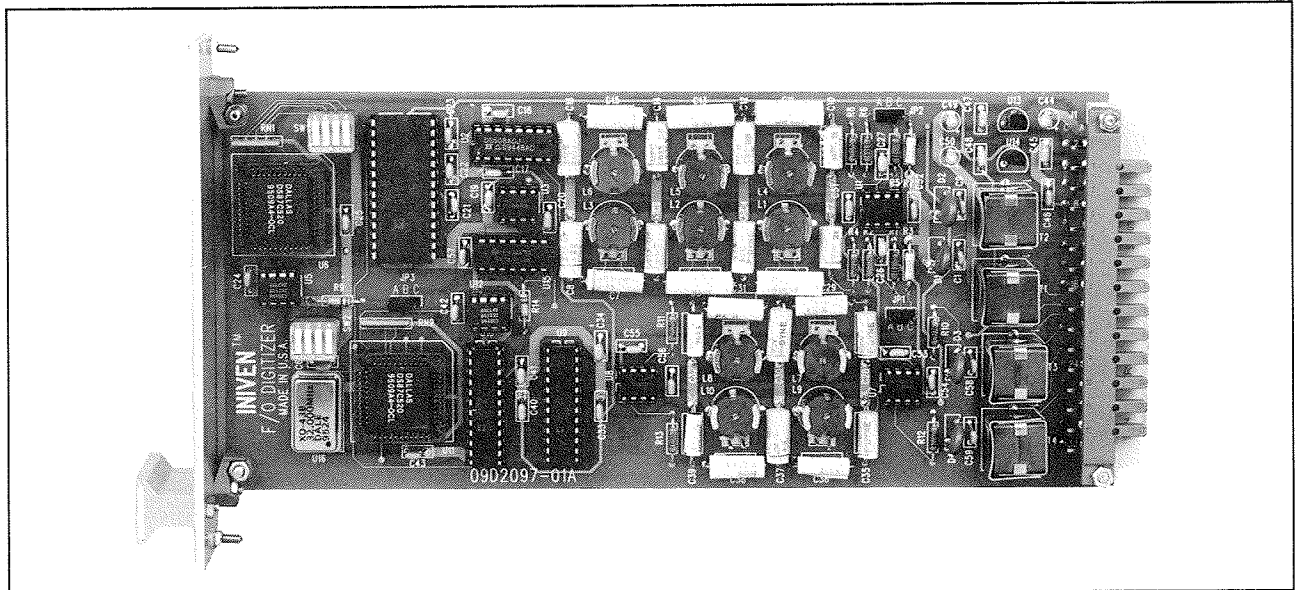


# INIVEN™

## INSTRUCTION MANUAL

### F/O-98 & F/O (PTR) SERIES

### FIBER OPTIC INTERFACES



**FIG. 1 DIGITIZER MODULE, SIDE VIEW**

**DESCRIPTION:** The Fiber Optic series of equipment allows for the sending and receiving of analog (or digital, in special applications) signals over a dedicated fiber optic pair. INIVEN's system provides for one or two voice channels in both the transmit and receive direction. It is available in both single and multimode.

Depending on the application, light ranges from 850 to 1550 nm are available. It can be supplied in one of two versions, one for mounting in INIVEN's series 98 chassis or one for the Audio Teleprotection chassis, PTR-1000.

The main difference between the two versions is physical. Both utilize a main board (Digitizer) and a Fiber Optic interface assembly. Interface assembly

on the 98 series is via an I/O (input/output) module and the PTR is a case with harness mounted on the rear panel drilled for this purpose.

#### **FEATURES:**

**Single or dual channel option.**  
**Single digital input/output option.**  
**Economical design.**

#### **SPECIFICATIONS:**

Input Voltages:

+12 Vdc @ 35 ma  
-12 Vdc @ 30 ma  
+5 Vdc @ 85 ma

Audio Levels:

Input: -50 to + 12 dBm

Output: -40 to +6 dBm

Level Stability: +/- .25 dB

Interface: 4 Wire

Impedance: 600 Ohms, balanced

Frequency Response: +/- .5 dB, 300  
to 4000 Hz.

Distortion: Less Than .1% @ 1 kHz.

Analog to Digital: 12 Bit Converter

Digital to Analog: 12 Bit Converter

Word Type: 11 Bit (1 Start, 8 data  
bits, 9th bit high, 1 stop  
bit)

Environmental Requirements:

Temperature Range:

-30°C to +60°C (-22°F to 140°F)

Relative Humidity: 95% maximum, non  
condensing @ 40°C (104°F)

Physical:

Weight: 1.4 lbs (64kg)  
Dimensions: 9.99" (25.4mm)  
Wide by 5.04" (128 mm) High by  
9.76" (248mm) Deep. [1 PTR  
Module slot].

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## SAFETY

**Standard safety precautions must be followed at all times when installing, operating, servicing and repairing this equipment. INIVEN/Conolog Corp. assumes no liability for failure to observe standard or specifically noted safety requirements or to use**

**this equipment for purposes other than intended.**

**WARNING  
DO NOT DIRECTLY LOOK AT  
THE OUTPUT OF THE FIBER  
HEADS.  
EYE DAMAGE MAY OCCUR**

### Grounding:

A suitable ground is required to reduce the hazard of shock. Refer to the enclosed module, chassis and/or cabinet wiring diagram for ground connection locations.

### Environment:

Operation of any electrical equipment in any area containing gases, fumes, wet, or damp is a potential safety hazard. Necessary precaution should be taken.

### Manual:

Operators and maintenance personnel should read this manual before installing the equipment and placing it in service. Only properly trained personnel with proper tools and equipment should operate, maintain, repair, or service this equipment.

### Shock:

Potentially dangerous electrical shock can occur whenever working on this product. Protective measures and safety procedures should be observed at all times.

### **Theory of Operation:**

**General:** The Fiber Optic series of couplers convert analog signals to digital signals which modulate light on the transmit end and convert the modulated light to digital signals and back to analog on the receive end.

**Power Input:** The Digitizer module and optic head adapter both require +/-12 to 15 V dc and +5 Vdc from the power supply. On the digitizer module, positive voltage regulator (U13) converts the + 12 to 15 Vdc to a regulated +5 Vdc. Bi-polar voltage regulator (U14) converts the - 12 to 15 Vdc to a regulated -5 Vdc. All five voltages are used to power the module.

### **TRANSMIT SECTION:**

**Audio Input:** There are two audio inputs to the digitizer. Input channel 1 is discussed. Input channel 2 is similar, refer to the enclosed schematic for components used. Transformer T1 isolates and couples the audio input to the module. Varistor D1 provides protection against transients which may enter the unit via the audio lines.

OP-Amp, U1A provides the gain required in accordance with the input signal range. Jumpers are arranged for maximum inputs of +13, +8 and -1 dBm.

L1 through L3 and C2 through C8 form a low pass filter to restrict frequencies above 4 kHz. Output of the filter is then fed to the switch.

**Switch:** U2 is a multiplexer that switches between the two low pass filter outputs at a 15 kHz rate. The output is then fed

to the analog to digital converter via operational amplifier U3. The switching is controlled by the microcontroller U6.

**Watchdog Timer:** Microcontroller software sequence is protected by watchdog timer U5. Should U6 program sequence jump out of step (a rare occurrence) it would require power to the unit be turned off and back on again. The watchdog timer prevents this from happening by resetting the controller, should it lock up, which causes the sequence to start at the beginning.

**General:** Output of the analog to digital converter is controlled by the 8 bit microcontroller (U6). The digital output is then fed to the emitter via the hex inverting Schmitt trigger U15. Section four of switch SW1 is used for single or dual channel operation. The remaining sections are for future use.

Optionally one digital channel only may be sent using the fiber optic adapter assembly and the Digital Signal Input on the digitizer. When using this option analog channels are not available.

Fiber Optic Adapter contains the transmit and receive fiber optic heads. Output from the digitizer is fed to the emitter via an inverter and switching transistors Q1 and Q2 (switching is accomplished between the signal and ground). D1 is modulated and the light is coupled to the fiber through the connector. Connector and emitter type is determined per application.

### **RECEIVER SECTION:**

Light from the fiber cable is coupled to the receive head of the fiber optic

adapter. The isolated signal is then amplified via operational amplifier U1. Capacitors C2 & 3 and diodes D3 & 4 form a zero crossing circuit for the input to the Comparator U3. The input to U3 is compared against circuit common and switches its output accordingly. The signal is then sent to the digitizer module via hex inverter U2.

For digital only applications the signal is fed through a hex inverter U15 located on the digitizer and brought out to the Digital Signal Output terminal. Analog channel service is not available when utilizing this option.

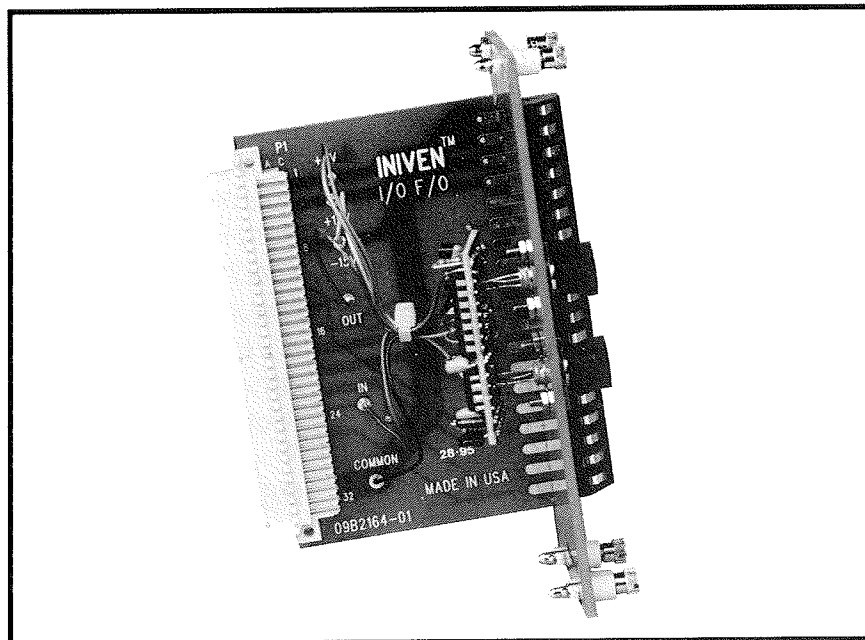
In analog applications the digital signal is fed to the receive 8 bit microcontroller U11 for processing. Switch SW2 is reserved for future options.

Like the transmit section a watchdog timer U12 is provided to protect the controller sequence.

Output of the controller is fed to the digital to analog converters (U9 & 10) to convert the two channels back to audio frequencies.

Audio Output: There are two audio outputs from the digitizer. Output channel 1 is discussed. Output channel 2 is similar, refer to the enclosed schematic for components used. The audio signal is amplified by op-amp U8 and passes through a low pass filter comprising of capacitors C28 through 30 and inductors L7 & L8. Amplification is provided by op-amp U7. Varistor D3 protects against transients which may enter the unit via the audio lines. Transformer T3 provides for both isolation and connection to the output for channel one. The receive level is 6 dB below the transmitted audio input level.

98 I/O  
SIDE VIEW



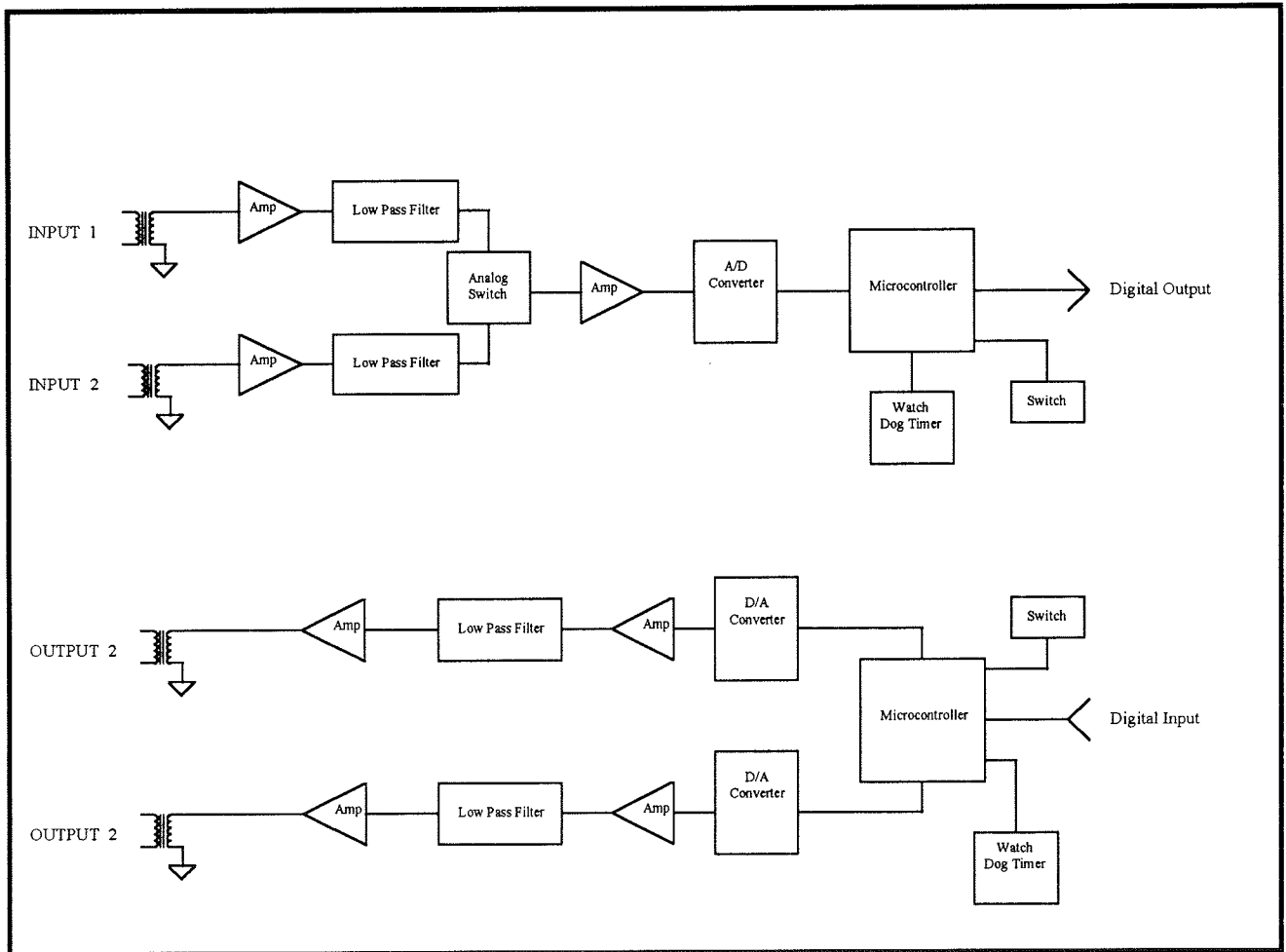


Fig. 2 Block Diagram, Digitizer

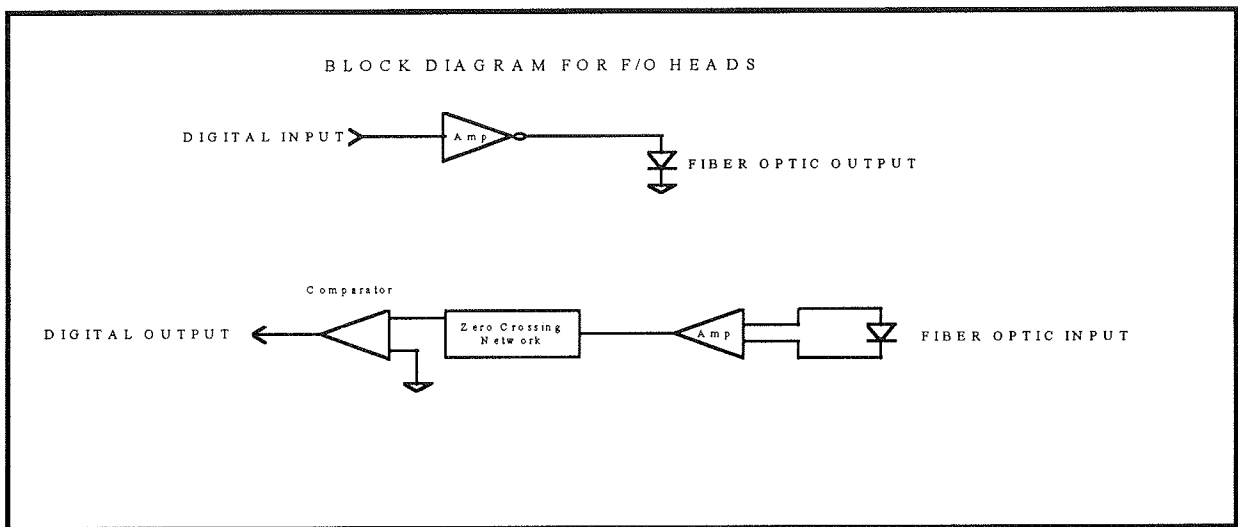


Fig. 3 BLOCK DIAGRAM, F/O Adapter

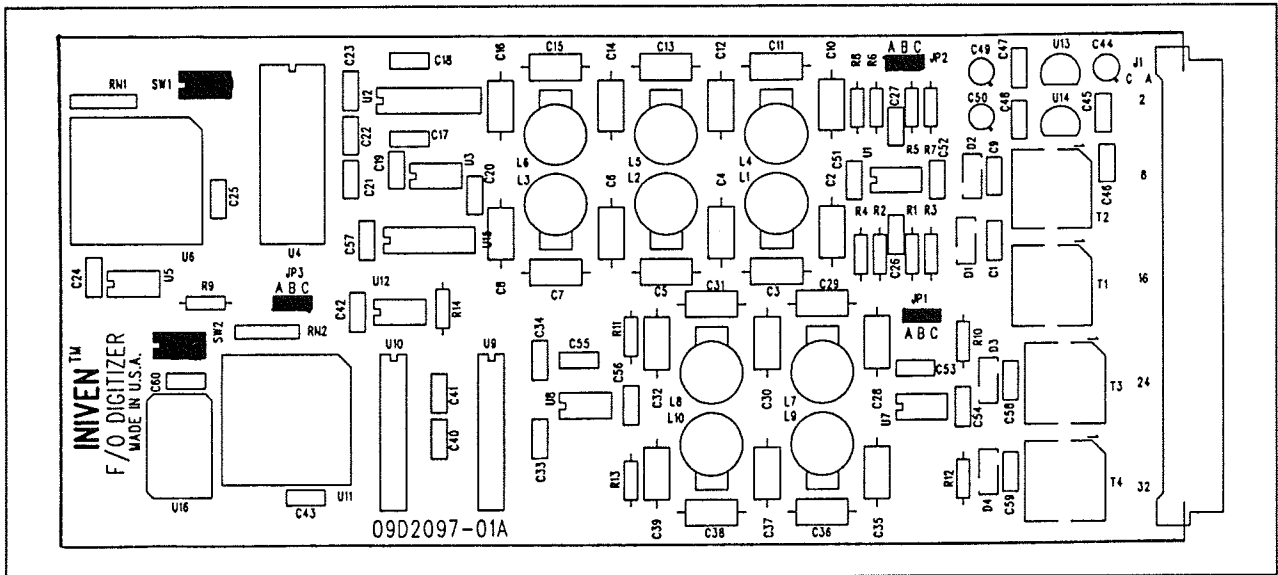


Fig. 4 Controls & Indicators

**SW1: Position 4 "ON" Single Channel, "OFF" Dual Channel operation.**

**SW2: Future Use.**

**JP1 & 2: Maximum input Level. None +13 dBm, A to B -1 dBm, B to C +8 dBm.**

**JP3: A to B, direct digital input; B to C, analog operation**

## INSTALLATION:

**GENERAL:** Fiber Optic Series equipment is supplied in various forms depending on the application and system purchased. When supplied loose the module must be installed in an appropriate housing (chassis), with card guides and mating edge connector (mini-mother board) or I/O module. This section covers the most common supplied methods. Separate instructions will accompany equipment not covered herein.

**UNPACKING:** This equipment may be supplied loose, mounted in an individual chassis, stacked interconnected chassis or as part of a rack or cabinet. Follow the procedure for the type of system supplied.

Loose and/or equipment mounted in an individual chassis will be packed in its own shipping carton. Inspect the carton for possible damage in transit. Open each carton carefully and remove the contents. Inspect the equipment for possible damage. Verify all items of value have been removed prior to discarding any packing material.

**NOTE:** It is suggested the carton be retained for possible onward shipment.

Interconnected chassis or equipment supplied in racks or cabinets will be supplied in special boxes, wood crates or if shipped via air-ride van without any case. Inspect the crate or other packing for damage in transit. Carefully remove the equipment from the container and inspect the equipment for possible

damage. Verify all items of value have been removed from the crate prior to discarding any packing material and refer to the note above.

Should transit damage be found please notify INIVEN and the carrier immediately.

**MOUNTING:** After unpacking, follow the appropriate mounting procedure.

Systems provided in a rack or cabinet from the factory must be secured to the floor or wall as required. Mounting hardware is not supplied due to the various surfaces and mounting methods.

**CAUTION: EQUIPMENT MOUNTED IN SWING RACK TYPE CABINETS MUST BE SECURED TO THE MOUNTING SURFACE PRIOR TO OPENING THE SWING RACK TO PREVENT THE CABINET FROM FALLING.**

### **98 Series Equipment**

Loose module: (The following is for new installations - replacement of an existing module will have the card guides already mounted, refer to **MODULE REPLACEMENT** in the maintenance section of this manual). Each I/O connector comes with two Card Guides which are to be mounted within the chassis (A one rack unit high chassis is supplied with the card guides mounted). Locate the desired position within the chassis for which the module is to be placed. Remove blank panels if existing. Viewing the chassis from the front, the recommended arrangement is a power supply on the extreme left then followed by transmit, receive and other modules working towards the right side

of the chassis. Determine the module location within the chassis and where the unit will be installed.

From the front of the chassis and with the boss side (rounded) facing to the right press the lower card guide into the holes provided for the desired location. Repeat this procedure for the upper card guide.

The I/O module, Optic portion, is (provided separately) is installed from the rear of the chassis. Aligning the I/O with the appropriate desired location push the assembly into the chassis. Turn the two mounting screws clockwise using a flat blade screwdriver which will secure it in place.

Install the module by sliding it into the proper slot aligning to the card guides. Once the module is firmly seated use a flat bladed screwdriver to turn the two mounting screws on the front panel clockwise.

### **PTR-1000 Series Equipment**

Loose Module: (The following is for new installations with a pre-wired position - replacement of an existing module will have the card guides already mounted, refer to **MODULE REPLACEMENT** in the maintenance section of this manual). The PTR-1000 chassis is arranged so that the Fiber Optic Digitizer is mounted in the tenth module slot from the right looking at the front of the chassis (in most applications). **Refer to the wiring diagram for exact location.** Card guides are normally provided, however, in some models this may not be the case and other positions may be used. Press

card guides into place (top & bottom) in the appropriate location.

Install the module by sliding it into the proper slot aligning to the card guides. Once the module is firmly seated into the edge connector use a flat bladed screwdriver to turn the two front panel mounting screws clockwise.

**POWER TO THE EQUIPMENT IS TO BE DISCONNECTED PRIOR TO MOUNTING THE FIBER OPTIC ADAPTER FOR SAFETY REASONS.**

The Fiber Optic adapter is mounted on the inside of the rear panel with the fiber heads facing out. Loosen the two thumb screws on the rear panel and ease the panel down. (The rear panel must have the two holes located on the right hand side as viewed from the rear of the chassis). Hold the adapter in place (insuring the transmit and receive heads pass through the panel in the proper position) mount the unit using the two screws provided in the upper and bottom outermost screw holes from the rear of the chassis.

**VENTILATION:** Proper ventilation is required for most electronic equipment. Enclosed cabinets or rooms where this equipment is mounted should be kept at temperatures within the specified limits. Operation beyond these limits may affect reliability.

**ELECTRICAL CONNECTIONS:**

**98 Series Equipment**

User connections are made via the I/O on the rear of the chassis. The other units in the 98 Series of equipment will

have these connections in the instruction manual for the specific module being used. On equipment supplied wired from the factory or on inter-wired chassis or cabinets an "as supplied" drawing will be included with the equipment. External wiring should be in accordance with the "as supplied" drawing when supplied.

Methods of making the wiring connections to the terminal blocks vary and based on local practice. It is suggested number 20 AWG size insulated wire, stripped portion tinned, be used. Approximately 1/4" of the insulation is to be removed and inserted in the terminal strip.

Module power and tone lines may be daisy-chained should the application allow.

Connect the fiber to the I/O in accordance with the type connector being used.

Tighten all connections and insure exposed wires do not touch each other or the chassis.

**PTR-1000 Series Equipment**

The fiber optic adapter contains six connectors which are attached to the module mother board(s). These connections are to be made per the specific chassis involved (a drawing will be provided). The leads from the adapter are as follows:

J1	TRANSMIT OUT
J2	RECEIVE IN
J3	+5 VOLTS IN
J4	+12 VOLTS IN
J5	-12 VOLTS IN
J6	COMMON



The above connections are to be made with the power off and the rear chassis door in the open position.

After the connections are made and checked, close the rear door and connect the fiber to the adapter in accordance with the type of connector being used.

Note: If the unit was provided as part of a system the module installation process will have been completed prior to shipment of the equipment. External wiring will be per the diagram supplied with the system.

#### INITIAL START-UP:

The digitizer contains three jumpers and one switch setting for normal operation. Switch, SW1 position 4 is on for single channel input and off for dual channel.

JP1 & 2 are set for the maximum signal input range. A to B for -1 dBm max., B to C for +8 dBm max., and no jumper is for +13 dBm max. (jumper is stored on one of the pins).

JP3 determines if the output is analog or direct digital. A to B is for direct digital and B to C is for analog.

#### ADJUSTMENTS:

There are no adjustments to be made on the fiber optic digitizer or adapter.

#### MAINTENANCE:

**ALL SAFETY PROCEDURES ARE TO BE STRICTLY ADHERED TO AND ONLY QUALIFIED MAINTENANCE, OPERATORS OR SERVICE**

**PERSONNEL ARE TO PERFORM WORK ON THIS EQUIPMENT. LIFE THREATENING VOLTAGES AND CURRENTS ARE PRESENT WITHIN THIS EQUIPMENT. OBTAIN ALL REQUIRED APPROVALS PRIOR TO PLACING THIS EQUIPMENT IN OR OUT OF SERVICE.**

PREVENTIVE MAINTENANCE is meant to reduce system downtime by locating and correcting potential problems prior to catastrophic failure. The following procedure is recommended to be performed on six month intervals. Equipment located in harsh environments may require more frequent maintenance. It is not the intent of this schedule to replace preventive maintenance procedures in place within any particular organization.

Items required to perform the following procedure:

Soft-bristled brush with non-conductive handle OR a source of low level (dry) compressed air.  
Clean dry cloth(s).  
Mild non-abrasive detergent solution.  
Test equipment described in the Installation Section (if required).

1. Turn off the power switch on the power supply module and de-energize the power applied to the equipment.
2. Remove the modules from chassis (**note module location**).
3. Using a brush or low pressure compressed air, remove all dust from the module and chassis.

4. Inspect module for signs of visual damage such as overheating or corrosion. Correct the condition prior to proceeding further.

5. Use the cloth and mild detergent to clean the front panels of each module and front of the chassis. Insure all parts are dry prior to proceeding.

6. Replace all modules in the proper location, as noted in step 2 above, aligning each to the card guides in the chassis. Be sure each card is firmly seated in the edge connector.

7. Energize power to the equipment and turn "on" the power supply.

8. Perform system checks.

MODULE REMOVAL is accomplished by first turning off the power switch on the power supply. Loosen the mounting screws. Pull out the module by its handle.

MODULE REPLACEMENT is accomplished by first turning off the power supply and then sliding the module into the proper slot aligning to

the card guides. Push the module handle until it is firmly seated in the edge connector. Tighten the mounting screws. Turn the power supply switch to "ON".

Note: In the event a replacement module is being installed check all switch and jumper positions prior to installation. Comparison with the removed module is one convenient method.

The equipment has been designed to operate in an industrial environment and should provide years of trouble free operation. In the unlikely event a malfunction should occur standard troubleshooting techniques may be followed to resolve the problem. To assist you we have included schematics and detailed information (including parts list) within this manual.

If factory assistance is required INIVEN may be contacted at the telephone numbers listed on the back of this manual. Should you require repair service please call for a return material authorization (RMA) number.

**Table 1. Replaceable Parts Digitizer**

<b>Circuit Symbol</b>	<b>Description</b>	<b>INIVEN Part Number</b>
<b>CAPACITORS:</b>		
C1, 9, 58, 59	Capacitor, ceramic, .001uF, 100V, +/-10% or equiv.	CM-X7R-E-102-K
C2, 10	Capacitor, metalized poly, .004uF, 100V, +/-5%, or equiv.	MPC32E402J
C3, 11	Capacitor, polystyrene, .018uF, 100V, +/-2%, or equiv.	PS32E183G
C4, 12	Capacitor, metalized poly, .027uF, 100V, +/-2% or equiv.	MPC32E273G
C5, 13	Capacitor, polystyrene, .018uF, 100V, +/-1% or equiv.	PS32E183F
C6, 14	Capacitor, metalized poly, .035uF, 100V, +/-2%, or equiv.	MPC32E353G
C7, 15	Capacitor, polystyrene, .003uF, 100V, +/-2% or equiv.	PS32E302G
C8, 16	Capacitor, metalized poly, .030uF, 100V, +/-2% or equiv.	MPC32E303G
C17, 27, 33, 34, 40-48, 51-57, 60	Capacitor, ceramic, .1uF, 50V, +/-20% or equiv.	CM-ZSU-D-104-M
C28, 35	Capacitor, metalized poly, .036uF, 100V, +/-2% or equiv.	MPC32E363G
C29, 36	Capacitor, polystyrene, .0024uF, 100V, +/-2% or equiv.	PS32E242G
C30, 37	Capacitor, metalized poly, .040uF, 100V, +/-2% or equiv.	MPC32E403G
C31, 38	Capacitor, polystyrene, .0091uF, 100V, +/-1% or equiv.	PS32E912F
C32, 39	Capacitor, metalized poly, .01uF, 100V, +/-2% or equiv.	MPC32E103G
<b>RESISTORS:</b>		
R1, 5	Resistor, metal film, 20k, 1/4 watt, +/-1% or equiv.	RN55D2002F
R2, 6	Resistor, metal film, 4.9k, 1/4 watt, +/- 1% or equiv.	RN55D4991F
R3, 7	Resistor, metal film, 30.1k, 1/4 watt, +/-1% or equiv.	RN55D3012F
R4, 8, 11, 13	Resistor, metal film, 1.43k, 1/4 watt, +/- 1% or equiv.	RN55D1431F
R9, 14	Resistor, carbon, 100k, 1/4 watt, +/-5% or equiv.	RCF07J104
R10, 12	Resistor, metal film, 604 ohm, 1/4 watt, +/-1% or equiv.	RN55D6040F
RN1, RN2	Resistor, network, 10k, 1/4 watt, +/- 5% or equiv.	460SX-101-103
<b>SEMICONDUCTORS:</b>		
D1-4	Varistor, GE V18ZA1 or equiv.	V18ZA1
U1, 7, 8	IC, Dual Op Amp, TI or Motorola TL082CP only	TL082CP
U2	IC, switch, 15kHz, ADG508AKN or equiv.	ADG508AKN
U3	IC, Operational Amp, TI TL081CP or equiv.	TL081CP
U4	IC, Analog to Digital converter, Analog Devices AD7871JN or equiv.	AD7871JN
U5, 12	IC, watchdog timer, Dallas Semiconductor DS1232 or equiv.	DS1232
U6, 11	IC, 8-bit microcontroller, Dallas Semiconductor DS87C520-QLC or equiv.	DS87C520-QLC
U9, 10	IC, Digital to Analog converter, Analog Devices AD7840JN or equiv.	AD7840JN

**Table 1. Replaceable Parts (continued)**

<b>Circuit Symbol</b>	<b>Description</b>	<b>INIVEN Part Number</b>
<b>SEMICONDUCTORS:</b>		
U13	IC, Positive Volt. Reg. +5V, Motorola MC78L05ACP or equiv.	MC78L05ACP
U14	IC, Bipolar Voltage Regulator, Motorola MC79L05ACP or equiv.	MC79L05ACP
U15	IC, HEX Inverting Schmitt Trigger, Nat. Semi MM74HC14N or equiv.	MM74HC14N
U16	IC, crystal clock generator, XO-43B32 or equiv.	XO-43B32
<b>MISCELLANEOUS COMPONENTS:</b>		
SW1, 2	Switch, DIP, 4 pos., ALCOSWITCH or equiv.	ADF-04
T1, 2	Transformer, Conolog CC1992-02	CC1992-02
T3, 4	Transformer, Conolog CC1992-03	CC1992-03
L1-10	Inductor, INIVEN/Conolog	CC2175-00

**FIBER OPTIC HEAD ASSEMBLIES**

THE FOLLOWING ASSEMBLIES ARE DEPENDENT UPON HEADS USED

**SERIES 98 I/O FIBER OPTIC ADAPTER**

<b>Part Number</b>	<b>Emitter Type</b>	<b>Wavelength (nm)</b>	<b>Fiber Mode</b>	<b>Output Power (Into 8um fiber)</b>	<b>Connector</b>
CC2175-30	Laser	1550	Single	-10dBm/100uW	FC
CC2175-31	Laser	1550	Single	-10dBm/100uW	ST
CC2175-00	Laser	1300	Single	0dBm/1000uW	FC
CC2175-01	Laser	1300	Single	0dBm/1000uW	ST
CC2175-02	Laser	1300	Single	-7dBm/200uW	FC
CC2175-03	Laser	1300	Single	-7dBm/200uW	ST
CC2175-04	Laser	1300	Single	-10dBm/100uW	FC
CC2175-05	Laser	1300	Single	-10dBm/100uW	ST
CC2175-06	LED	1300	Single	-33dBm/500nW	FC
CC2175-07	LED	1300	Single	-33dBm/500nW	ST
CC2175-20	LED	850	Multimode	-17.5dBm/19uW (50um) -15dBm/34uW (62.5um) -10.5dBm/95uW (100um)	ST
CC2175-21	LED	850	Multimode	-21.5dBm/7.5uW(50um) -18dBm/16uW (62.5um) -14.5dBm/38uW (100um)	ST

## SERIES PTR-1000 FIBER OPTIC ADAPTER

Part Number	Emitter Type	Wavelength (nm)	Fiber Mode	Output Power (Into 8um fiber)	Connector
CC2130-30	Laser	1550	Single	-10dBm/100uW	FC
CC2130-31	Laser	1550	Single	-10dBm/100uW	ST
CC2130-00	Laser	1300	Single	0dBm/1000uW	FC
CC2130-01	Laser	1300	Single	0dBm/1000uW	ST
CC2130-02	Laser	1300	Single	-7dBm/200uW	FC
CC2130-03	Laser	1300	Single	-7dBm/200uW	ST
CC2130-04	Laser	1300	Single	-10dBm/100uW	FC
CC2130-05	Laser	1300	Single	-10dBm/100uW	ST
CC2130-06	LED	1300	Single	-33dBm/500nW	FC
CC2130-07	LED	1300	Single	-33dBm/500nW	ST
CC2130-20	LED	850	Multimode	-17.5dBm/19uW (50um) -15dBm/34uW (62.5um) -10.5dBm/95uW (100um)	ST
CC2130-21	LED	850	Multimode	-21.5dBm/7.5uW(50um) -18dBm/16uW (62.5um) -14.5dBm/38uW (100um)	ST

NOTES:

## WARRANTY AGREEMENT

We hereby certify that the INIVEN product line carries an equipment warranty for any part which fails during normal operation or service for twelve years from date of shipment. A defective part should be returned to the factory, shipping charges prepaid, for repair f.o.b. Somerville, New Jersey. A **Return Material Authorization number is required** and may be obtained by calling the factory. In the event INIVEN cannot promptly return the unit to you, it will endeavor to provide a loaner until the repair or replacement is returned to you. Any unauthorized repairs or modifications will void the warranty.

**INIVEN**<sup>TM</sup> 5 Columbia Rd. Somerville, NJ 08876  
908-722-3770 or 800-526-3984 FAX 908-722-5461