FIBERLINK®
XA-1900, XA-1903, RA-1900, XR-1900
IRIG Transmission System

USER'S MANUAL

WORLD HEADQUARTERS
55 Cabot Court
Hauppauge, NY 11788 USA
TEL: (631) 273-0404 FAX:(631) 273-1638
WWW: http://www.commspecial.com
EMAIL: info@commspecial.com

Communications Specialties Pte Ltd
100 Beach Road
#22-09 Shaw Tower
Singapore 189702
TEL: +65 6391 8790 FAX: +65 6393 0138
EMAIL: csiasia@commspecial.com

P/N: 101958 Rev. E

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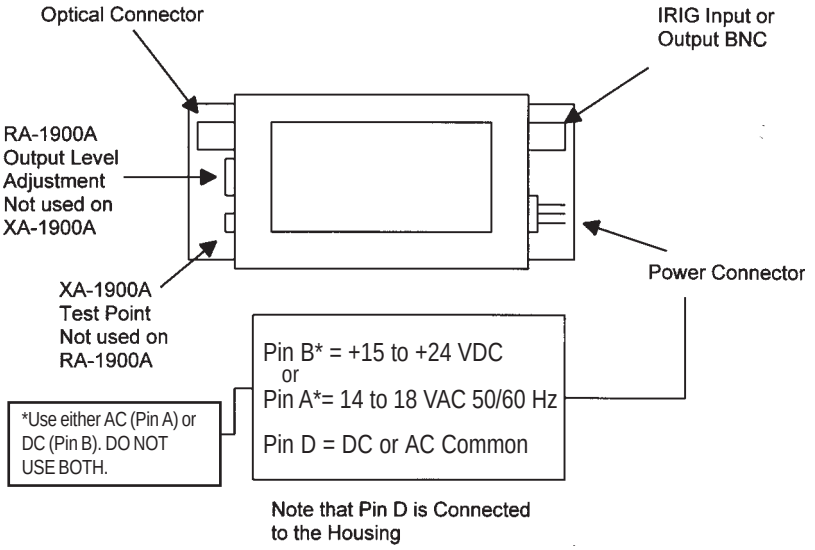
QUICK INSTALLATION GUIDE

The following is a quick installation guide for the Fiberlink® XA and RA-1900. It is intended for users familiar with the installation of fiber optic transmission systems to get "up and running" in minimal time. For additional details, or for installation of the XA-1903 and XR-1900 please consult the balance of this manual.

Stand-Alone Version



Rack Mountable Version

The Fiberlink XA-1900 and RA-1900 may also be used in the MCR-1000A rack-mountable card cage. In order to accomplish this, they must first be mounted to individual AP-1000 adapter plates with the four enclosed nylon binder head screws. Then the 5 pin power connector and BNC IRIG cable on the adapter plate must be connected. When this is done, the units may be plugged directly into the card cage. All operating power for the XA-1900 and RA-1900 will then be provided by the MCR-1000A card cage.

GENERAL INFORMATION

Introduction

The Fiberlink XA-1900 IRIG Fiber Optic Transmitter is designed to convert wide band IRIG analog signals into modulated light for transmission over fiber optic cables. The transmitter employs linear, intensity modulation and is suitable for use with most optical fibers. The XA-1900 employs a single ended, unbalanced input which is compatible with all IRIG input formats. There is only one operating control on the XA-1900 series. This is an input attenuator, designed to allow input signals larger than the normal 1 volt rms level to be accommodated. The XA-1903 is a 10 channel optical output version of the XA-1900 and is designed for IRIG signal distribution applications.

The RA-1900 IRIG Fiber Optic Receiver is the companion receiver for the XA-1900 and XA-1903. It converts the modulated light from a fiber optic cable back into an exact replica of the original transmitted signal. The RA-1900 is intended for driving single ended, unbalanced loads in accordance with IRIG standards. There is only one operating control on the RA-1900 series. This is an output level control and is used to compensate for the optical attenuation of the fiber being used. The XR-1900 is an optical to electrical "tap/repeater" designed for IRIG distribution systems.

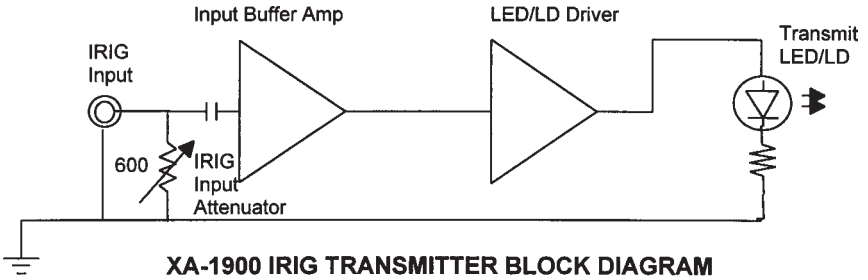
Technical Specifications

System Bandwidth (+0, -3 dB)	20Hz to 100KHz
Input/Output Load Impedance	600 Ohms Nominal
Input/Output Signal Voltage	1 volt rms
Signal/Noise Ratio	67 dB typical
Noise Floor (full bandwidth)	1.3 mv rms max.
Optical Loss Budget	50u Fiber, 0-10 dB 62.5u Fiber, 0-13 dB 8/10u Fiber, 0-10 dB
Operating Wavelength	850 nm, 1300 nm
Optical Connectors	ST, SMA or FCPC
Operating Temperature Range	-20 to +60 degrees C

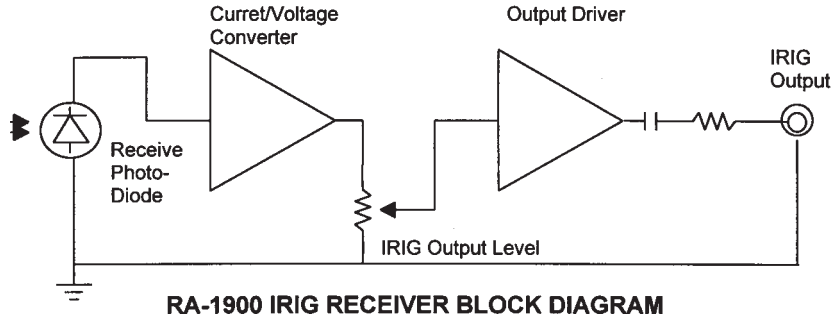
Theory of Operation

The Fiberlink XA-1900 converts an incoming audio signal into a varying current that intensity modulates the transmitting LED located in the optical connector on the unit. The modulated light is then applied to a fiber optic cable.

The RA-1900 detects the light coming from a fiber optic cable by a photodiode located in the optical connector on that unit. The small current produced by the photodiode is amplified and applied to a driver stage. This stage provides the proper output voltage to drive the required load. The output level adjustment is used to set the output audio to the proper level.



XA-1900 IRIG TRANSMITTER BLOCK DIAGRAM



RA-1900 IRIG RECEIVER BLOCK DIAGRAM

The XA-1903 is functionally the same as 10 XA-1900 units in one housing.

The XR-1900 is functionally the same one XA-1900 and one RA-1900 in the same housing.

INSTALLATION INSTRUCTIONS FOR XA-1900 AND XA-1903

Installation Procedure

The Fiberlink XA-1900 is supplied pre-aligned for use with an input signal of 1 volt rms. It may be put into service by simply making the appropriate signal and power connections. When input voltages in excess of the normal 1 volt rms level are to be accommodated, the following procedure (in particular, steps 2, 3, and 4) should be followed:

1. It will be necessary to have a source of +15 to +25 volts DC or 14 to 18 volts AC 50/60 Hz. Be certain to make all connections carefully and check hat the correct pins are being used.
2. Turn the input attenuator , located in the white plastic bushing between the electrical connectors on the XA-1900, fully clockwise (10 - 15 turns will be (adequate). In the XA-1903, this attenuator is located on the internal P/C board, near the input BNC connector, and is labeled R1. When using the XA-1903, also set the rear panel input switch to the 600 ohm position.
3. Apply power and, with no signal applied, connect an oscilloscope between the test jack, located next to the optical output connector and the case of transmitter for the XA-1900, and on the P/C board for the XA-1903. Any of the points labeled TP!, TP2, TP3, TP4 or TP5 may be used. The oscilloscope will show the current flowing through the transmitting LED, which exactly corresponds to the signal being transmitted.
4. Apply the signal to be transmitted and slowly turn the attenuator until the signal appears on the scope. Now continue to turn the attenuator until a maximum peak-to- peak amplitude of 0.8 volts is obtained. This point constitutes full modulation. If the signal level is increased further, distortion and clipping will occur. The best level is just below the clipping point.
5. Once this adjustment has been made, the transmitter is ready for operation.

Note that the transmitting element in the "-7" single mode version of the XA-1900, the XA-1903 and the transmitting section of the XR-1900 uses a solid state Laser Diode located in the optical connector on the unit. This device emits invisible infrared electro-magnetic radiation which may be may be of sufficient intensity to cause instantaneous damage to the retina of the human eye. As a result, direct viewing of this radiation should be avoided at all times.

Signal and Power Connections

The XA-1900 may be powered from an external AC or DC power supply. Pin connections are as follows:

PIN	FOR DC OPERATION	FOR AC OPERATION
A	No Connection	14 to 18 volts 50/60Hz
B	+15 to +25 volts	No Connection
D	DC Common	AC Common
E	No Connection	No Connection
H	No Connection	No Connection

Please note that AC and DC common is connected to the enclosure.

The mating power connector for this system is an Amphenol 126-223 or equivalent.

For operation from 115 VAC 60Hz, a Communications Specialties =XP-1000A plug-in adapter may be used. This adapter is supplied with the appropriate connector installed.

Signal connections are made via a standard BNC type signal connector. Pin connections are as follows:

Center pin	Signal
Outer shell	Signal return and ground

Operating Pointers

Driving Signal: The input to the XA-1900 is an AC coupled 600 ohm impedance. It can be driven by any source including lines with DC levels (below 4 volts) present. The signal return is connected to case ground and power ground.

The XA-1903 may be switched between the 600 ohm impedance level and a high impedance level. The high impedance level is used to connect additional XA-1903 units to form a distribution system. When this feature is desired, connect the original IRIG signal to the input BNC connector of the first XA-1903 and the output BNC connector of that unit to the input BNC connector of the second XA-1903 and so on until all XA-1903 units have been connected. Then set all impedance switches to the high impedance position except for the last XA-1903, which should be set for 600 ohms.

Power Supplies: The power input to the XA-1900 is designed to accept AC or DC voltages. In order for proper operation, the AC level should not drop below 14 volts rms or the DC level, below 15 volts DC. As long as this criteria is met, unregulated sources may be used. To prevent damage, voltages higher than 18 volts AC or 25 volts DC should not be applied. Suitable voltages can be obtained from various low voltage transformers or from a Fiberlink XP-1000A, 115 to 14 VAC plug-in adapter.

Note that one side of the DC input or AC input is connected to the case.

The XA-1903 operates from 115/239 VAC 50/60 Hz.

Optical Fiber: Versions of the XA-1900 and XA-1903 are available to drive most multimode (MM) and single-mode (SM) optical fibers. The specific models are identified by a suffix at the end of the model number as follows:

Fiber Size	Connector	850nm	1300nm
50u, 62.5u MM	ST	-1	-3
50u, 62.5u MM	SMA	-2	-4
8/10u SM	FCPC	-	-7

Installation of XA-1900 in the MCR-1000A Card Cage

The XA-1900 can be used in the MCR-1000A rack-mountable card cage. In order to accomplish this, it must first be mounted to an AP-1000 adapter plates with the four enclosed nylon binder head screws. Then the 5 pin power connector and BNC IRIG cable on the adapter plate must be connected. When this is done, the unit is ready to be plugged into the card cage. All operating power for the XA-1900 will then be provided by the MCR-1000A card cage.

The XA-1903 may be directly mounted in a standard 19 inch rack frame.

INSTALLATION INSTRUCTIONS FOR RA-1900 AND XR-1900

Installation Procedure

The RA-1900 and XR-1900 are provided with a single control that will have to be adjusted prior to putting the unit in service. This control is used to compensate for existing optical cable attenuation. Since optical cable attenuation is a function of the fiber optic cable used, the receiver will have to be re-adjusted, with the actual fiber optic cable used in the system as follows:

1. Apply power and signal to both the RA-1900 to be used as well as the matching XA-1900 or channel being used on the XA-1903. For alignment purposes, the input signal to the transmitter should be a 1 KHz, 1 volt rms sine wave.
2. Connect the fiber optic cable from the transmitter to the receiver, and a 600 ohm load resistor to the output connector of the receiver.
3. Connect an oscilloscope across the 600 ohm load resistor.
4. Adjust the output level control until 1 volt rms is obtained.
5. This completes alignment of the receiver.

The XR-1900 consists of an XA-1900 and RA-1900 in the same package. As a result, the installation instructions for the XR-1900 transmitter section is the same as for the XA-1900 and the installation instructions for the XR-1900 receiver section is the same as for the RA-1900.

BE CERTAIN TO READ AND OBSERVE THE WARNING RELATING TO THE XR-1900 IN THE XA-1900 SECTION OF THIS MANUAL.

Signal and Power Connections

The RA-1900 and XR-1900 may be powered from an external AC or DC power supply. Pin connections are as follows:

PIN	FOR DC OPERATION	FOR AC OPERATION
A	No Connection	14 to 18 volts 50/60Hz
B	+15 to +25 volts	No Connection
D	DC Common	AC Common
E	No Connection	No Connection
H	No Connection	No Connection

Please note that AC and DC common is connected to the enclosure.

The mating power connector for this system is an Amphenol 126-223 or equivalent. For operation from 115 VAC 60Hz, a Fiberlink XP-1000A plug-in adapter may be used. This adapter is supplied with the appropriate connector installed.

Signal connections are made via a standard BNC type signal connector. Pin connections are as follows:

Center pin	Signal
Outer shell	Signal return and ground

Operating Pointers

Output Signal: The output of the RA-1900 and XR-1900 is designed to drive load impedances of 600 ohms or more. The RA-1900 employs an unbalanced output configuration with signal return connected to case ground and power ground. Attempting to drive lower impedance loads may result in distortion and low output levels.

Power Supplies: The power supply considerations for the RA-1900 and XR-1900 are the same as for the XA-1900.

Optical Fiber: Versions of the RA-1900 and XR-1900 are available to drive most multimode (MM) and single-mode (SM) optical fibers. The specific models are identified by a suffix at the end of the model number as follows:

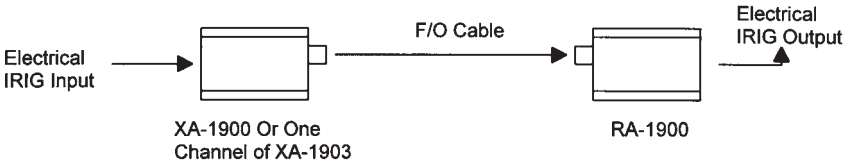
Fiber Size	Connector	850nm	1300nm
50u, 62.5u MM	ST	-1	-3
50u, 62.5u MM	SMA	-2	-4
8/10u SM	FCPC	-	-7

Installation of RA-1900 in the MCR-1000A Card Cage

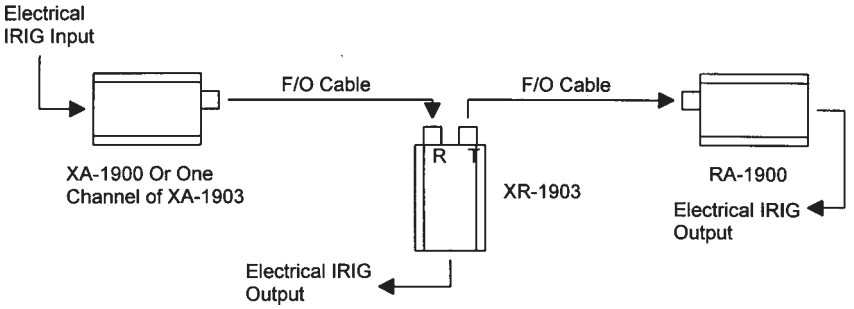
The RA-1900 can be used in the MCR-1000A rack-mountable card cage. In order to accomplish this, it must first be mounted to an AP-1000 adapter plates with the four enclosed nylon binder head screws. Then the 5 pin power connector and BNC signal cable on the adapter plate must be connected. When this is done, the unit is ready to be plugged into the card cage. All operating power for the RA-1900 will then be provided by the MCR-1000A card cage.

IRIG SYSTEM CONFIGURATIONS

The XA-1900, RA-1900 and XR-1900 are designed to configure an IRIG point-to-point or distribution system. The diagrams below show both configurations.



Point-to-Point IRIG Transmission System



IRIG Multi-drop Distribution System

INTERFACE TROUBLESHOOTING

Some troubleshooting pointers to consider when this system is not operating properly are:

XA-1900, XA-1903 or Transmitting Section of XR-1900

Is operating power present and connected to the proper pins on the power connector?

Is an IRIG signal present at the input connector of the unit?

Is the input attenuator set properly?

Is the impedance switch on the XA-1903 set properly?

RA-1900 or Receiving Section of XR-1900

Is operating power present and connected to the proper pins on the power connector?

Is the correct fiber optic cable connected between the transmitter and receiver?

Is the correct size fiber being used for the particular transmitter/receiver combination?

Is the attenuation of the fiber optic cable within the range of the system's loss budget specifications?

Is an IRIG signal present at the output connector of the unit?

Is the output attenuator set properly?

If all of the above is correct and the system is still not operating, please contact the Customer Service Department for further assistance.

OVERALL SYSTEM CHECKOUT AND TROUBLESHOOTING TECHNIQUES

Occasionally, during the installation of a fiber optic system, difficulties arise that are the result of factors beyond the control of the installer.

It is to simplify the task of the installer that the following general checkout procedure is included.

A. Check Transmitter or Transmit Section of a Transceiver

1. Is operating power (DC, AC, Voltages) correct?
2. Are the correct pins on the connector or terminal block being used?
3. Is the correct signal level present at transmitter input?
4. Does the transmitting LED glow dimly when a signal is applied? Note that this is only true for an operating wavelength of 850 nm. Units at 1300 nm are totally invisible.*
5. If the unit is an analog or video transmitter (at 850 nm), is there a continuous dim glow from the transmitting LED? *
6. Is the optical connector on the transmitting LED clear of any obstruction or minute dirt particles?
7. Does the fact that the power ground and signal ground of many systems are common, matter?
8. Does the fact that the power ground, signal ground, and case are common cause a short circuit anywhere in the system?

* The above visual check should only be attempted with LEDs.

NEVER LOOK DIRECTLY AT AN OPERATING *LASER* DIODE REGARDLESS OF THE OPERATING WAVELENGTH!!!

US Government regulations require that all equipment using Laser Diodes be clearly identified with appropriate warning labels. Be sure to heed these labels.

B. Check Optical Connectors

1. If stepped 906 type SMA optical connectors are being used, are the short plastic alignment sleeves normally supplied with the connectors being used? If they are not present, the system may not work properly!
2. Are the connectors are being used the correct size for the fiber being used?
3. Are the ends of the connectors free of all dust or dirt? If not, gently clean the tip of the connector with a clean cloth or gauze moistened with alcohol.
4. Is the fiber broken in the connector? A quick inspection with an inexpensive jeweler's loop can determine this.
5. Is the fiber protruding from the tip of the connector? If so, refinishing will be necessary.

C. Check Fiber Optic Cable

1. Is the fiber optic cable pulled too tightly around a sharp corner?
2. Is the correct fiber size being used with the correct transmitter/receiver combination?
3. Does the fiber pass light at all? A small penlight or flashlight can usually be used for this test.
4. Does the fiber have too much attenuation for the system? The attenuation measured on the reel will always be different after the cable is installed.
5. When using very short lengths, less than 10 meters (30 feet), overloading of the receiver may occur. The shorter the length of the fiber, the greater the possibility for this condition. Be sure there is adequate attenuation in any system. If this seems to be the case, or if operation with a meter or so of fiber is required, contact the factory.

D. Check Receiver or Receiving Section of a Transceiver

1. Is the operating power (DC, AC, Voltages) correct?
2. Are the correct pins on the connector or terminal block being used?
3. Is light coming out of the fiber optic cable? This may be difficult to see in many cases, but a dim glow may be present with 850nm light. Other wavelengths, such as 1300 nm, are totally invisible.
4. Is the optical connector on the receiver optical port clear of any obstruction or minute dirt particles?
5. Does it matter that the power ground and signal ground of many systems are common?

MAINTENANCE

The Fiberlink XA-1900, XA-1903, RA-1900 and XR-1900 have all been manufactured using the latest semiconductor devices and techniques that electronic technology has to offer. They have been designed for long, reliable, and trouble free service and are not normally field repairable.

Should difficulty be encountered, Communications Specialties maintains a complete service facility to render accurate, timely and reliable service of all products.

The only maintenance that can be provided by the user is to ascertain that optical connectors are free of dust or dirt that could interfere with light transmission and that electrical connections are secure and accurate.

All other questions or comments should be directed to our Customer Service Department. It should be noted that many “problems” can easily be solved by a simple telephone call.

WARRANTY

Communications Specialties warrants that for a period of three years after purchase by the Buyer, all Fiberlink® transmission systems will be free from defects in material and workmanship under normal use and service. A Return Material Authorization (RMA) number must be obtained from Communications Specialties before any equipment is returned by the Buyer. All material must be shipped to Communications Specialties at the expense and risk of the Buyer.

Communications Specialties' obligation under this warranty will be limited, at its option, to either the repair or replacement of defective units, including free materials and labor. In no event shall Communications Specialties be responsible for any incidental or consequential damages or loss of profits or goodwill.

Communications Specialties shall not be obligated to replace or repair equipment that has been damaged by fire, war, acts of God, or similar causes, or equipment that has been serviced by unauthorized personnel, altered, improperly installed or abused.

RMA numbers and repairs can be obtained from:

Communications Specialties, Inc.
55 Cabot Court
Hauppauge, N.Y. 11788 USA

Tel: (631) 273-0404. **Internet: www.commspecial.com**
FAX: (631) 273-1638 **Email: info@commspecial.com**

Customers in the Asia Pacific Region should contact:

Communications Specialties Pte Ltd, Singapore.
TEL: +65 6391 8790 FAX: +65 6396 0138

Please have your serial number available when contacting us.