between -5 and -22 dBm will be optimal.
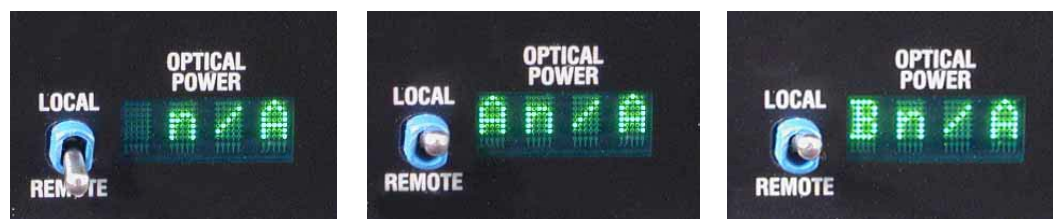
Fig. 2-4: Optical Power Display – various conditions

In addition to the optical power readings, a Green **LOCK** LED on the right side of the Base faceplate (next to the power switch) indicates that the frame is properly linked. A Red LED indicates no link/lock (see Figure 2-2).

Fig. 2-5: Link LOCK Status LEDs

If the switch is on the REMOTE position and the frame on the other side of the link is not locked, the display will indicate **NoLk**.

Coaxial Connections

Figure 2-2 above shows the position of the COAXIAL I/O (labeled 75/125 MBPS) on the rear panel of the Base. As an alternative to using fiber, the Adder II system can support full operation on two coaxial cables of up to 300m (1000 ft) in length.

When not linked, the system looks for an active link on the fiber and COAX ports. In this way (and unlike previous Adder versions), the coax canserve as a redundant path in conjunction with one or both of the optical paths.

Connection is simply a 75 Ohm coaxial cable from the OUT on each frame to the IN on the other.

The COAX ports are also used (the Adder II must in 75 Mbps mode) when paired with bi-directional DiamondBack II's or DiamondBack 4x4's. See Legacy Systems on page 26 for more information.

Other Display messages

A fiber or coax break (depending on configuration) or loss of signal from one end of the link to the other will result in the message **Communication Lost**.

The message **Illegal configuration or loopback** will appear if you pair two chassis that have a TX module in one chassis for which there is no corresponding RX module in the other.This message will also appear if you loop back the fiber or coax so that the chassis is talking to itself. The message goes away as soon as you press any button.

Other Base Features

Data Transport

The Adder II Base units have built-in data support for:

- 2 Tally (GPI)
- 2 RS-422
- 2 RS-485
- 2 RS-232
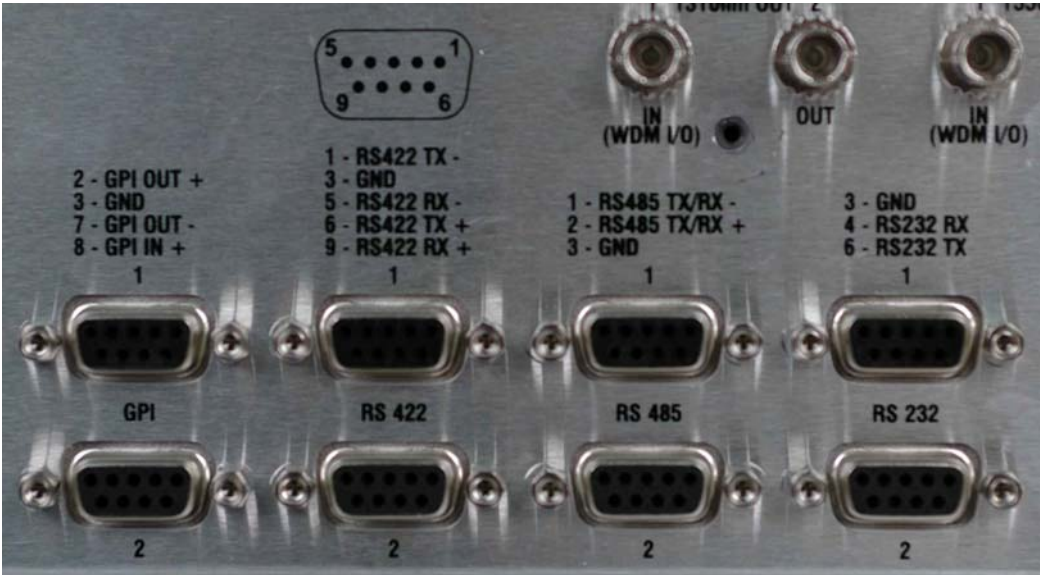
Fig. 2-6: Data Connectors on Base Rear Panel

The pin-outs for the DB-9 connectors are described on the rear panel above the connectors and in Table 2-1(see Figure 2-7 for position). Note that these pinouts are non-standard,so you will require custom cables.

Fig. 2-7: Data LEDs

Front panel LED indicators will flash with data traffic or stay constant Green in the case of a closed (shorted) Tally/GPI.

The Adder II accepts and multiplexes up to two RS-232, two RS-422, and two RS-485 digital data signals and two remote relay closures. The other side of the link then receives the

aggregate data, restores the digital signals and provides switch closures. The number of data channels is fixed and independent of the number of audio channels in the assembly. Both data input and output are accomplished on the same connector.

Digital signal connections are made via 9-pin D connectors; see Figure 2-6. The connection specifications are listed in Table 2-1; note that these pinots do not conform to standard serial pinouts and custom cable wiring will typically be required when connecting to third-party devices. Several interconnection cables are described in IntercomCable Wiring on page 28. A 110 Ohm terminating resistor placed across the balanced inputs may be needed if input cable lengths are in excess of six feet.

PIN	Conns 1 & 2	Conns 3 & 4	Conns 5 & 6	Conns 7 & 8
1		422 TX (-)	485 TX/RX (-)	
2	GPI Out (+)		485 TX/RX (+)	
3	GND	GND	GND	GND
4				232 RX
5		422 RX (-)		
6		422 TX (+)		232 TX
7	GPI Out (-)			
8	GPI In (+)			
9		422 RX (+)		

Table 2-1: Data pin-outs

Contact closure input is activated by pin 8 on contact to ground or to a TTL logic 0 signal level. Contact closure output is established by an isolated, normally open, dry contact built onto the Main PC Board. The eight digital I/O connectors are AMP 747905-2, D-sub female or equivalent.

Additional data ports can be added in groups of 8 with A2-DATA-8 I/O strips.

+18/+24 Audio Level Reference Settings

The rear-panel +18/+24 switch toggles the Input analog audio encoder that can be set at either 18db or 24db. This will determine the level where analog input audio will clip. It is not necessary that both ends of the link be set the same.

Fig. 2-8: +18/24 Switch Location

Signal Generator/Analyzer

The integrated audio signal generator/analyzer is a convenient way to confirm signal presence for both analog and digital (AES) audio signals.

Tone for analog signals is accessed via the XLR-Male connector **TONE OUT** using standard XLR audio cable. Three different frequencies (20Hz, 400HZ and 1k Hz) are available at three different audio levels (-20, 0 and +8 db) to allow easy channel verification/identification. Selection is via the small buttons on the lower right side of the base unit (see Figure 2-10). For digital signals, tone (Line Level @ 1Khz) is available on the **AES OUT** BNC.

A built-in speaker is accessed via XLR-Female connector **MONITOR IN** (for analog signals) using standard XLR audio cable. Digital signals are monitored via the **AES IN BNC**. The speaker is directly associated with the audio level bar graph that will indicate audio levels from -33 to +24 db. Speaker volume is controlled via the **VOLUME** knob.

Fig. 2-9: Analog/Digital Signal Generator/Analyzer

In order to monitor analog and AES signals properly, payattention to the switch to the left of the **VOLUME** knob.

Fig. 2-10: AUD MON On/Off Switch

When monitoring only analog signals, the switch can remain in the top ANALOG position. For AES signals, A refers to the left component and B to the right component of a given AES signal. Be sure you are monitoring the correct "side" of your digital signals.

Use of the headphone jack (1/4" standard) automatically disables the external speaker. There is also a switch on the rear of the frame for disabling the speaker.

Analog TX and RX Modules

The modules in your system are factory-configured for your specific requirements. It is not recommended to try to change the configuration.

Analog audio I/O is via 3-pin XLR connectors with industry standard wire locations (see table below). Analog TX and RX modules are in groups of 16 channels.

PIN	SIGNAL
1	Ground
2	Balanced I/O (+)
3	Balanced I/O (-)

The XLR connectors are located on the front panel of each module.

- On the input modules, XLR connectors are female Neutrik type NC3FPR-H.
- On the output modules, XLR connectors are male Neutrik type NC3MG-H (refer to Figure 2-7).

Input (female)   Output (male)
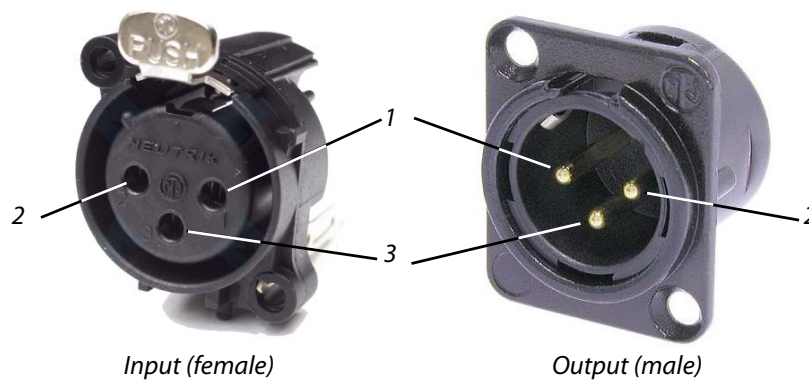
Fig. 2-11: XLR Connectors on TX and RX Modules

Analog TR Modules

Adder II Analog TR modules have eight line level inputs and eight line level outputs as on the same single module as shown in Figure 2-12.

Line Level Inputs and Outputs

Fig. 2-12: Analog TR Module

There are no gain pr phantom adjustments for the 8x8 module. LEDs show **AUD** Signal presence and **CLIP** only.

Analog TX Modules

Adder II Analog TX modules are 16 inputs wide as shown in Figure 2-13 .

Fig. 2-13: Analog TX Module and Analog TX LED indications

- **AUD**: blinks Green with audio presence
- **CLIP**: glows Red when audio levels are clipping
- **SEL**: glows Blue to show that the channel is selected for adjustment

Each input accepts a mono audio signal on a male XLR. Input levels can be mic or line level and gains as well as phantom mic power can be set from the bottom base unit.

Input parameters can be set for individual channels or entire modules/banks.

Analog RX Modules

The analog RX modules feature 16 XLR-M outputs. The module faceplate is shown in Figure 2-14.

Fig. 2-14: Analog RX Module and Analog RX LED indications

Each output has 3 associated LEDs as shown in Figure 2-14 .

- **AUD**: blinks Green with audio presence
- **CLIP**: glows Red when audio levels are clipping
- **SEL**: glows Blue to show that the channel is selected for adjustment

Each output provides a mono audio signal on a male XLR. Levels can be set at either side of the link.

Local and Remote Gain Control of Analog Audio Modules

Analog gains are adjusted via a knob and two buttons on the Base Unit. The following selection describes procedures for making input adjustments. Control location is indicated in Figure 2-15. Note that adjustments for an audio path can be set from either end of the link.

Fig. 2-15: Local gain controller/selector

The process starts by pressing the ACK button and then dialing the control knob indicate the proper "Bank" or module. All modules except the base and 882i can be addressed. An attempt to address an audio path that does not contain an analog TX will result in the message gain "[FIXED]". An example of this might be an AES TX connected to an analog RX.

Remember that the Base Control Unit occupies Bank 0, so that the first module up is Bank 1, the second is Bank 2, etc. Once you have found the analog module that requires adjustment, press the **ACK** button to acknowledge that you are in position to select channels to modify.

You may press the **CANCEL** button at any time to start the process over from the beginning.

Once you have selected the proper Bank, you can now opt to select one channel or make a universal change to all of the channels in that Bank.

Selecting Channels to Modify

By using the knob to scroll to Chan:ALL, you can change gain and phantom voltage for all 16 inputs in one step. Figure 2-13 shows that the **SEL** LEDs for all 16 inputs are illuminated and blinking. LED's above the channels will remain illuminated to show that a change has been made from unity gain or no phantom voltage.
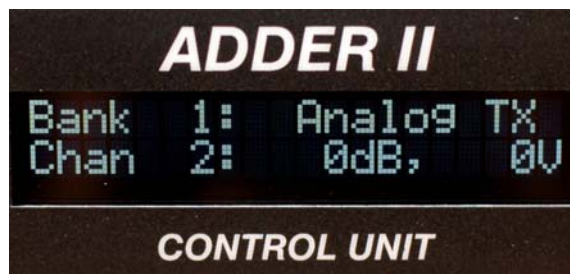
Fig. 2-16: Starting point

If you wish to only change a parameter for a single input, rotate the knob until the desired channel is indicated in the display **AND** the proper **SEL** LED is flashing over the input/inputs.

Fig. 2-17: All Channels selected

Once you are satisfied with your selection, press the **ACK** button. The **SEL** LED will remain blinking as long as you are working on that particular input/inputs and will remain on to show that some parameter for that channel has been changed. Figure 2-18 shows that we will be working on Channel 2.

Fig. 2-18: Channel 2 selected

Setting Gains

Once you have selected a channel (or channels) to work on, you can adjust gain and phantom power settings. Figure 2-14 shows the display when adjusting gain for channel 2.

Fig. 2-19: Setting Gain

Once the ACK button is pressed to select an input or inputs, **GAIN** will flash in the display. You may now use the control knob to toggle through six gain options; 0db, +10db, +20db, +30db, +40db and +50db. Once the desired gain level is displayed, press the ACK button to set. Figure 2-14 shows that the gain was set to +50db.

Setting Phantom Voltage

Once the gain change is acknowledged, Volts will flash. Use the control knob to toggle between the three phantom voltage options: 0V, 12V, and 48V. Once the desired voltage level is displayed, press the ACK button to set. Figure 2-14 shows that we are setting the phantom power to 48V.
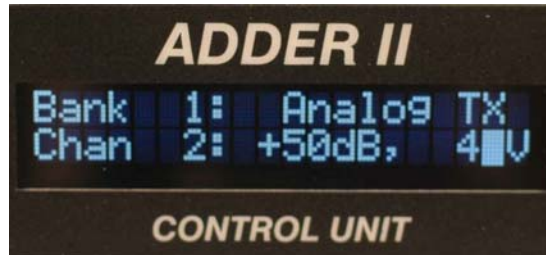
Fig. 2-20: Setting Phantom Voltage

Note that there will be a short delay while the inputs are updated with the new settings.

The Adder II system will remember any gain or phantom settings between power ups.

If a frame is linked to a different frame, the settings from the analog TX modules will be restored on both ends of the system. The message **Synchronizing With Remote Unit** will appear as settings are restored during start-up or following a power or fiber failure. And loss of link will result in the display of **Communication Failure**.

The Adder II will remember all settings following a power failure.

AES 8 TX and RX Modules

The TX and RX AES 8-channel modules feature BNC connectors for input and output. A representative module is shown in Figure 2-21 .
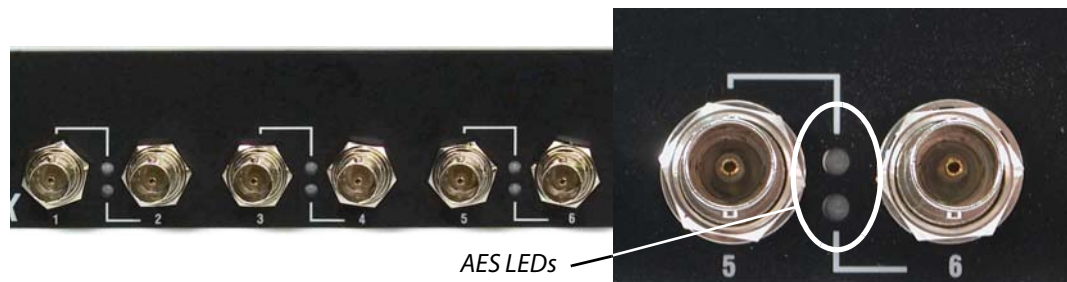
AES LEDs

Fig. 2-21: AES-8 TX and AES LEDs

Each channel has a single green LED that indicates signal presence. All levels and other signal parameters are as defined by the AES-3 specification (user bits are NOT maintained). Modules come in 8 TX and 8 RX.

External AES Sync

Input AES audio is synchronized by local internal clock or can be synchronized to an external source connected to the BNC connector located on the rear panel. Any AES digital signal with or without audio (null word okay) can be used for this purpose.

Intercom Modules

The 882i Intercom module can house up to 4 ADDR-AUX modules:

- Balanced 4-wire
- Clear-Com 2-wire
- RTS/Telex compatible 2-wire

Fig. 2-22: 882i Intercom Modules

Intercoms can be of any type in any location in the assembly. However, for proper operation of the intercom channels, the same placement order must be followed at the other side of the system. A 2-wire system can be interconnected with a 4-wire system at another Adder II, but not all intercom functions will work (for example, calling).

4-wire (balanced)

4-wire Auxiliary (balanced) intercoms use an individual 5-pin XLR on each of the two channels in each module (see Figure 2-21). XLR pin functions are given in the following table. Intercom Module Gain is 0 dB.

PIN	FUNCTION	IMPEDENCE	SIGNALS
1	Ground		
2	Input (+)	600 Ohm input	Line: +8 dBm
3	Input (-)	600 Ohm input	Mic: -32 dBm
4	Out (+)	>=600 Ohm load	+8 dBm
5	Out (-)	>=600 Ohm load	+8 dBm
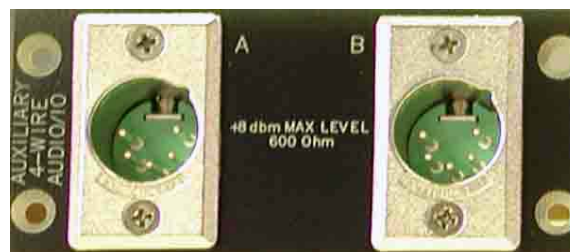
Fig. 2-23: Intercom Module: 4-Wire Auxiliary (balanced)

Clear-Com

Clear-Com intercom modules have a 3-pin XLR connector for each of the A and B channels. This Grass Valley module fully supports the Clear-Com signaling protocol and signal levels.

Fig. 2-24: Clear Com module

The Clear-Com Intercom Connections are listed in the table below.

Pin	Description
Pin 1	Ground
Pin 2	+VDC Power
Pin 3	Power

- The units null by plugging in a 1/8-inch (3.5mm) stereo headset (not a TS-1) into the connector located in the center of the unit and then adjusting the top set of pots for optimum null.
- The second set of pots, labeled **GAIN**, adjust the receive gain for that channel +/-3db.
- The **POWER** switch controls whether 30VDC is applied to beltpacks and/or remote stations that might be plugged into the module.
- The **MODE** switch should always be set to CC for Clear-Com intercom systems.

Nulling Procedure

Note: A stereo audio headset and a tweeker are needed to null these modules.

Inserting the 1/8" sub-mini stereo headset jack into the Clear-Com module turns on a tone that nulls the system. It is important that the nulling procedure be done when all beltbacks and other interfaces are in place. If you add additional beltpacks, it is likely that the nulling procedure should be repeated.

As indicated on the module faceplate, the right ear serves Channel A and the left ear serves Channel B. Do not listen to both ears at the same time as this will not allow you to carefully discern the tone.

While listening to the right side, turn the adjustment pot on the top left above the mini headset jack. The goal is to eliminate and/or minimize the nulling tone. Once you have gotten the adjustment so that the tone is as quiet as possible, then change ears and do Channel B while using the top right adjustment pot.

Powered (Wet) and Unpowered (Dry) Intercom Systems

The Grass Valley Clear-Com interface is compatible with powered or unpowered belt packs as well as fixed equipment . Switch the Module to **WET** (down) when you want to use the Adder to provide power to one or more intercom beltpacks and/or remote intercom stations. The module will provide adequate power for approximately 4 beltpacks or 2 remote stations, or a combination thereof.

If you are supplying power to your intercom system externally with an intercom power supply or "Master" intercom station, switch the Module to **DRY** (up). Many more belt packs can be added if powered externally. Refer to your intercom manufacturer's documentation for additional system details.

> **Note:** When powering a Clear-Com intercom system with an external power supply, be sure to set the AdderII intercom module to "dry" to prevent noise, oscillation or motor-boating.

RTS Telex

RTS modules provide a two-channel intercom on a single 3-pin XLR connector. This module fully supports the RTS signaling protocol and signal levels.

RTS channel operation is optimized by the use of front panel adjustments as shown in Figure 2-25 and listed below.

- Input Gain, ± 10 dB
- Output Gain, ± 10 dB
- Null

Fig. 2-25: Intercom Module: RTS Telex

The following table lists the RTS Telex pin numbers and intercom connections. Switches are also provided for the channel pair for:

- Dry unpowered (d), or Wet powered (w) PORTS
- 200 Ohm ON or OFF terminations TERM

Pin	Description
Pin 1	Ground
Pin 2	+VDC Power & Chan 1 Audio
Pin 3	Chan 2 Audio

The interface is compatible with powered or unpowered belt packs, as well as fixed equipment. You may power up to five belt packs with each intercom module. Refer to your intercom manufacturer's documentation for additional system details.

For operation with a belt pack, adjust the following:
- set the PORTS to w (powered)
- the TERM to ON
- center each of the INPUT gain, OUTPUT gain, and NULL controls

Readjust these controls to optimize performance as required.

Installing/Removing Intercom Modules

Before attemping any module exchange,the Adder II should be powered OFF .

Two multi-conductor cable harnesses are built into the Adder II and run behind the module locations. These cables connect the intercom modules to power and signal sources. There are AMP-MTA type connectors for each module on this harness; the connector fits all module types.
- Signal is 8-pin
- Power is 2-pin

To change an intercom module in the assembly:
1 Turn the power **OFF.**
2 Remove the four screws that hold the module in the frame.
3 Gently pull the intercom module away from the frame until you can see and remove the two cable harnesses.
4 Replace with new module and reconnect in reverse order.
5 Turn the power **ON.**
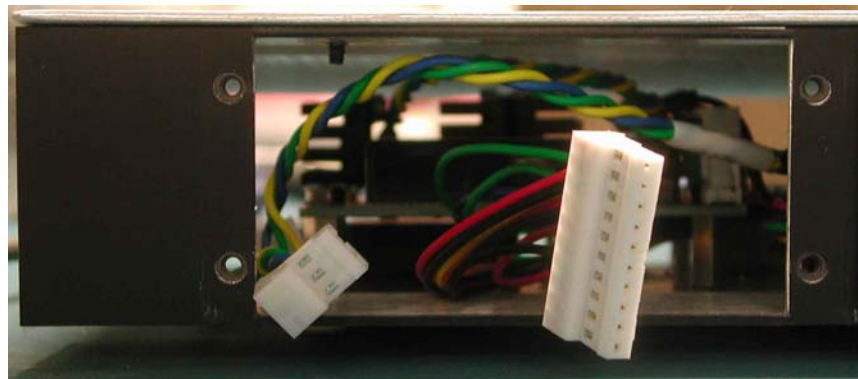
Fig. 2-26: Replacing Intercom Modules

Data Transport Module

The A2-DATA-8 I/O module allows you to add additional RS-485 serial data ports to your Adder II. The ports can be added in groups of 8. Each A2-DATA-8 module uses 8 transmit and 8 receive channels on the fiber multiplex (the same as the A2-AM8x8-0 bidirectional analog audio module would use.) The baud rate is automatically set to match the data source with a maximum data rate of 112 kbps.

A2-DATA-8 module

Close up of ports on the A2-DATA-8 module

Fig. 2-27: A2-DATA-8 module

For each port there are 232, 422 and GPI I/O connections, however you can use only one data input at a given time. The input port automatically determines the incoming signal type. When the input is a serial data signal, the corresponding output on the other Adder II system appears on both the RS232 and RS422 pins of the data connector.

You can achieve GPI input trigger by either tying pin 1 to ground or pin 6 to V+ (CMOS, TTL, nominally up to +12VDC). Inputs are protected from over-voltagesand input impedance is 5k.

A2-DATA-8 Pinouts

Pin	Function
1	RS422 In-, GPI-
2	GPO Relay NC
3	Ground
4	RS232 Out
5	RS422 Out +
6	RS422 In+, GPI +, RS232 In
7	GPO Relay NO
8	GPO Relay Common
9	RS422 Out-
Shroud	Ground

Legacy Systems

The Adder II is the latest audio over fiber multiplexer from Grass Valley, a Belden Brand Several versions of Adder and other audio multiplexers preceded the Adder II, and some Adder II modules are no longer manufactured. This section is for reference should you be using this manual with an earlier system or components.

AES 16 input and output modules

16 input, 16 output, and 8 in/8-out AES modules were previously offered for the Adder II. Each 16 Channel AES module uses two "Banks" on the base unit backplane. For modules with 16 AES signals, for addressing purposes, the first 8 AES signals will be equivalent to one bank and the second 8 AES signals will be addressed as the next bank. To ensure proper channel mapping when converting to and from analog or AES, it is important to remember that 16 channel AES's occupy two banks.

If a 16 port AES module is used at one end, at the other end it would connect to another 16 port AES modules, two 8-port AES modules, or two 16-port analog audio modules.

Clear-Com Intercom Modules (original version)

Earlier Clear-Com intercom modules were different that the current version with different configuration. The setup of the earlier model is described below.

Clear-Com channel operation is optimized by the use of the front panel adjustments shown in Figure 2-28 and listed below:

- Input Gain, ±10 dB
- Output Gain, ±10 dB
- Null

Switches are also provided for the channel pair for:

- **PORTS**: Dry unpowered (d), or Wet powered (w)
- **TERM**: 200 Ohm on or off terminations

Fig. 2-28: Intercom Module: Clear-Com

The original Clear-Com interface is compatible with powered or unpowered belt packs as well as fixed equipment. You may power up to three belt packs with each intercom module from the internal power supply.

Many more belt packs can be added if powered externally. Refer to your intercom manufacturer's documentation for additional system details.

For operation with a belt pack, adjust as follows:

- set the **PORTS** to w (powered)
- set the **TERM** to ON
- center each of the **INPUT** gain, **OUTPUT** gain and **NULL** controls

Readjust these controls to optimize performance as required.

Diamondback

The Adder II is compatible with earlier Diamondback multiplexers. The Coax ports are used and the Adder II must be set for 75 Mbps mode when paired with bi-directional DiamondBack II's or DiamondBack 4x4's. When used with a Diamondback, the Adder II is limited to 32 channels in each direction.

Setting 75 Mbps operation

75/125 Mbs Switch   The Base Unit PCB
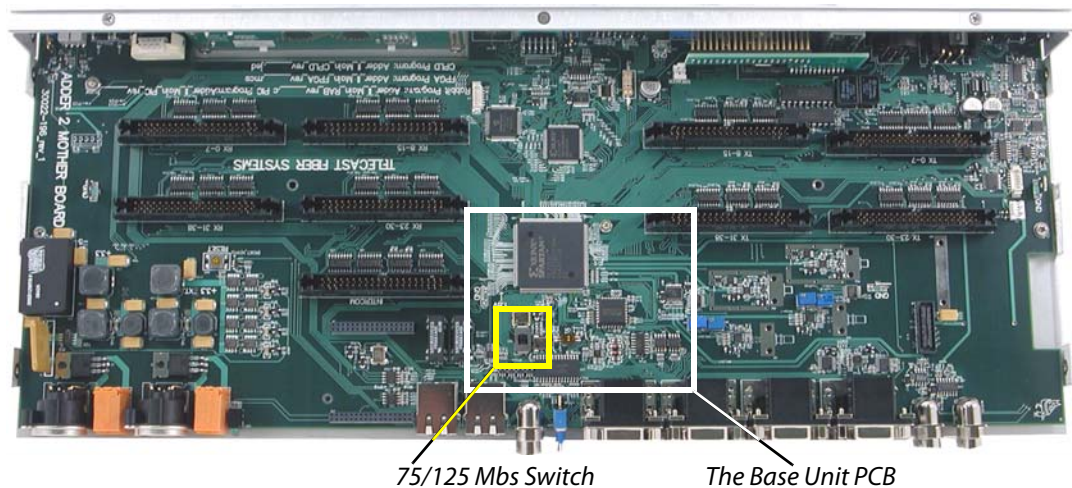
Fig. 2-29:   The Base Unit PCB and 75/125 Mbs Switch

Figure 2-29 shows the Base Unit PCB. Each module is attached to its appropriate cable header on this board. In addition, all optical and coaxial I/O, data functions and power are handled here. Figure 2-29 also shows the 75/125Mb switch that has a bearing on overall system functionality.

The large switch (in the yellow circle) toggles between two different system data transport rates.

- In 75Mb/sec mode, the system is Diamondback II compatible, but is capable of only 32 bi-directional channels plus Intercom and data.
- In 125Mb/sec mode, the system is no longer Diamondback II compatible, but can accommodate up to 64 channels, bi-directional, plus data, and intercom.

IntercomCable Wiring

4-Wire XLR 5-pin to two XLR 3-pin
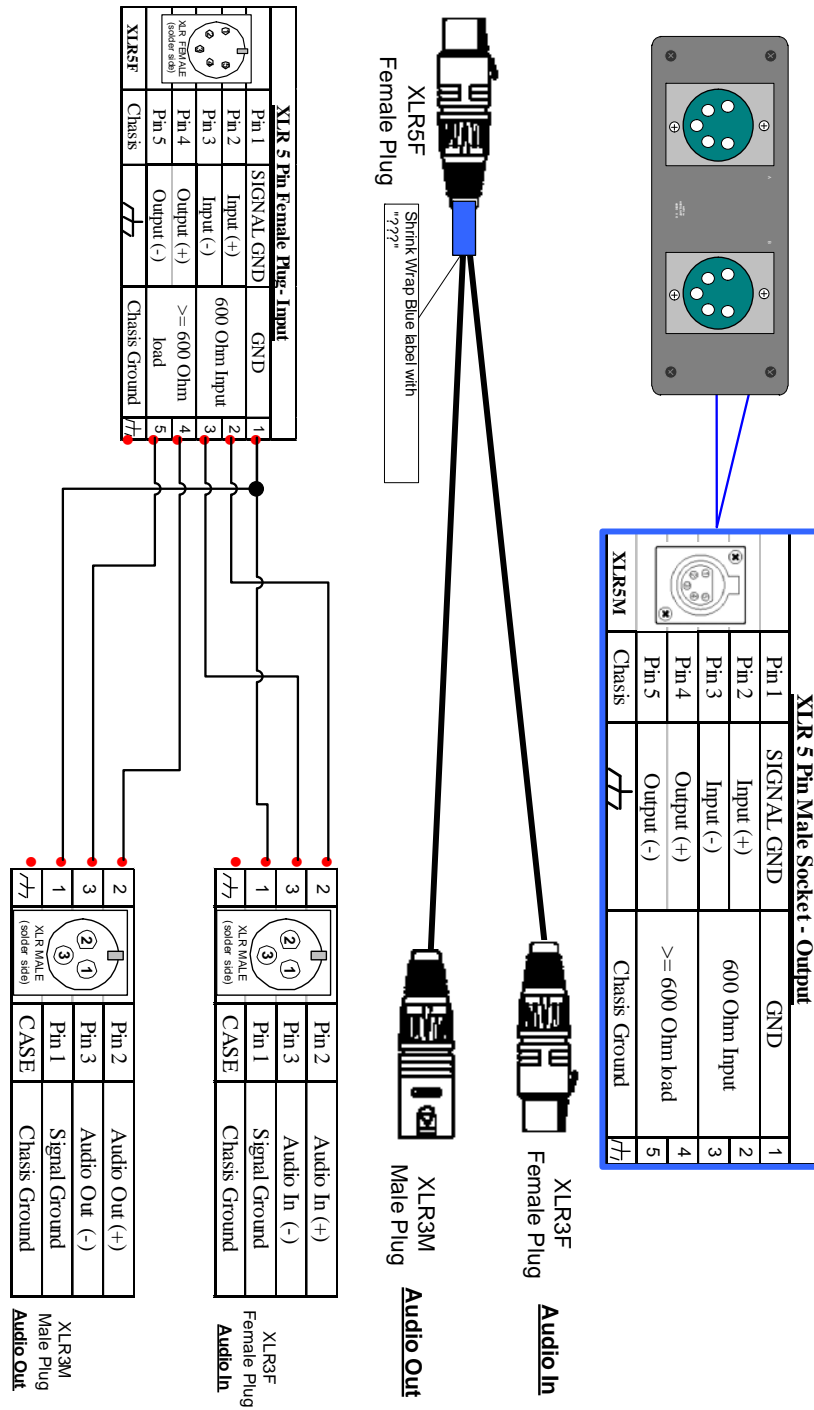
Fig. 2-30: 4-Wire XLR 5-pin to two XLR 3-pin

Adder II to Clear-Com Matrix Plus Intercom Stations
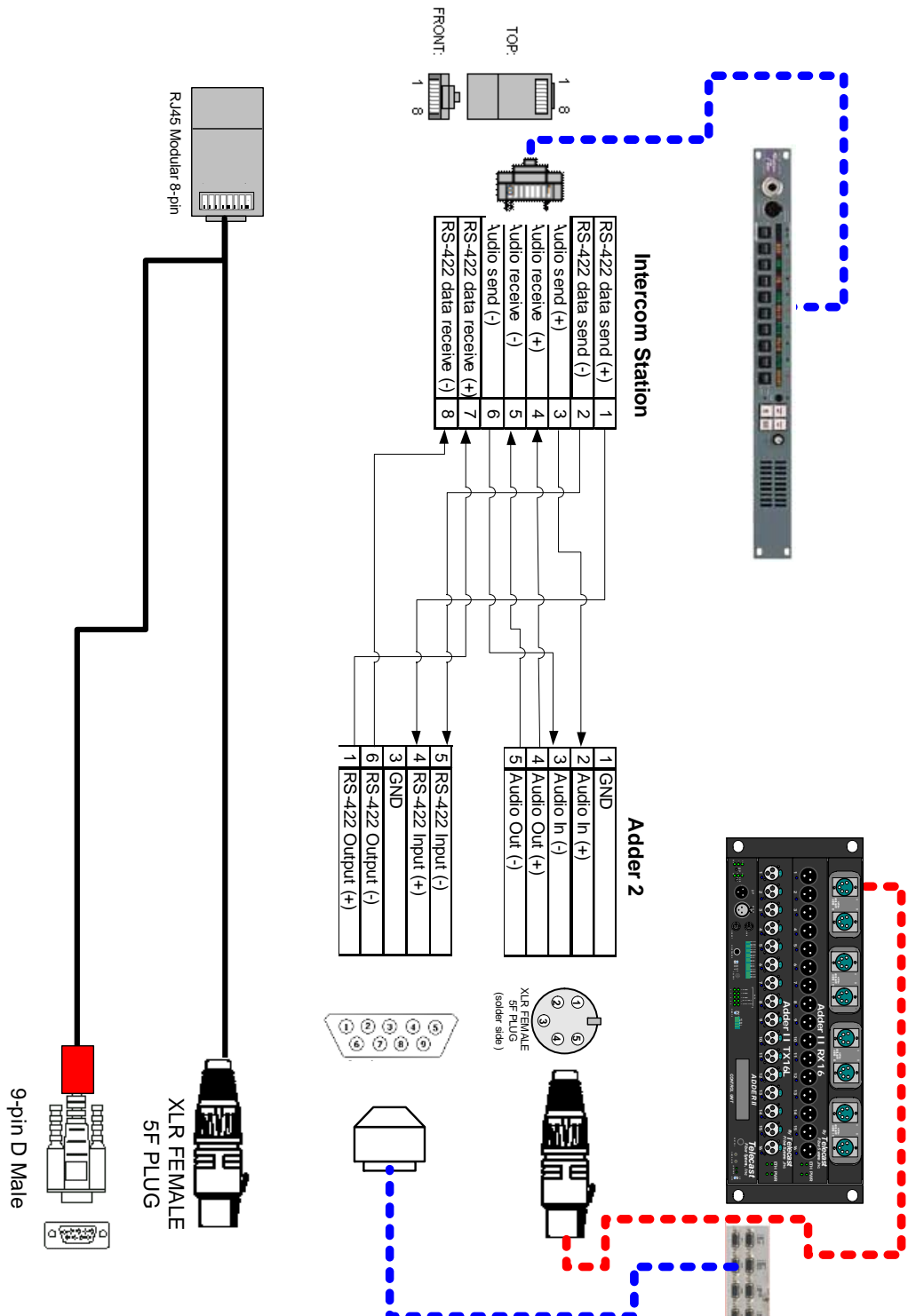
Fig. 2-31: Adder II *to Clear-Com Matrix Plus Intercom Stations*

Adder II to Clear-Com Matrix Plus Intercom Frame
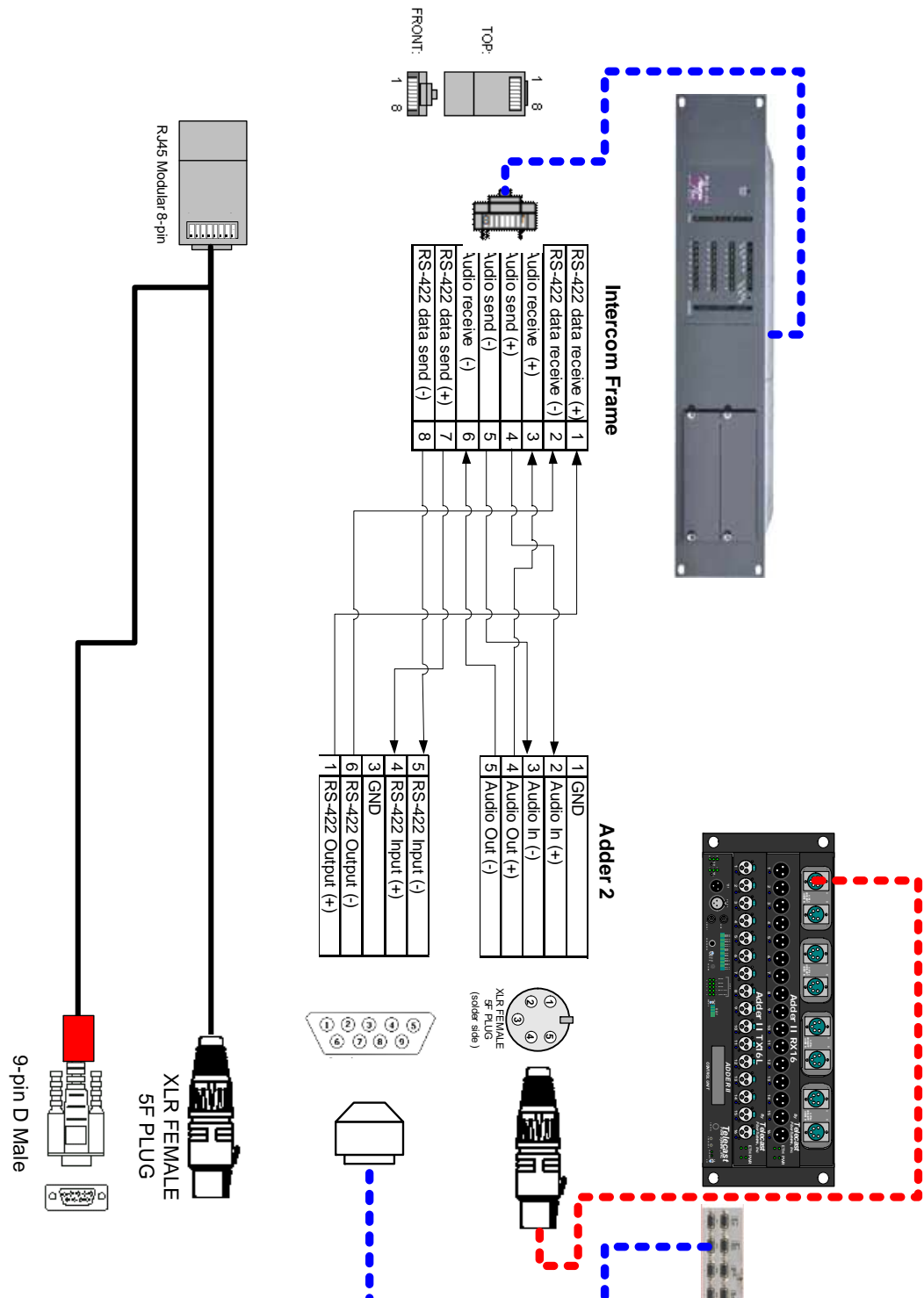
Fig. 2-32: Adder II *to Clear-Com Matrix Plus Intercom Frame*

3

Troubleshooting

This chapter list common issues with the Adder II system and provides solutions to these issues.

Issues and Solutions

Symptom	Possible Cause	Corrective Action
No Power	No power adapter Bad power adapter	Replace AC-DC Supply with a known functional one.
No Optical Link	Bad Fiber Mispatched fiber Lossy fiber or dirty fiber connections	Verify that there is a link at both ends via optical power meter and LINK LED. Clean ends and/or reduce the number of interconnections to achieve optical power within range (-5 to -22 dBm).
Signal Generator/ analyzer not working	Speaker turned OFF	Activate speaker using rear panel switch.
Overall audio levels too high or low	Frame not set to match audio console	Use +18/+24 switch on rear panel to set level at which audio will clip.
Clipping audio	Too much gain	Ensure that gains for each channel are set properly for the input signal.

Accessory List

The following accessories are available from Grass Valley:

- Portable optical power meter
- Fiber and coaxial cables built to custom lengths

Specifications 4

General

Data Transmission Method .... Digital Time Division Multiplexing (TDM)

Aggregate Data Rate .... 75 or 125 Mbps (selectable)

Latency .... ~1 millisecond plus 5 microseconds per km of fiber

Interchannel Phase Delay .... <1 degree at 1kHz

Optical Fiber Connectivity

Operating Wavelength .... 1310 nm and 1550 nm

Fiber connector ....ST type

Recommended fiber type .... Single mode

.... 2-fiber system   1-fiber (WDM) system

TX Output into cable .... -7 dBm -8 dBm

RX Sensitivity .... -32 dBm -31 dBm

Link budget (maximum) .... 23 dB - 25 dB

Recommended distance limit .... 20 km (singlemode), 5 km (multimode)

Coax Connectivity

Impedance .... 75 Ohms

Recommended cable ....Belden 1694A

Connector ....BNC

Distance limitation ....305 meters (1000 feet)

Audio, Analog ....

Analog Audio Connectors .... 3-pin XLR (female on TX & male on RX)

Transmission Method .... Digital, 24-bit, 48 ksamples/sec

Input Impedance, Analog ....10k Ohms balanced

Output Impedance ....30 Ohms balanced

Line Input Setting ....+24 dBm (peak)

Maximum Input Level ....

Unity Gain (0 dB) ....+18 dBM peak   /   +24 dBm peak (selectable)

+10 dBM Input Setting ....+ 8 dBM peak   /   +14 dBm peak

+20 dBm Input Setting ....- 2 dBM peak   /   + 4 dBm peak

+30 dBm Input Setting ....- 12 dBM peak   /   - 6 dBm peak

+40 dBm Input Setting .... - 22 dBM peak   /   - 16 dBm peak

+50 dBm Input Setting ....- 32 dBM peak   /   - 26 dBm peak

Maximum Output Level
(from 30 Ω balanced) ....+18 dBm @ 1kHz, 600 ohm, switchable to +24 dBm

Frequency Response (@ 8 dBm) ....±0.2 dB from 20 Hz to 20 kHz

Total Harmonic Distortion + Noise .... <0.05% from 20 Hz to 20 kHz (@ +8 dBm)

....<0.01% at 1 kHz (@ +18 dBm)

Intermodulation Distortion (SMPTE) . <0.04%, 60 Hz + 3 kHz mixed 4:1 @ +8 dBm

Signal to Noise Ratio (A-weighted) .... >95 dB, 20 Hz -20 kHz, ref. to +18 dBm

Audio, Digital ....

AES/EBU Inputs and Outputs .... unbalanced, 75-ohm BNC

Transmission MethodAES/EBU Digital Audio Pair conforming to AES3 specifications

External Sync...BNC, rear panel

Sample Rate...48 kHz

User Bits ....Not supported

Serial Data Transmission ....

Data Connector...9-pin Female "D"

RS232 ....±8 Vp-p level, 20 kBps max.

RS422/RS485 ....Balanced TTL levels, 150 kBps max.

Jitter... <330 ns (3.07 MS/s)

Latency .... ~ 0.90 us plus 5 us per km of fiber

Intercom (882i module)..

Total intercom channels...8

Intercom compatibility (per module)..

.... 4-Wire: 2 balanced, non-powered, 5-pin XLR-M

.... Clear-Com: 2 unbalanced, powered, 3-pin XLR-M

....RTS: 1 unbalanced, powered, dual-channel, 3-pin XLR-M

Signal-to-noise ratio (A-weighted)... >90 dB

Frequency response .... +1/-3 dB, 80Hz-20kHz, +8 dBm

Contact Closure / GPIO ....

Connector...2 9-pin Female "D" connectors

Input contacts....... Normally High TTL 1 level (remote contact open/open circuit)

.... Short to ground TTL 0 (remote contact closed/triggered)

Output contacts...........................Form 1A SPST, "Normally Open" isolated contacts

Switch Voltage Rating... 50V AC/DC

Switch Current Rating..500 mA

Maximum Carry Current Rating ....500 mA

Contact Resistance...< 0.5 Ohm

Mechanical/Electrical/Environmental...

2RU .... 19" wide x 7.75" deep x 3.5" high,   8 lbs (3.5 kg)

3RU ....19" wide x 7.75" deep x 5.25" high,   9 lbs (3.5 kg)

4RU ....19" wide x 7.75" deep x 7.0" high,   10 lbs (3.5 kg)

5RU .... 19" wide x 7.75" deep x 8.75" high,   11 lbs (3.5 kg)

6RU .... 19" wide x 7.75" deep x 10.5" high,   12 lbs (3.5 kg)

7RU ....19" wide x 7.75" deep x 12.25" high, 13 lbs (3.5 kg)

Power Connector.. 4-pin XLR (male) x2, screw terminals

Input Voltage Range...12 to 18 VDC, 4.5A max.

Power Consumption

(per end, all channels at full level) .... 45 watts maximum
Temperature Range .... -40° to +60°C
Humidity Range ....0 to 90% non-condensing

Specifications

Grass Valley Technical Support

For technical assistance, please contact the Grass Valley Technical Support center nearest you:

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