



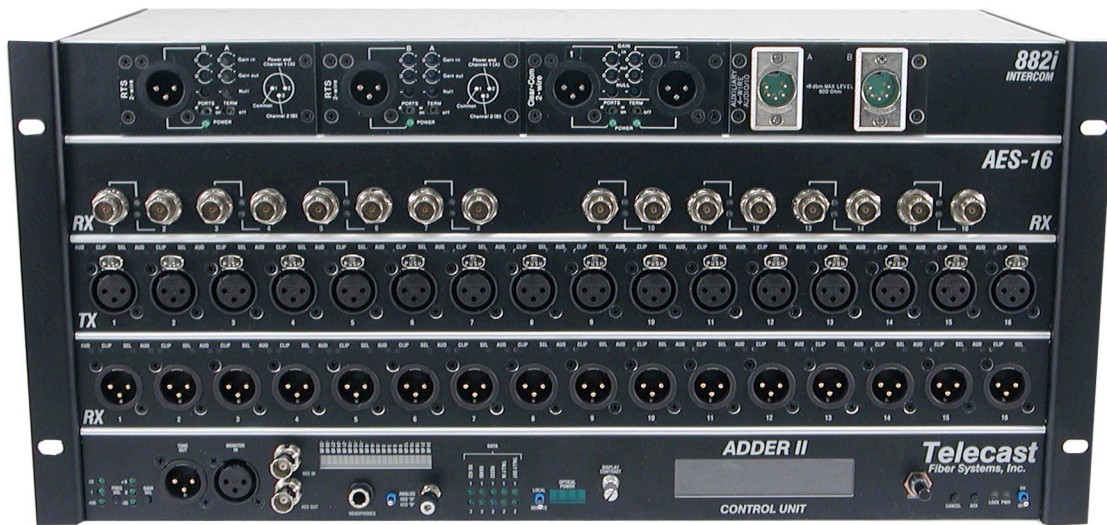
Telecast
Fiber Systems, Inc.

Adder II™

***Analog and Digital Audio, Intercom and Data
Multiplexing System***

User Manual

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11/07

Software Version:

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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 servicing to Telecast Fiber Systems, Inc.

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 will be required to correct the interference at their 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 measures.

Introduction

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 point-to-point as well as multi-point signal transport.

With up to 64 bi-directional channels of audio, 4 intercom module slots providing up to eight intercom channels, expanded data and GPI capabilities, improved s/n, remote gains, phantom mic power and industry leading latency specs, this new Adder is an audio workhorse.

This new Adder is built from the ground up with single RU frames that interface to a common backplane. You purchase only the parts that you need. 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. And with ultra-low latency, delay is never an issue.

Analog TX modules feature preamps that allow 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 can be optionally equipped for remote control of these functions. And with better than 25 db of optical dynamic range, this Adder can operate across the theater or across town.

Operation can be on one or two fibers or 2 standard coaxial cables. It is dual-wavelength to facilitate easy WDM single-fiber operation. GPI's and data channels are via convenient DB-9 connectors and data offerings include RS-232, RS-422 and RS-485. The signal analyzer now features an improved LED bar graph and the generator has three different tone frequencies and three level choices in both the analog and digital domains.

Your Adder has been shipped to you pre-configured and with just a little bit of preparation, you should be up and running very quickly.

Unpacking the Adder II

Each end of an Adder system consists of at least two parts: One base unit and one input/output (I/O) module. All modules are 1 RU high. 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 tone generator/analyzer.

Moving up, the next module (referred to as "BANK") can be any of a number of input or output modules, either analog or digital, or intercoms. For analog signals, banks are 16 wide. For AES signals, Banks are 8 or 16 wide. Note that, 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. This will be further explained later in the manual. 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. That is to say that if Bank 2 on one end is an analog TX then Bank 2 on the other end will be an analog RX. The only exception to this would be if you had an AES TX on one side and an analog RX on the other.

Each Adder can accommodate one or two 12 VDC power inputs @ 3 Amps via 4-pin XLR or terminal strip. Telecast's ADAP-AC-03 is an acceptable external DC power supply.

Depending on version, there will either be a third 12VDC input or a 30VDC input for intercoms.

If you require re-configuration of your Adders, they should be returned to Telecast Fiber. Call 508-754-4858 and request and RMA (Return Materials Authorization) number.

When removing your Adders from their 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 Adders so report any damage to the carrier and to Telecast.

Setting Up an Adder System

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

Power Requirements

Any power supply used with your Adders must provide a minimum of 3 amperes, continuous, at 12 to 24 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 Table 1 for pinout and Figure 1 for location. Be sure that AC outlets are within reach of their 6-foot power cords.

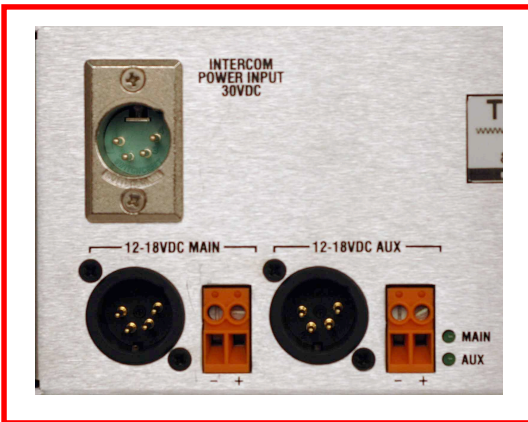


Figure 1: Power Input Location

PIN	SIGNAL
1	Ground
2	No Connection
3	No Connection
4	+ VDC

Table 1: Power XLR-M Pin-out

Both Telecast's EEL-4 and ADAP-AC-03 meet the power requirements for Adders. Of course, 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. An LED next to the power switch on the front panel will be RED to indicate that DC is present and GREEN to indicate 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 above the MAIN input. The same wiring conventions apply.

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.

The optical output from each TX is generated by an infrared laser diode that is coupled to the fiber. User connections are made at bulkhead ST type connectors on the rear panel; refer to Figure 2. Either single mode or multimode fiber may be used but take care

to never mix types of fiber in a given run. Once WDMs are employed into the system, THEIR type will dictate the type of fiber that must be used.

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

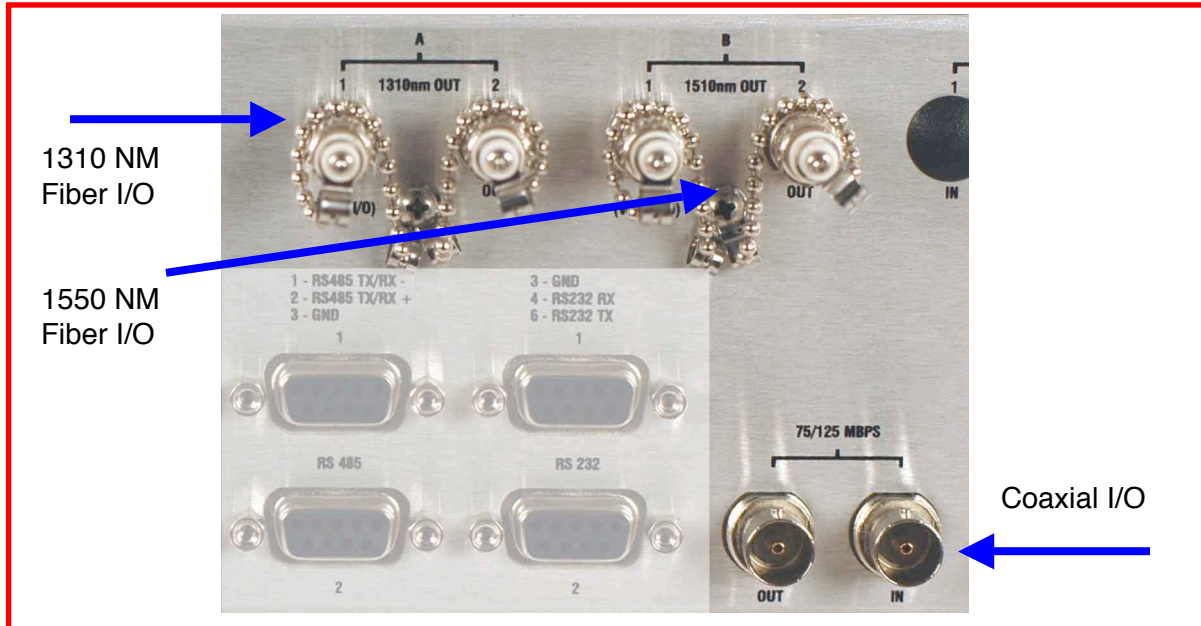


Figure 2: Fiber and Coax I/O Locations, Rear panel

There are several ways to fiber-up your Adder II systems:

- 1310 only. In this scenario, two fibers are used to connect the IN's of each to the OUT's of the other in the 1310nm optical window.
- 1550 only. In this scenario, two fibers are used to 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. This scenario requires only one fiber per link but requires the addition of either an internal or an external WDM (Telecast part number MWD-1315-SA or MWD-1315-M).

In either scenario, two links can be made and the Adders will automatically switch links should one fail. This solution offers complete and automatic optical redundancy. See Figure 3.

Once you choose your method of connection, inspect the fiber ends and clean them with 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 Adder II is FIBER PRIORITY. 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.

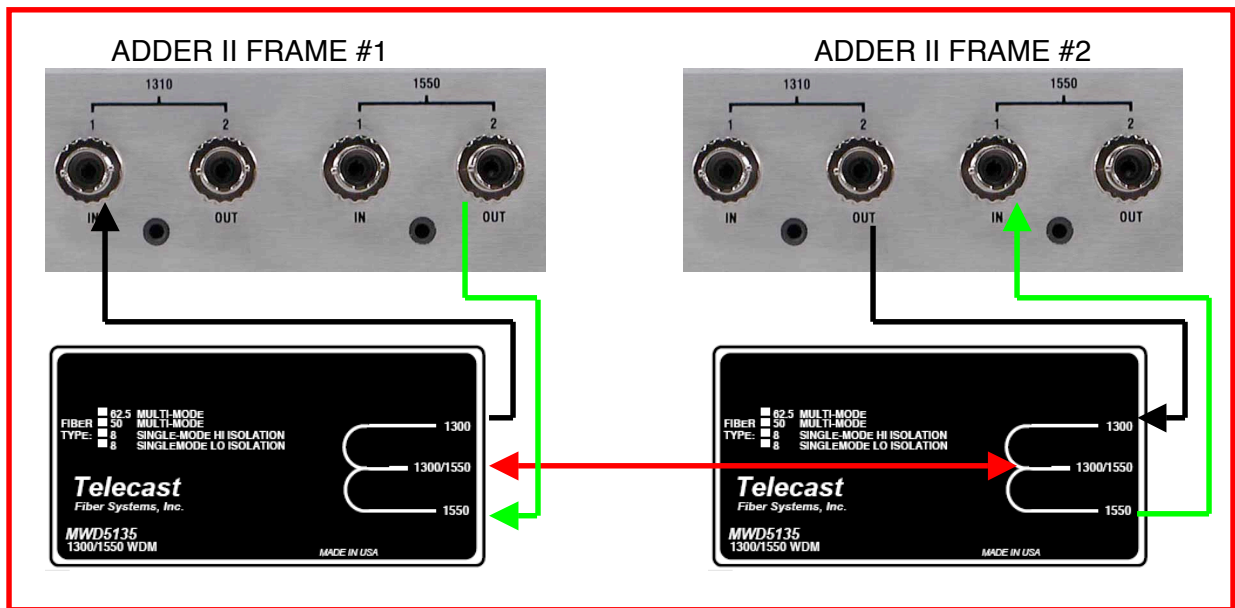


Figure 3: Single Fiber Operation w/ External WDMs

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 4, below.



Figure 4: Optical Power Display and LINK LED Location, Front panel

With the switch in 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 5.

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 photo's, below, 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.

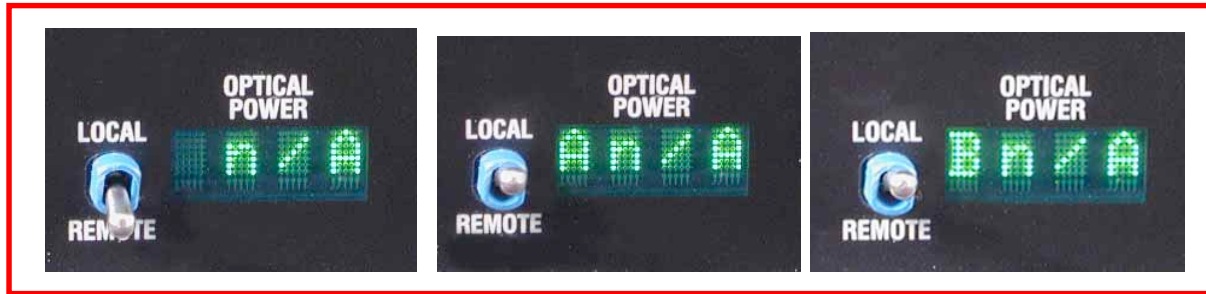


Figure 5: Optical Power Display – various conditions

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 6.

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”.



Figure 6: Link LOCK Status LEDs

Coaxial Connections

Figure 2 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 Adders) the coax can be used 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 the “Advanced Operations” section beginning on page 29.

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

The pin-outs for the DB-9 connectors are described on the rear panel above the connectors and in Table 2. See Figure 7, below for position.

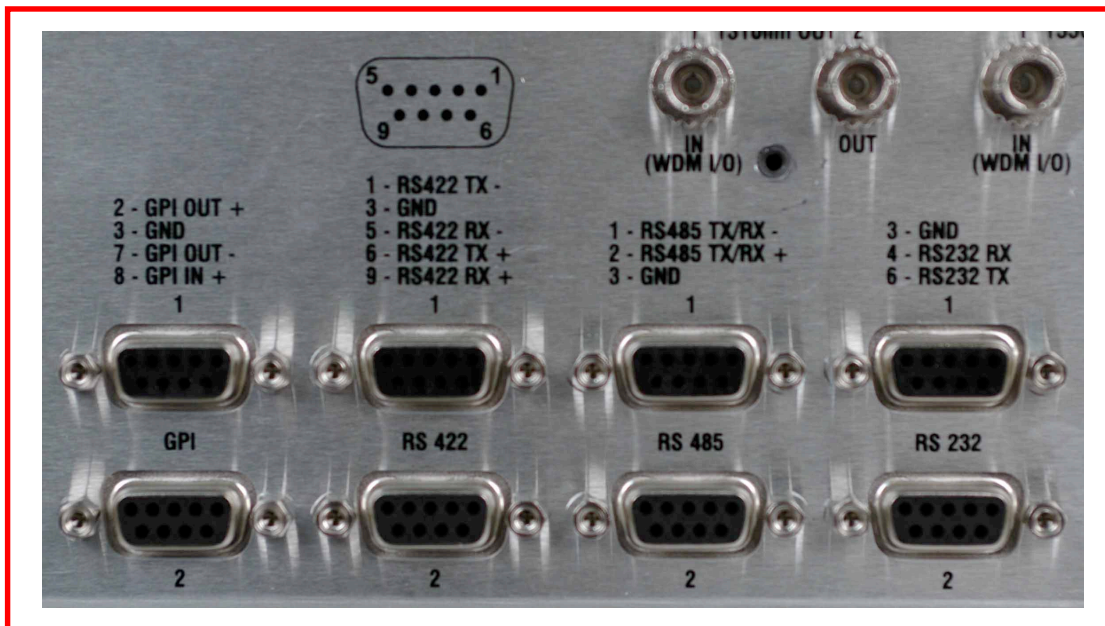


Figure 7: Data Connectors on Base Rear Panel

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

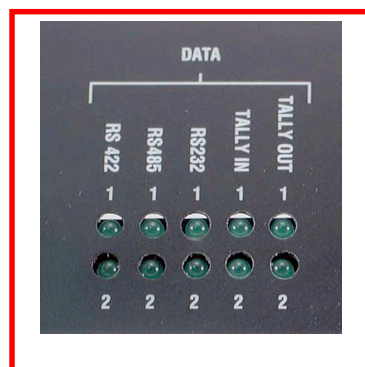


Figure 8: Data LEDs

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 7. The connection specifications are listed in Table 2. A 110 Ohm terminating resistor placed across the balanced inputs may be needed if input cable lengths are in excess of 6 feet.

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.

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: Data pin-outs

The eight digital I/O connectors are AMP 747905-2, D-sub female or equivalent.

+18/+24 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.



Figure 9: +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 9, below. 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.



Figure 10: Analog/Digital Signal Generator/Analyzer

In order to monitor analog and AES signals properly, attention must be given to the switch to the left of the VOLUME knob.

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.



Figure 11: AUD MON On/Off Switch

Analog TX and RX Modules

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

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

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

Table 3: XLR Audio Cable Connections

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 11.

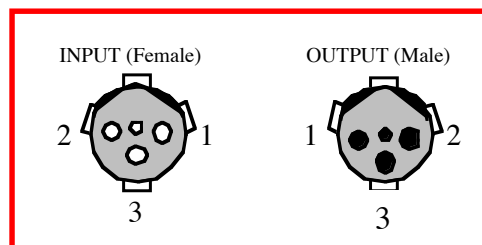


Figure 11: XLR Connectors on TX and RX Modules

Analog TR Modules

Adder II Analog TR modules have 8 LINE LEVEL inputs and 8 LINE LEVEL outputs as shown in figure 11a.



Figure 11a: XLR Connectors on TX and RX Modules

There are no gain or 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 11.



Figure 12: Analog TX Module

Each input has 3 associated LEDs as shown in Figure 12.

- 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.



Figure 13: Analog TX LED indications

Analog RX Modules

The analog RX modules feature 15 XLR-M outputs. The module faceplate is shown in Figure 14.

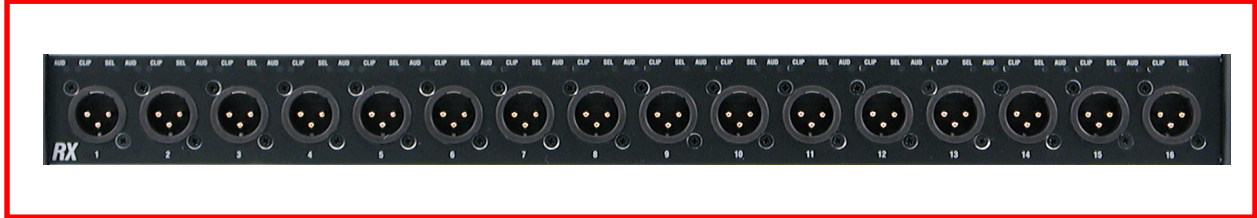


Figure 14: ANALOG RX MODULE

Each output has 2 associated LEDs as shown in Figure 15.

- 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.



Figure 15: Analog RX LEDs

An analog 8x8 module has 8 TX inputs and 8 RX outputs on the same single module.

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 16. Note that adjustments for an audio path can be set from either end of the link.



Figure 16: 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 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.



Figure 17: Starting point

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 18 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.



Figure 18: All Selected

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. Figure 19 shows that we will be working on Channel 2.



Figure 19: Channel 2 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.

Setting Gains

Now that we have selected a channel (or channels) to work on, we now can adjust gain and phantom power settings. Figure 20 shows that we are working on the gain for channel 2.



Figure 20: 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 20 shows that we have set the gain 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 21 shows that we are setting the phantom power to **48V**.



Figure 21: Setting Phantom Voltage

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

The Adders 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 be displayed as settings are restored during start-up or following a power or fiber failure. And loss of link will result in "Communication Failure" being displayed.

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

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".

Pairing two chassis that have a TX module in one chassis for which there is no corresponding RX module in the other or looping back the fiber or coax so that the chassis is talking to itself will result in the message "Illegal configuration or loopback". The message goes away as soon as you press any button.

AES 8 and 16 TX and RX Modules

The TX and RX AES modules, whether 8 or 16 channel, feature BNC connectors for input and output. A representative module is shown in Figure 22.

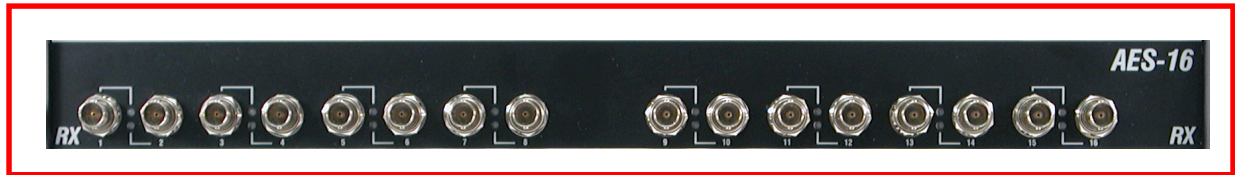


Figure 22: AES 16 RX (TX 16 Looks identical)

Each channel has a single LED that glows GREEN to indicate signal presence. See figure 23, below. All levels and other signal parameters are as defined by the AES-3 specification. User bits are NOT maintained.

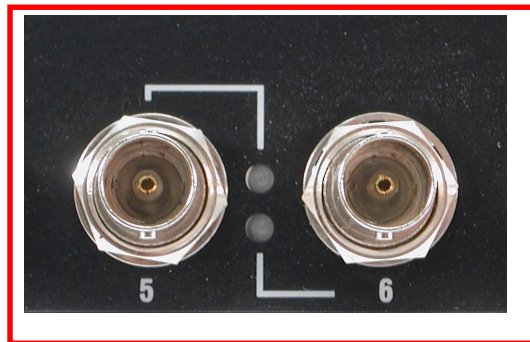


Figure 23: AES LEDs

Modules come in 8 TX, 8RX, 16TX, 16RX and 8TR.

16 Channel AES modules use two “Banks” on the base unit backplane. This is because each bank encodes only 8 bits. 8 bits equates to 16 analog channels or 8 AES channels. 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.

So, although there might be only the 16 channel AES atop the base, AES channels 1-8 would be Bank 1 and the AES channels 9-16 would be Bank 2.

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:

1. Balanced 4-wire
2. Clear-Com 2-wire
3. RTS/Telex compatible 2-wire



Figure 24: 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. Refer to Figure 27. XLR pin functions are given in Table 4. Intercom Module Gain is 0 dB.

PIN	FUNCTION	IMPEDENCE	SIGNALS
1	Ground		
2	Input (+)	600 Ohm input	Line: +8 dBm
3	Input (-)		Mic: -32 dBm
4	Out (+)	≥600 Ohm load	+8 dBm
5	Out (-)		

Table 4: 4-Wire Intercom Connections

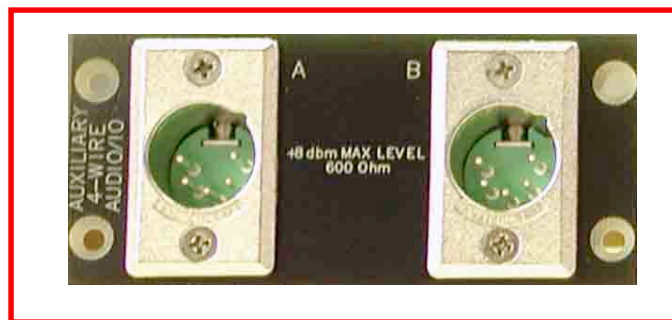


Figure 25: Intercom Module: 4-Wire Auxiliary (balanced)

Clear-Com (Old revision)

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

The Clear-Com Intercom Connections are listed in Table 5.

PIN	FUNCTION
1	Ground
2	+VDC Power
3	Power

Table 5: Clear-Com Intercom Connections

Note: When using the Clear-Com external power supply, pin 3 termination must be lifted on the power supply to prevent motor-boating.

Clear-Com channel operation is optimized by the use of the front panel adjustments shown in Figure 27 and listed below:

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

Switches are also provided for the channel pair for:

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



Figure 26: Intercom Module: Clear-Com

The Telecast Clear-Com interface is compatible with powered or unpowered belt packs as well as fixed equipment. You may power up to 3 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, set the PORTS to w (powered), the TERM to ON and center each of the INPUT gain, OUTPUT gain and NULL controls. Readjust these controls to optimize performance as required.

Clear-Com (New revision)

The new Clear-Com intercom modules are the same size as the older modules and install in exactly the same way. Note that the Adder should be powered OFF before any module exchange is attempted. Pin-outs are the same as in Table 5 on page 24.

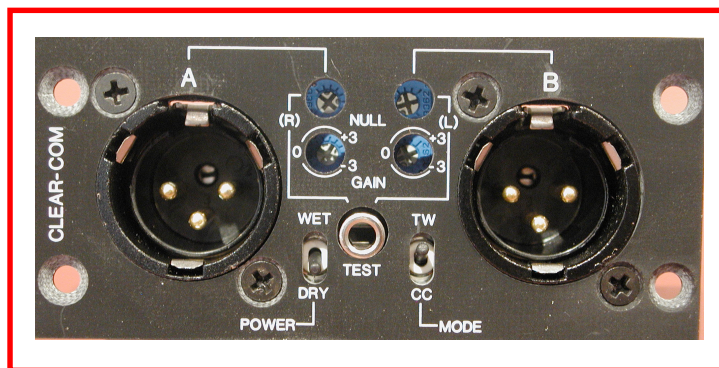


Figure 27: New Clear Com module

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 belt packs and/or remote stations that might be plugged into the module.

The "MODE" switch optimizes the module's audio for one of the two leading brands of intercom system.

Nulling Procedure

Note: A stereo "walkman" type headset and a tweaker are required to null these modules.

Inserting the 1/8" sub-mini stereo headset jack into the Clear-Com module turns on a tone that is used to null the system. It is important that the nulling procedure be done when all beltbacks and other interfaces are in place. If additional belt packs are added, it is likely that the nulling procedure should be done again.

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

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 locally with an intercom power supply or “Master” intercom station, switch the Module to “DRY” (up).

Intercom Mode

The “MODE” switch optimizes your Intercom Module for the type of intercom system that you are plugging into it. Move the switch for “CC” (up) for Clear-Com intercoms and to “TW” (down) for “two-wire” style (RTS) systems. Note: having this switch in the wrong position for your intercom type will reduce the audio quality of your system.

RTS Telex

RTS modules provide a two-channel intercom on a single 3-pin XLR connector. This Telecast 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 29 and listed below.

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

Table 6 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



Figure 28: Intercom Module: RTS Telex

The interface is compatible with powered or unpowered belt packs as well as fixed equipment. You may power up to 5 belt packs with each intercom module. Refer to your intercom manufacturer's documentation for additional system details.

For operation with a belt pack, set the PORTS to w (powered), the TERM to ON and center each of the INPUT gain, OUTPUT gain and NULL controls. Readjust these controls to optimize performance as required.

PIN	FUNCTION
1	Ground
2	+VDC power & Chan 1 Audio
3	Chan 2 Audio

Table 6: RTS Telex Intercom Connections

Installing/Removing Intercom Modules

Two multi-conductor cable harnesses are built into the AdderII 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 and 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.

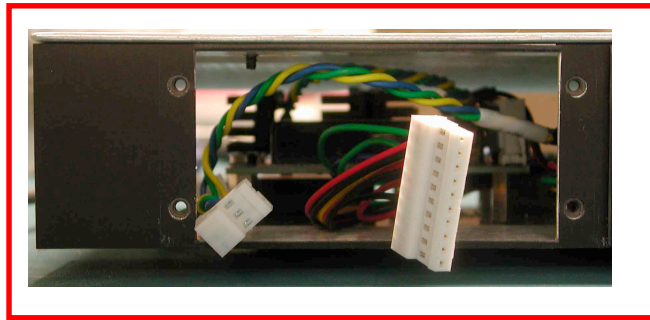


Figure 29: Replacing Icom Modules

System Capabilities – Advanced Operations

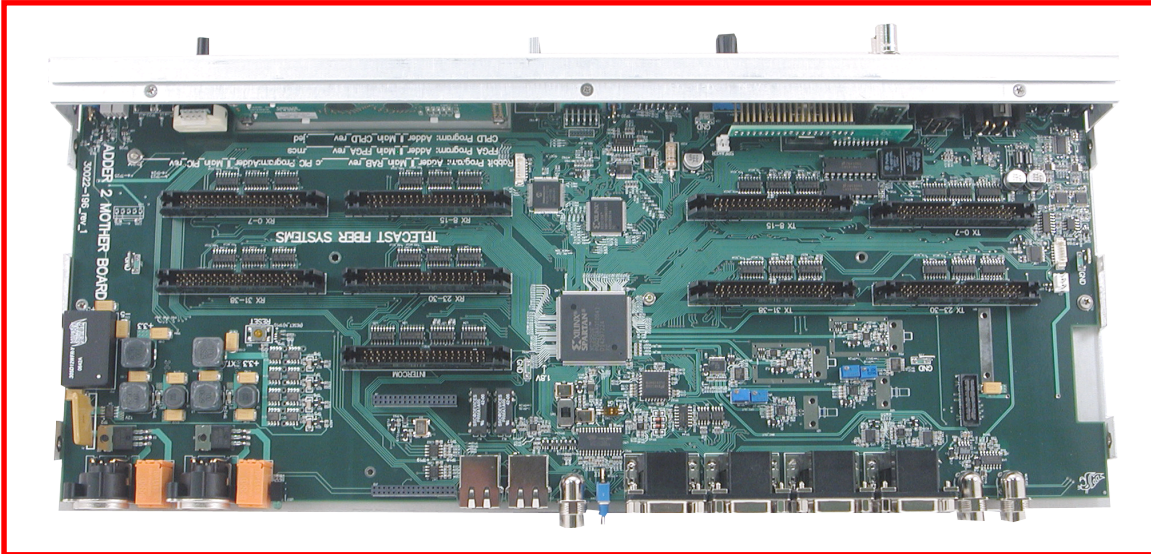


Figure 30: Main PCB

Figure 30 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 31 shows the 75/125Mb switch that has a bearing on overall system functionality.

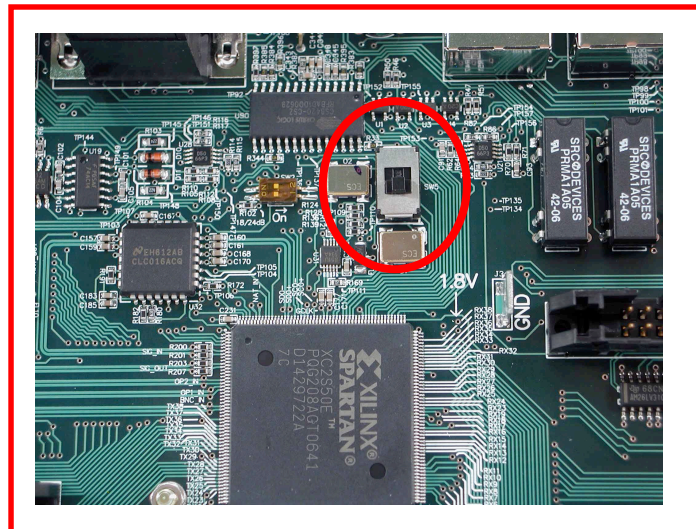


Figure 31: 75/125 Mbs Switch

The large switch (in the red 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.

Remote Gain Control

While remote control currently exists between two given frames, a future implementation will feature a 1 RU remote panel capable of addressing up to 16 frames.

Repair

For technical assistance with your Adder II system, contact Telecast Fiber Systems, Inc. at 508-754-4858. To return a unit for repair, you must obtain a return material authorization (RMA) number from Telecast service.

Accessory List

The following accessories are available from Telecast:

- Viper II Throw Down WDMS
 - MWD-1315-SA for single mode
 - MWD-1315-M for multimode
- Portable optical power meter
- Fiber and coaxial cables built to custom lengths

Software Revision History

Rev. 4 Motherboard:

Rev A.0.15	9/13/07	Fixes inadvertant +50dB Gain at powerup due to 0's base loop in a 1's based design. channel-1 became -1 which is 0xFF which drove the CPLD on the analog modules crazy.
Rev A.1.0	9/13/07	Updates for Rev. 4 Motherboard for which the shaft encoder is routed to interrupt pins, swapped with the I2C_SEL_* lines (which are now I2C_WP_*).
Rev A.1.1	9/18/07	Bug fixes for loopback operation, gain settings.
Rev A.1.2	9/19/07	Relies on slot to identify RX from TX modules.
Rev A.1.3	9/22/07	Relies on correct slot to identify RX from TX modules.
Rev A.2.0	9/28/07	Significant restructuring. The simultaneous exchange of gains were corrupting each others' global variables for bank & channel. Function calls now rely on passed parameters instead of globals, and the update_gain function maintains separate state.
Rev A.2.1	10/31/07	Prevents "sticking" flashing LED after updating remote gains.
Rev A.2.2	11/05/07	Suppresses LED flashing during the exchange of gains after achieving lock. Uses the last remaining bit and forces a call of background_advertise() to convey the state change.
Rev A.2.3	11/05/07	Adds fan control. Turns on at power up momentarily, and turns on at or above 50C and off at or below 45C.
Rev A.2.5	11/12/07	RETURNED TO A.2.1, Added back Fan control logic. Resets loopback condition on loss of lock. Added better synchronization between FSMs on connected boxes. Adds UART debug capability (for modified HW only) For testing purposes, forces RX LEDs OFF on powerup to demonstrate and verify gain exchange. SPI overhaul.
Rev A.2.6	11/12/07	Cursor off at change of state. Modified state machine to better deal with one-way fiber breaks.
Rev A.2.7	11/13/07	Released the RX LEDs to power up from memory. Fixed weird gain settings when whipping the knob.
Rev A.2.8	11/13/07	AES modules that still have PICs require CS assertions per byte, not per 3-byte transactions. (Analog modules use CPLDs which don't require.)
Rev A.2.9	02/28/08	Changed bank (rack) number to zeroes-based. Full 10-RU chassis had bank number 8, which overflowed the 3-bit advertisement field. Now, 0-7.
Rev A.2.10	07/02/08	doubles the size of a message queue to avoid the "TX Overflow" errors that a customer encountered when swapping RX and TX modules to make 48 TX and 16 RX channels.
Rev B.0.0	07/14/08	Retargeting a PIC18F8680 associated with rev 5 motherboard Requires a short across nets NAT_COMM_0 and NAT_COMM_6. Static display changes to show 75 vs 125Mbps, +18 vs +24dBu, and the temperature and fan status. Also includes a timeout (~25 seconds) that backs out of programming mode automatically.

Troubleshooting

Symptom	Possible Cause	Corrective Action
No Power	No adapter Bad adapter	Replace AC-DC Supply with known good one
No Optical Link	Bad Fiber Mismatched fiber Lossy fiber	<ul style="list-style-type: none"> • Verify that there is a link at both ends via optical power meter and LINK LED • Clean ends and/or reduce connections to Get optical power within range (-5 to -22)
Signal Generator/analyzer not working	Speaker turned OFF	Turn on speaker using rear panel switch
Overall audio levels too high or low	Frame not set to match aud 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

Specifications

General

Transmission Method	Digital Time Division Multiplexing (TDM)
Aggregate Data Rate	75 and 125 Mbps

Audio Characteristics

Analog Modules	16 Channel INPUT or OUTPUT
AES Modules	8 or 16 Channel INPUT or OUTPUT Or 8 in/8 out
Analog to Digital Conversion	24 bit
Sample Rate	48 ksamples/sec
Amplitude Frequency response	
@ +8 dBm	20Hz to 20kHz +/- 0.2db
Total Harmonic Distortion	
@ +8 dBm, 20-20kHz	<0.05%
@ +8 dBm, 1kHz	<0.01%
Intermodulation Distortion(SMPTE)	
@ +8 dBm	60Hz +3kHz mixed 4:1 < 0.04%
Signal to Noise ratio (A-weighted)	
20-20kHz; re: +18dBm	>95db
Latency	~1millisecond PLUS 5 microseconds per km of fiber or <1 degree at 1kHz
Interchannel Phase Delay	

Analog TX Module Characteristics

Connector	Female 3-pin XLR
Input Impedence	10kOhm, balanced
Maximum Input Signal Levels	Note that the frames can be internally set to +18 or +24 dBm Peak

Unity gain	+18 dBm peak	+24 dBm Peak
+10 dB	+ 8 dBm peak	+14 dBm peak
+20 dB	- 2 dBm peak	+ 4 dBm peak
+30 dB	-12 dBm peak	- 6 dBm peak
+40 dB	-22 dBm peak	-16 dBm peak
+50 dB	-32 dBm peak	-26 dBm peak

Analog RX Module Characteristics

Connector	Male 3-pin XLR
Output Impedence	30 Ohm Balanced
Maximum Output level	+18 dB @ 1kHz, 600 Ohm Switchable to +24 db

AES TX and RX Module Characteristics

Connector	BNC
Channels	8 or 16
Input/Output Format	AES/EBU Digital Audio Pair
	Conforms with AES-3 Specification
External Sync	Via Rear panel BNC
Sample Rate	48 KHz

Note: User bits are NOT maintained

882i Characteristics

Total Intercom Channels	8
Compatibility (each of 3 modules)	
4-Wire	(2) Balanced, non-powered, 5-Pin XLR-M
ClearCom	(2) Unbalanced powered, 3-Pin XLR-M
RTS	(1) Unbalanced dual-channel, 3-Pin XLR-M
Signal to Noise Ratio (A-weighted)	>90 db
Frequency Response @ +8 dBm	
80Hz-20kHz	+1/-3 dB

Data Characteristics

Connector	(6) 9-pin Female "D"
Data Channels	(1) channel per connector, (4) total
Maximum Data Rate	
RS-442	> 150,000 bps
RS-232	> 20,000 bps
RS-485	> 150,000 bps
Jitter	< 330 ns (3.07 MS/s)
Latency	~ 0.90 microseconds plus
	5 microseconds per km of fiber or
Contact Closure (Tally)	
Connector	(2) 9-pin Female "D"
Input	TTL 1 or open circuit (remote contact open)
	TTL 0 or shorted to circuit ground (remote contact closed)
Output	(Form 1A SPST-NO isolated contacts)
Switch Voltage	Rating 50 VAC/DC
Switch Current	Rating 0.5 Amps
Maximum Carry Current	0.5 Amps
Contact Resistance	< 0.5 Ohm

Mechanical/Electrical

Height	Dimensions (W x L x D inches)	Weight
2 RU	3.5 x 19 x 7.75	8 lbs (3.5 kg)
3 RU	5.25 x 19 x 7.75	9 lbs (4.0 kg)
4 RU	7.0 x 19 x 7.75	10 lbs (4.5 kg)
5 RU	8.75 x 19 x 7.75	11 lbs (5.0 kg)
6 RU	10.5 x 19 x 7.75	12 lbs (5.5 kg)
7 RU	12.25 x 19 x 7.75	13 lbs (6.0 kg)
8 RU	14.0 x 19 x 7.75	14 lbs (6.5 kg)
9 RU	15.75 x 19 x 7.75	15 lbs (7.0 kg)
10 RU	17.50 x 19 x 7.75	16 lbs (8.0 kg)

Power Requirements

Current	4.5 Amps maximum
Power	45 watts maximum
External Input Voltage	12-18 VDC
Operating Temperature Range	- 40 to + 60 °C
Operating Humidity Range	10-90%, non-condensation

Optical Characteristics

Transmit Optical Wavelength	1310nm and 1550nm	
Optical Connectors	ST Type	
Two fiber system (standard)	1310	1550
Minimum Transmit Power	-7 dBm	- 7 dBm
Minimum Receiver Power	- 32 dBm	-32 dBm
Available Loss Margin	25 dB	25 dB
One fiber system (WDM option)		
Minimum Transmit Power	- 8 dBm	- 8 dBm
Minimum Receiver Power	- 31 dBm	- 31 dBm
Available Loss Margin	23 dB	23 dB
Fiber Optic Distance Limits		
Singlemode	20Km	
Multimode	5 Km	

Coax Characteristics

Impedance	75 Ohm
Recommended Cable Type	Belden 8281 (2 required)
Connectors	BNC
Distance Limits	305 meters (1,000 feet)

Warranty

LIMITED WARRANTY STATEMENT

Telecast Fiber Systems, Inc. ("Telecast") expressly warrants to Buyer that the Products supplied shall be free from defects in materials and workmanship for a period of 12 months following the date the Products are delivered to Buyer (the "Warranty Period"). Telecast's liability under this limited warranty shall be limited, at its option, to providing refund of purchase price for Products, or replacing or repairing Products shown to be defective either in materials or workmanship. Buyer's sole and exclusive remedy for breach of warranty shall be such refund, replacement or repair.

A claim of defect in materials or workmanship in any Product shall be allowed only when it is submitted in writing to Telecast Fiber Systems, Inc. within seven days after discovery of the defect, and in any event within the Warranty Period. No claim shall be allowed in respect of any Product which has been altered, neglected, damaged or stored in any manner which adversely affects it. In order to obtain service under the terms of this warranty, Distributor's customer or Distributor must notify Telecast of the defect prior to the expiration of the applicable warranty period and obtain a Return Authorization Number from Telecast. In no event may products be returned to Telecast or to Distributor for warranty service without having obtained from Telecast a Return Authorization Number.

This limited warranty applies only to new and unused Products delivered to Buyers located within the United States of America, or to international Buyers if sold through an authorized Distributor organization, and shall not extend to any equipment not manufactured by Telecast Fiber Systems, Inc., even though such equipment may be sold or operated with the Products. In addition, this limited warranty shall be void and of no further force or effect whatsoever if the Product is repaired or modified by any person other than an authorized representative of Telecast Fiber Systems, Inc. without the consent of Telecast Fiber Systems, Inc. This warranty shall not apply to any defect, failure or damage caused by improper use or inadequate maintenance and care. Nor shall this warranty apply to any damage caused in whole or in part by attempts by personnel other than Telecast's personnel, as approved in advance in accordance with the foregoing provisions, to open, install, repair, or service the Product; nor to damage resulting from improper connection with incompatible equipment; nor to damage to a unit which has been modified by personnel other than Telecast personnel.

Products returned to Telecast for warranty service shall be shipped, freight prepaid to Telecast. Telecast will return the repaired product or ship a replacement, freight prepaid, to either Distributor or Distributor's customer, as requested by Distributor's customer, at a location within the United States or, at Telecast's option, to Distributor's location in the case of international sales.

This limited warranty shall also apply to Products that replace defective Products and Products that have been repaired by authorized representatives of Telecast Fiber Systems, Inc., but only for the original Warranty Period. The Warranty Period shall not be extended by reason of defect, or any period of time during which the Product is not available to Buyer because of defects or repairs, without the express written consent of Telecast Fiber Systems, Inc.

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