INIVEN™

CC-500

Multiplexer Converter

INSTRUCTION MANUAL

12.10.21

WARRANTY AGREEMENT

We hereby certify that the INIVEN product line carries a warranty for any part which fails during normal operation or service for 12 years. A defective part should be returned to the factory after receiving a return material authorization number (RMA), shipping charges prepaid, for repair f.o.b. Somerville, New Jersey. In case 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. In the case of parts not being commercially available, INIVEN reserves the right to replace the unit with a functionally equivalent unit.

INIVEN

5 Columbia Road, Somerville, NJ 08876

SAFETY

Standard safety precautions must be followed at all times when installing, operating, servicing and repairing this equipment. INIVEN assumes no liability for failure to observe safety requirements or to operate this equipment for purposes other than intended.

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 area containing gases or moisture is a potential safety hazard. Necessary precautions 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 when working on this product. Protective measures and safety procedures should be observed at all times.

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Section 1 GENERAL

Figure 1-1. CC-500

DESCRIPTION

The CC-500 is a communications device that converts and combines up to four IEEE Std C37.94 fiber optic and up to six DS0 interfaces into a single backhaul. Backhaul options include a T1 electrical interface and a point-to-point singlemode fiber.

The CC-500 is designed to multiplex up to ten DS0 channels without the need to program or map the channels. The physical ports on the CC-500 correspond directly with the I/Os on both ends of the backhaul channel. A C37.94 channel connected to port 1 of the CC-500 will be mapped to port 1 of the corresponding CC-500 on the remote end of the backhaul channel. Port 2 will be mapped to the remote unit's port 2, and so on.

The CC-500 is DIP switch programmable for up to two backhaul options, depending on how it is equipped. All CC-500s will come with T1 and MM C37.94 interfaces. A 1310 SM Laser or LED, or a 1550 SM Laser is available as an option.

The T1 interface is designed to communicate point-to-point over a third party electrical T1 channel, such as a leased T1 channel from a phone company. The master clock will be sourced from the T1 channel, and the CC-500 will act transparently in the communications path. If a master clock is not available on the T1 circuit, the CC-500 will automatically sync with another CC-500.

For point-to-point fiber applications, the SM fiber channel is available.

While the CC-500 can be equipped with two backhauls, only one can be used at a time.

The CC-500 will multiplex up to ten DS0s. The unit consists of both a mother board (Control Unit) and a sister board. The mother board contains the backhaul channel(s), power connections, and four C37.94 fiber optic DS0 channels. The CC-500 will support any type of C37.94 format. Multimode heads are standard, but singlemode heads are available as an option.

The sister board has its own terminal blocks and can support any legacy DS0, including: Audio, G.703, RS-422, RS-232, V.35, contact closures, or additional C37.94. The sister board can support up to six DS0s, depending on the space available for interconnections on the back of the unit. Due to the many possible combinations that can be supported, the customer must contact Iniven in order to specify what I/Os they require. A dash number will be assigned to their configuration to make repeat orders simpler.

The CC-500 is designed for applications such as protective relaying and environments where substation hardened equipment is required.

The CC-500 has limited programmability. It has been designed as a plug-and-play system. Programming is limited to turning off unused channels via DIP switches, selecting the backhaul, and specific settings for the sister board, which will change according to configuration. Communications through the CC-500 are transparent.

T1 and fiber signal monitoring is a included on all units. The CC-500 displays the status of the channels using LEDs on the front panel and utilizes relays for remote monitoring.

The enclosure is a 17.25 inch wide, 1 Unit high (1U) chassis by 9.2 inches deep. The chassis is equipped with mounting brackets for a standard 19 inch rack. Mounting brackets for 23 inch racks is available as an option.

All indicators and DIP switches are located on the front of the chassis. All wiring, including communications, power, and alarm connections are on the rear of the chassis.

FEATURES

DESIGN: The CC-500 has been designed for ease of setup and use. Each CC-500 is equipped with four C37.94 channels. These may be multimode, singlemode, or a combination of both. The unit's design allows for quick system monitoring and diagnosis.

PROGRAMMABILITY: Programming is performed using two 10 position DIP switches located on the front panel of the unit. This is currently limited to turning off unused channels via DIP switches, selecting the backhaul, and specifying settings for the sister board, which change based on the configuration. Turning off unused channels prevents unwanted alarms. There are unused DIP switches, which are reserved for future options that may be required by customers. The unit is designed to be plug-and-play. Iniven can modify any of the T1 settings at the factory to accommodate the local T1 requirements.

COMMUNICATIONS: The CC-500 converts multiple audio signals, contact closures, C37.94, or other DS0 signals to a digital backhaul. The backhaul can be point-to-point fiber or electrical T1. The T1 interface does not make the CC-500 a T1 multiplexer, but rather a converter. A T1 channel needs to be in place for the unit to communicate using the T1 backhaul. Typically, this would consist of a leased T1 channel from a local telephone company. The T1 interface is an RJ-48 female connector. The standard CC-500 uses the T1 line format, B8ZS and the T1 frame format, ESF. Iniven can modify any aspect of the T1 format at the factory. The CC-500 will support a T1 channel that lacks clocking by syncing from its own signal.

If a singlemode backhaul fiber is ordered as an option, the customer must select the SM fiber type to be installed.

As a converter, the CC-500 does not utilize the IEEE C37.94 Yellow alarm.

All communication connections are located on the rear of the chassis.

POWER SUPPLIES: The CC-500 is equipped with independent and redundant power supplies. Each supply supports DC input power from 24VDC to 125VDC. 250VDC input power supplies are available as an option. The CC-500 may be equipped with a single power supply as an option.

SUBSTATION HARDENED: The CC-500 meets all requirements of IEEE Standard 1613, class 2. Environmental temperatures can range from –20 degrees C to +65 degrees C.

DIAGNOSTICS: Sixteen front panel LEDs are used to indicate the heath of the communications channel. There are three status relays on the Control unit. See Section 4, Main Assembly - Control Unit, for more information on the LEDs and status relays.

The sister board may have its own LEDs and relays, depending on configuration. See section 5, Sister Board for more information.

ROUTING: The CC-500 uses a basic physical routing method. Any IED connected to a port on a local unit, will interface with the same physical port on the remote unit. No additional programming or mapping is required.

The CC-500 is designed to work end-to-end. It is not designed to work with more than a pair of units communicating over a single backhaul channel.

A CC-500 is required at both ends of the backhaul circuit.

Section 2 ORDERING INFORMATION

The CC-500 has the ability to be configured in an almost endless combination of I/Os depending on the customer's needs. If a standard configuration does not meet the user's requirements, contact Iniven to have a CC-500 designed to customer specifications. Once a configuration is designed, a part number will be assigned to make reordering simpler.

There are two main boards that make up the CC-500.

The mother board contains the processor, redundant power supplies, four C37.94 channels, an electrical T1 interface, and an optional SM fiber backhaul channel.

The motherboard may be ordered with or without the SM fiber backhaul. The C37.94 fiber optic channels may be ordered with SM or MM heads.

There are two power supply choices: a wide range 24-125 VDC power supply, or a single voltage 250VDC power supply. The CC-500 is designed with redundant power supplies but can be ordered with a single power supply to reduce cost, power draw, and heat.

The supporting I/O module, the sister board, may be ordered with one or more of the following and supports up to six DS0 channels:

2W/4W Audio
G.703
RS-449
V.35
RS-232
C37.94, MM or SM
Other interfaces may be available, upon request

CC-500 PART GENERATOR

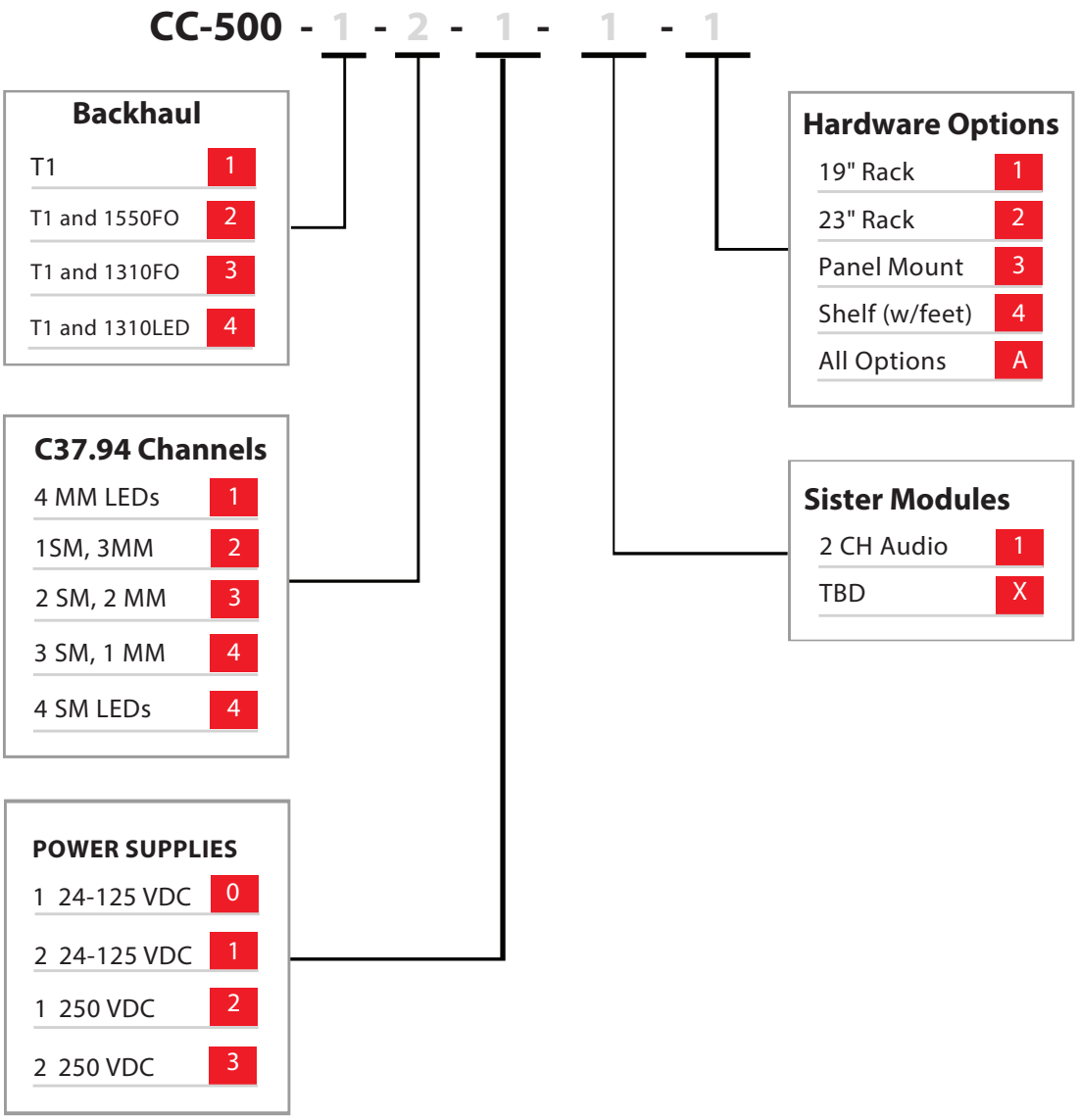


Figure 2-1. CC-500 Part Number Generator

Section 3 INSTALLATION

This section of the user manual covers unpacking, mounting, initial startup, module installation, and module interconnect wiring instructions.

UNPACKING

Various forms of the CC-500 may be supplied. The unit may be supplied as an individual chassis, stacked interconnected chassis, or mounted in a rack or cabinet. Follow the procedure for the type of system supplied.

INDIVIDUAL CHASSIS

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 chassis. Inspect the equipment for possible damage. Verify all items of value have been removed from the carton prior to discarding the packing material.

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

INTERCONNECTED CHASSIS

An interconnected chassis or equipment mounted in racks or cabinets will be shipped either in special boxes (wood crates) or via air-ride van without any case. Inspect the crate or other packaging for possible damage in transit. Carefully remove the equipment from the container and inspect it for damage. Verify all items of value have been removed from the crate prior to discarding any packaging material and refer to the above note.

Should transit damage be found, please notify Iniven immediately.

MOUNTING

INDIVIDUAL CHASSIS

An individual module will come with hardware that will allow the chassis to be mounted in a standard 19” or 23” rack.

Please note: hardware to attach the CC-500 assembly to a rack, are not included. Spacing of the mounting holes is compliant with EIA and DIN standards.

SYSTEMS

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.

PANEL MOUNT: If connecting a unit to a panel, connect the brackets facing down or up (depending the orientation desired) and hand tighten the eight screws into the brackets.

Please note: hardware to attach the CC-500 assembly to the panel, such as machine screws, are not included.

SHELF MOUNT: If placing a CC-500 on a shelf, self-adhesive rubber feet should be included. Remove the rubber feet from the backing, and place them towards the corners on, the bottom of the unit.

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.

INTERCONNECTED CHASSIS

Interconnected chassis or equipment will be mounted similarly to a single chassis. When shipping rails are provided, the equipment is to be placed near the desired location. Remove the screws holding the shipping rails and remove them. Slide the equipment into the rack or cabinet, and secure it with the proper screws for mating hardware being used. Tighten all screws.

NOTE: Adequate ventilation is required for reliable operation of electronic equipment. Temperatures in the equipment room should be kept within specifications to assure reliable operation.

TERMINAL BLOCKS

The CC-500 uses barrier style terminal blocks for power and relay connections. Euro style compression terminal blocks may be used in some sister board connections. The Euro terminal blocks are two-piece units. The screw portion of the terminal block is removable. The Euro terminal block may not separate easily. The use of a small screwdriver may be helpful.

The barrier terminal blocks will accommodate wire sizes from 12-24 AWG.

Euro terminal blocks will accommodate wire sizes from 12-28 AWG.

INITIAL START UP

Each CC-500 is checked and burned in at the factory. It is suggested that the CC-500 be connected and programmed on a test network before connection to an operational network, in case of damage due to shipping and to ensure all programming has been done properly.

BASIC ELECTRICAL AND FIBER OPTIC CONNECTIONS

User connections are made on the rear of the chassis through terminal blocks, T1 RJ-48, and fiber optic ST ports. Refer to the Wiring Diagram in this section for specific wiring details. Connections to the sister board are listed in Section 5, Sister Board

The rear panel is labeled to show correct wiring and communication connections, and will match the Wiring Diagram.

CAUTION: FOR SAFETY REASONS, ELECTRICAL POWER ON THE LEADS BEING CONNECTED TO THE UNITS SHOULD BE DE-ENERGIZED DURING INSTALLATION.

Various methods of making the connections to the terminal block may be used and are based on local practice. Make sure to tighten all connections and ensure exposed wires do not touch each other or the chassis.

To reduce the possibility of induced currents on the input leads, it is recommended that shielded twisted pair wires are used with the shield grounded at the CC-500 end only. It is recommended that the mounting rack be grounded.

GROUNDING THE EQUIPMENT IS IMPORTANT FOR BOTH SAFETY REASONS AND RELIABLE OPERATION. Connect a 16 AWG or larger wire between chassis ground and earth ground utilizing the shortest path to keep resistance and inductance to a minimum. It is also recommended that the rack be grounded, when possible.

BATTERY SUPPLY

The CC-500 comes equipped with one or two wide range (24-125VDC) or optional 250VDC Power Supply modules. Verify the battery voltage matches the voltage of the individual DC-DC converter.

Note the CC-500 has no Main Power Switch. Turn the unit ON either by installing an external switch or applying voltage to the Power In circuit. The unit must be disconnected from the DC supply before removing the unit from the rack or disassembling in any way.

STATUS RELAY CONNECTIONS

Each CC-500 has three relay contact terminals for status signaling to outside equipment. Each relay is a form C configuration. Either normally open (Form A) or normally closed (Form B). The type of relay function can be selected by using either NO or NC terminal for that status relay. The third terminal for each status relay is marked A, for armature. This terminal along with the NO or NC terminal determines the function of the status relay output.

The relays' coils are activated by the CC-500 circuit. The Power Fail relay's coil is activated when the power is on. The Communication Fail relays are energized when the unit is powered on and no alarm condition has occurred. For both status alarms, the alarm condition is NC.

The DC voltage wired to the terminal blocks must be supplied by an outside source. The CC-500 is not designed to supply power for anything other than its internal circuits and communications.

There is no polarity on the wiring for alarm relays.

WARNING: DOUBLE-CHECK ALL CONNECTIONS FOR TIGHTNESS AND CORRECTNESS, INCLUDING POLARITY AS APPLICABLE. REPLACE ALL PROTECTIVE COVERS, IF SUPPLIED.

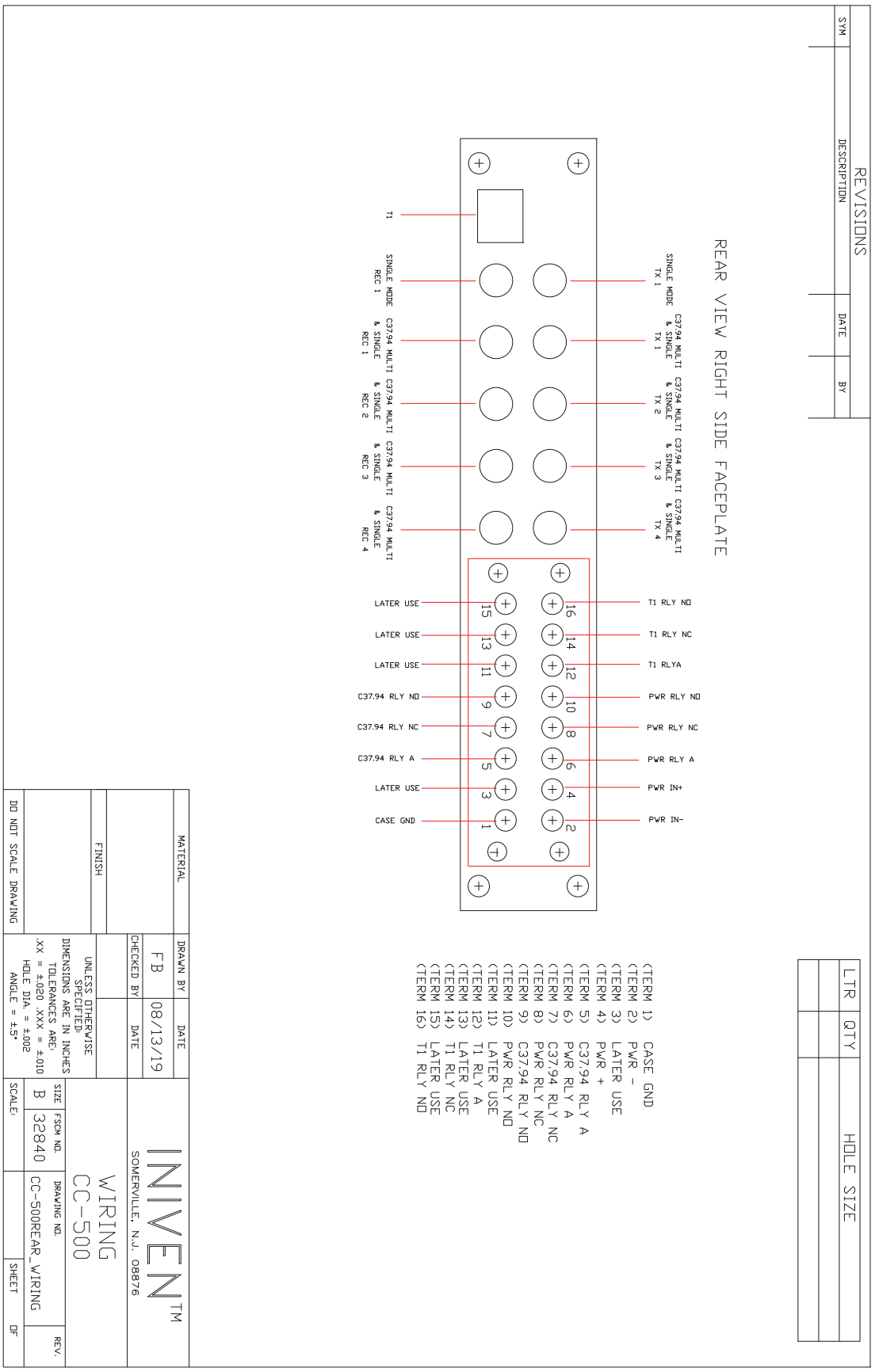


Figure 3-1. CC-500 Control Unit Wiring Diagram

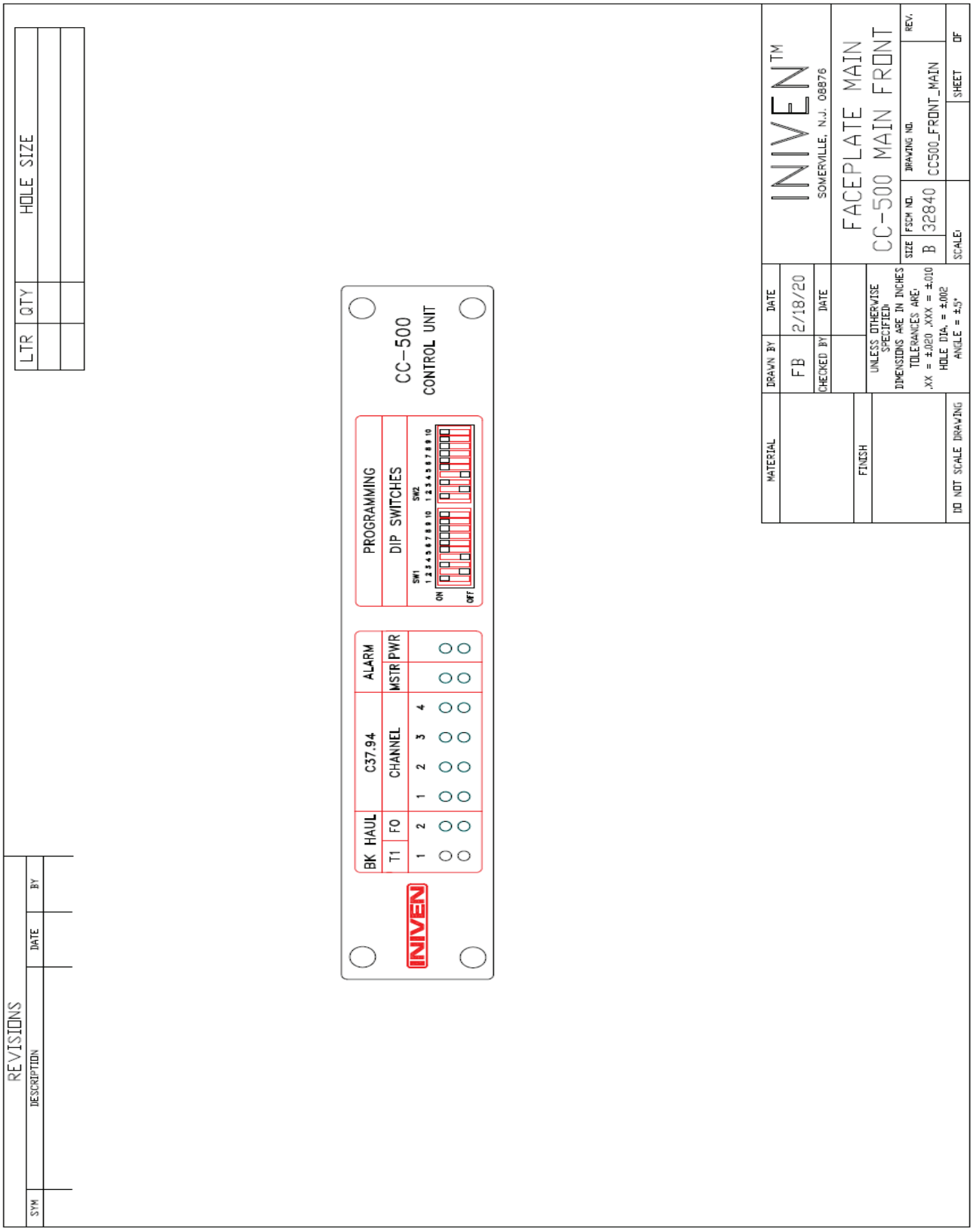


Figure 3-2. CC-500 Control Unit Front Panel

Section 4 MAIN ASSEMBLY - CONTROL UNIT

GENERAL

The Basic Assembly complies with EIA dimensional standards and, when rack mounted, occupies one rack unit (1.875 inches) of vertical space in a rack or cabinet. Its overall dimensions are as follows:

Height: 1.72 inches (43.69 mm) Width 19 inches (483 mm) Depth: 9.2 inches (233.68 mm)

A CC-500 can fit in a 19" 1U rack space. Terminal blocks, the T1 connector, and fiber heads are located on the back of the chassis. Wiring is completed using barrier style terminal blocks on the mother board.

Each CC-500 is made up of two sections: the mother board and the sister board. The mother board, also called the Control Unit, is the larger of the two sections. The power supplies, microprocessor, main LEDs, alarm relays, DIP switches, T1, SM fiber and four C37.94 fibers are all located on the Control Unit.

The smaller sister board will have its own controls and LEDs when required. Some sister boards will use the switches and indicators of the Control Unit. See Section 5, Sister Board

FRONT PANEL LEDS

The front panel contains sixteen LEDs. A green LED indicates communication is detected over the channel. A red LED indicates that the channel is on, but no communication is detected. If neither LED is on, the channel has been turned off by the DIP switch on the front of the CC-500.

There are two backhaul indicators on the front panel: T1 and SM "FO". If the T1 is being used as the backhaul, the SM FO should be turned off to eliminate a nuisance alarm. When a loss of communications is detected on the T1 channel, the T1 ALARM red LED on the front panel will illuminate. When the T1 ALARM LED is green, the T1 channel is communicating properly. A T1 is considered in alarm when any of the four following conditions exist:

- Receive Remote Alarm Indication Condition (RRAI). Set when a remote alarm is received at RTIP and RRING.
- Receive Alarm Indication Signal Condition (RAIS). Set when an unframed all-ones code is received at RTIP and RRING.
- Receive Loss of Signal Condition (RLOS). Set when 192 consecutive zeros have been detected after the B8ZS/HDB3 decoder.
- Receive Loss of Frame Condition (RLOF). Set when the DS26521 is not synchronized to the received data stream.

If the SM FO is used as a backhaul, the T1 channel should be turned off to eliminate a nusance alarm.

The Power LED remains green when the unit is powered On and is off when the power is Off. The red and green LEDs will illuminate when one of the two power supplies has failed.

Each C37.94 channel has its own set of LEDs. If the channel is on and is communicating properly, the green LED is illuminated. If a loss of communications is detected, the red LED will illuminate. If the C37.94 channel is turned off, both the red and green LED will remain off.

STATUS ALARMS

There are three status relays integrated into the CC-500: Power Fail, Backhaul Fail and C37.94 Fail. Each of the alarm relays are Form C relays. The terminal blocks allow for either alarm to be wired as a normally open (NO) or normally closed (NC) relay. See Section 3, Installation.

When set-up for NC, the alarm relay will be closed when there is no power to the unit and when the unit is alarming. The relay will be in the open position when the unit is energized and no alarm is present.

When set-up for NO, the alarm relay will be open when there is no power to the unit and when the unit is alarming. The relay will be in the closed position when the unit is energized and no alarm is present.

Power Fail is used to indicate that the both of the unit's power supplies can no longer operate within acceptable parameters. In the case of a power failure, all status relays will return to their "normal" position and the green Power LED on the front panel will turn off.

Backhaul Fail is an alarm shared with the T1 channel and the SM FO channel. The CC-500 is designed for only one backhaul to be active at a time. If a loss of communications is detected on the backhaul, the relay will return to its "normal" position.

C37.94 Fail is a common alarm shared by the four C37.94 interfaces. If any of the communication channels stop communicating, the Com Fail relay will go to its "normal" state. This alarm will also return to normal if there is a power failure.

Causes for Alarms

Power Fail:

- Power has failed.
- Input power has exceeded or is too low for the rating of the DC/DC converters.

Backhaul Fail:

- A loss of communication detected on the T1 or SM FO backhaul channels.
- A loss of packet structure (bad data) on the T1 or backhaul channels.
- Fiber optic receive signal level below the ability of the heads to receive data accurately.
- A backhaul channel is unused but has not been turned off using the DIP switch.

C37.94 Fail:

- A loss of communication detected on any of the four C37.94 channels.
- A loss of packet structure (bad data) on any of the four C37.94 channels.
- Fiber optic receive signal level below the ability of the heads to receive data accurately.
- A C37.94 channel is unused but has not been turned off using the DIP switch.

POWER SUPPLY

The CC-500 comes with two standard wide range DC/DC converters, unless 250VDC supplies have been ordered or installed. The standard input range 24VDC -20% to 125VDC +20%. The converters are mounted to the PC board of the CC-500 with two screws. The pins connecting the electrical circuits of the DC/DC converters to the PC board are socketed and a whole converter can be removed once the mounting screws are removed.

Each DC/DC converter has under and over voltage protection integrated into the device. If the input voltage is too low or too high, the status alarm LEDs may flash or the unit may attempt to restart itself.

INPUTS AND OUTPUTS

The rear panel contains all the I/O connections. Communications interfaces consist of one RJ 45/48 T1 plug and four C37.94 fiber optic interfaces. A SM fiber optic backhaul is optional. Each C37.94 interface has one transmit and one receive 850nm multimode head with an ST connector. 1310 SM heads are available as an option for any of the C37.94 channels.

Barrier terminal blocks, for wiring power and alarms, are located on the rear of the chassis.

The CC-500 uses a wide range power supplies capable of operating on a DC voltage between 24 and 125V. See the Wiring Diagram (WD) for connections. The unit can accept negative voltage inputs.

Each alarm has 3 connections: normally open (NO), normally closed (NC), and armature (A). The alarm relays do not have polarity and accept voltages up to 125VDC.

CONTROL UNIT PROGRAMMING

DIP SWITCH SETTINGS

CC-500 programming is designed to be uncomplicated. There are two 10 position DIP switches on the front panel: SW1 and SW2. The ten switches located in SW1 are used to program the Control Unit. SW2 is reserved for sister board and other settings. See Section 5, Sister Board.

Switch SW1 position 1 and 2 are used to program the backhaul and mode.

The backhaul can be an electrical T1 or SM point-to-point fiber optic. Only one backhaul may be used at a time. When using point-to-point fiber, one of the two ends of the channel must supply the clocking. This clock source is called the Master. The unit not supplying the clock is referred to as the Remote. When implementing point-to-point fiber as the backhaul, one end must be programmed to be the Master and the other must be programmed to be the Remote. This is not applicable when using the T1 backhaul in the CC-500.

SW1 -1	SW1 - 2	BH	Description
ON	ON	T1	T1 over an electrical T1 line with or w/o clocking
ON	OFF	SM FIBER	Point-to-point using dedicated SM fiber port. This setting sets the unit as the Master clock
OFF	ON	SM FIBER	Point-to-point using dedicated SM fiber port. This setting sets the unit as the Remote clock.

Switches SW1 - 3 is reserved and not currently used. Switches SW1, 4 through 10 are used to configure the power supply set-up and turn on or off channels on the Control Unit. When configured with a single power supply, the DC/DC converter must be located on the right side of the unit while the left DC/DC converter is left empty.

SW1 - 4	PWR Supply	Switch on with single power supply, off for dual supply
SW1 - 5	T1	Switch on to turn the channel on, off to turn channel off
SW1 - 6	SM FO Port	Switch on to turn the channel on, off to turn channel off
SW1 - 7	C37.94 Ch. 1	Switch on to turn the channel on, off to turn channel off
SW1 - 8	C37.94 Ch. 2	Switch on to turn the channel on, off to turn channel off
SW1 - 9	C37.94 Ch. 3	Switch on to turn the channel on, off to turn channel off
SW1 - 10	C37.94 Ch. 4	Switch on to turn the channel on, off to turn channel off

All T1 circuits may not operate the same way. The communications processor used in the CC-500 is capable of supporting all T1 options. Any changes to the T1 settings need to be made by the factory.

NOTE: UNIT MUST BE POWER CYCLED IF SETTINGS ARE CHANGED ON SW1 1-6

Section 5 SISTER BOARD - 2 CHANNEL 2W/4W AUDIO CONVERTER

The Audio sister board has two independent 2W/4W voice grade audio channels. To increase accuracy, each audio channel uses three DS0 channels.

The jumpers to convert either or both of the audio channels from/to 2W or 4W are located on the board and are considered factory settings. For your convienence, please order the CC-500 as it will be deployed in the field, avoiding the need to open the unit.

DIP SWITCH SETTINGS

The audio converter uses an attenuator to adjust the output level. The attenuator is adjusted using the first eight switches of SW2. Positions 1-4 are used to attenuate or turn off audio channel 1, and positions 5-8 attenuate or turn off audio channel 2.

The attenuation is adjustable by approximately 1 dB steps, from no attenuation to 15 dB attenuation, similar to a stepped potentiometer.

SW2 Positions 1 - 4, Channel 1

On-On-On-On	SW 2, 1-4	No attenuation
Off-On-On-On	SW 2, 1-4	1 dB attenuation
On-Off-On-On	SW 2, 1-4	2 dB attenuation
Off-Off-On-On	SW 2, 1-4	3 dB attenuation
On-On-Off-On	SW 2, 1-4	4 dB attenuation
Off-On-Off-On	SW 2, 1-4	5 dB attenuation
On-Off-Off-On	SW 2, 1-4	6 dB attenuation
Off-Off-Off-On	SW 2, 1-4	7 dB attenuation
On-On-On-Off	SW 2, 1-4	8 dB attenuation
Off-On-On-Off	SW 2, 1-4	9 dB attenuation
On-Off-On-Off	SW 2, 1-4	10 dB attenuation
Off-Off-On-Off	SW 2, 1-4	11 dB attenuation
On-On-Off-Off	SW 2, 1-4	12 dB attenuation
Off-On-Off-Off	SW 2, 1-4	13 dB attenuation
On-Off-Off-Off	SW 2, 1-4	14 dB attenuation
Off-Off-Off-Off	SW 2, 1-4	15 dB attenuation, max attenuation

To turn the audio channel “off”, set the attenuation to, max attenuation.

The CC-500 audio converter adds approximately 3dB of attenuation, when set to 4 wire operation. This includes the small amount of attenuation added when the channel is set to the least attenuation.

SW2 Positions 5 - 8, Channel 2

On-On-On-On	SW 2, 5-8	No attenuation
Off-On-On-On	SW 2, 5-8	1 dB attenuation
On-Off-On-On	SW 2, 5-8	2 dB attenuation
Off-Off-On-On	SW 2, 5-8	3 dB attenuation
On-On-Off-On	SW 2, 5-8	4 dB attenuation
Off-On-Off-On	SW 2, 5-8	5 dB attenuation
On-Off-Off-On	SW 2, 5-8	6 dB attenuation
Off-Off-Off-On	SW 2, 5-8	7 dB attenuation
On-On-On-Off	SW 2, 5-8	8 dB attenuation
Off-On-On-Off	SW 2, 5-8	9 dB attenuation
On-Off-On-Off	SW 2, 5-8	10 dB attenuation
Off-Off-On-Off	SW 2, 5-8	11 dB attenuation
On-On-Off-Off	SW 2, 5-8	12 dB attenuation
Off-On-Off-Off	SW 2, 5-8	13 dB attenuation
On-Off-Off-Off	SW 2, 5-8	14 dB attenuation
Off-Off-Off-Off	SW 2, 5-8	15 dB attenuation, max attenuation

The audio converter has a frequency range of 300-3800Hz.

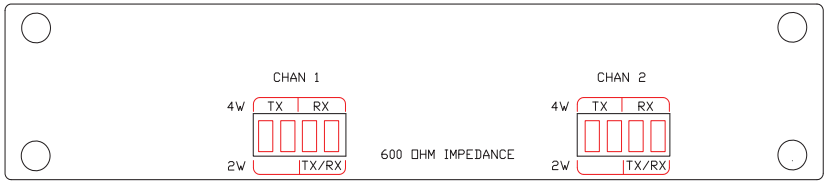
The dynamic range is +10dBm to -30dBm.

The audio converter will support at least 2400 baud.

ANY CHANGES MADE TO THE DIP SWITCHES ARE INSTANTANEOUS.

REVISIONS			
SYM	DESCRIPTION	DATE	BY

LTR	QTY	HOLE SIZE



MATERIAL	DRAWN BY	DATE	INIVEN™
	FB	01/26/21	SOMERVILLE, N.J. 08876
	CHECKED BY	DATE	
FINISH			WIRING
	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ARE: .XX = ±.020 .XXX = ±.010 HOLE DIA. = ±.002 ANGLE = ±.5°		CC-500 REAR AUDIO
DO NOT SCALE DRAWING			SIZE: B · FSCM NO.: 32840 · DRAWING NO.: CC500AUDIO_WIRING · REV.: A · SCALE: · SHEET OF

Figure 5-1. CC-500 Audio Converter Wiring Diagram

Figure 5-2. CC-500 Audio Converter Unit Front Panel

Section 6 SPECIFICATIONS

Physical:
- Dimensions:
  - Height: 1.72 in. (43.69 mm)
  - Rack Space: 1 RU
  - Width: 17.25 in. (215.14 mm)
  - Depth: 9.2 in (233.68 mm)
- Weight: 5 pounds (2.27 kg) max

Operating and Storage Temperatures:
- -20 degree C to +65 degree C
- (-4 degree F to +149 degree F)
  - Up to 1500 meters altitude

Relative Humidity:
- 95% maximum @ +42 degree C
- (+108 degree F) non-condensing

Interface Dielectric Strength
Surge Withstand Capability (SWC)
FAST Transient
Radiated EM Interference (RFI)
Electrostatic Discharge (ESD)
- Inputs, outputs & connectors
- meet the following Standards:
  - IEEE Standard 1613-2003 (Class 2)

Power Supply:

Floating

Battery Supply Voltages:

Nominal	Permissible Var.
24-125 VDC	19-150 VDC
250 VDC	200-300 VDC

- DC/DC converter output voltage: 5 VDC
- Fuses (2AG):

Alarm Relay Outputs:
- Form C
- Max contact make rating, 1 amp
- Max contact voltage, 300 VDC
  - Power Fail
  - C37.94 Fail
  - Backhaul Fail

Fiber Optics (C37.94):
- Data Rate: 0 to 155Mbps
- Fiber optic types:
  - 850 nm MM LED
  - 1310 nm SM LED (optional)
  - 1550 nm SM Laser (optional)
- Connector type: ST
- Meets IEEE Std C37.94™-2017 optical requirements

T1:
- Electrical T1 Compliant
  - RJ-48 electric connector (female)
  - T1 Line Format, B8ZS
  - T1 Frame Format, ESF

Propagation Delay: 3 microseconds (est)

Terminal Blocks:
- Barrier Style Screw Terminal
  - 28-12 AWG

Section 7 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 TO PLACE THIS EQUIPMENT IN OR OUT OF SERVICE.

PREVENTIVE MAINTENANCE

The CC-500 is designed for trouble free service. It is not necessary to perform preventive maintenance. This statement is not intended to replace preventive maintenance procedures in place within any particular organization.

WARNING: ALWAYS TURN OFF THE POWER TO THE CC-500 BEFORE REMOVING THE UNIT.

POWER SUPPLY FUSE REPLACEMENT

If the CC-500 has power being applied to the terminal blocks but there is no green Power LED lit, or a red Power LED is illuminated on the front panel, a fuse may be blown. There are two fuses, one for each power supply.

When replacing a failed fuse, first disconnect the CC-500 from the power source. Unscrew the Power I/O terminal block using the two captive screws from either end of the terminal block. Access to the top cover is required. If access is not available in the rack, the unit will need to be unwired and removed from the rack.

Remove the four screws on the cover of the chassis and the top four screws on both of the faceplates and the top four screws of rear plates of the chassis. Lift the aluminum cover off. Use a flat blade screwdriver or fuse puller to remove the failed fuse from the clips. Be careful not to shatter the glass. Eye protection should be worn. Replace the fuse with one of the same physical and electrical characteristics.

Replace the cover of the CC-500 using the twelve screws, four on the top of the cover and the top four screws on the front and back of the unit. If the unit was mounted in a rack, place the CC-500 back in the rack and secure it with the mounting screws. Replace the wires to the terminal blocks and communication connections. Connect the power source to the CC-500. If the green Power LED is illuminated, and there is no red LED illuminated, the problem has been corrected. If the LED does not light or if the fuse blows again, further troubleshooting is required. Iniven should be contacted at (800) 526-3984 for assistance, repair or replacement of the faulty module.

DC/DC CONVERTER REPLACEMENT

Follow the above instructions for removing and opening the CC-500. Before removing the DC/DC converter, check to make sure the fuse has not blown. The DC/DC converters are located next to each other. They are easily recognized, and have a large flat aluminum top with two screws attaching them to the PC board. Remove the two screws and remove the DC/DC converter from the PC board mounted sockets.

Replace the DC/DC converter. The converter cannot be put in backward. Reuse the mounting screws and attach the converter to the PC board.

Replace the cover and reinstall the unit as described above. Connect the power source to the CC-500. If the unit continues to have DC/DC converter issues, further troubleshooting is required. Iniven should be contacted at (800) 526-3984 for assistance, repair or replacement of the faulty module.

Section 8 GLOSSARY

ANSI – American National Standards Institute
The primary organization for fostering the development of technology standards in the United States.

Alarm
A signal generated when abnormal network conditions exist.

Major Alarm – indicates major abnormal conditions where service is disrupted or out.
Minor Alarm – indicates minor abnormal conditions where service is not disrupted.
Status Alarm – indicates information regarding the status of an action or event.

BER – Bit Error Rate
The percentage of bits that have errors relative to the total number of bits received in a transmission. It is usually expressed as ten to a negative power. For example, a transmission might have a BER of 10 to the minus six, meaning that out of 1,000,000 bits transmitted, one bit was in error.

BPS – Bits Per Second
A measure of speed in serial transmission, the number of binary 1s and 0s sent each second. Also uses Kbps for thousands of bits per second (bps), Mbps for millions of bits per second and Gbps for billions of bits per second.

Bit
A unit of measure of information designated by a specific value (e.g., binary digit “0” or “1”).

Bit Rate
The speed at which the bits are transmitted (e.g., 2400 bps).

Com Port – Communications Port
A standard PC will have up to 4 communications ports but generally will only have COM1 and COM2 present as standard communications. This port can be used to connect a modem or any other communications device to the PC.

Channel
In communications, a transmission path (usually both ways) between two or more points.

Circuit
In communications, a means of two-way communications between two or more points; usually metallic (e.g., telephone line) or fiber-optic.

Connection Types
A connection type that is either dedicated (assigning a permanent connection) or virtual (assigning a temporary connection).

Content
Information carried across a given circuit, regardless of format.

Data
A Digital representation of facts, concepts, or instructions.

Digital
Information that has been binary encoded (a 1 or a 0).

DIN - Deutsches Institut für Normung
The German institute for standardization and Germany’s ISO member body responsible for creating standards.

EIA – Electronic Industries Association
A standards setting body comprised primarily of manufacturers. (See RS-232, RS-449, etc.)

FDDI – Fiber Distributed Data Interface
An ANSI standard for fiber optic links with data rates up to 100 Mbps.

FOTS – Fiber Optic Transmission System
An acronym to designate the optical network

Fiber Optics
An optical transmission medium that consists of thin, plastic (or glass) strands which reflect light pulses within their interior along their length as a means to transmit large amounts of data.

IED - Intelligent Electronic Device
A generic term used to describe devices with microprocessor controllers.

ISO – International Standards Organization
International Standards Organization Group responsible for CCITT/ITU standards for digital transmission over ordinary telephone copper wire as well as over other media.

Kbps – Kilobits per second (one thousand bits per second)
A measure of bandwidth (the amount of data that can flow in a given time) on a data transmission medium. Higher bandwidths are more conveniently expressed

in Megabit per second (Mbps or millions of bits per second) and in Gigabits per second (Gbps, or billions of bits per second).

LOS – Loss of Signal
An alarm signal sent from the local node to a remote node indicating that no data is being received from the remote node.

Mbps – Megabit per second
The measure of a data transfer rate (the total information flow over a given time) on a communication medium equal to 1,000,000 bits per second.

MTBF – Mean Time Between Failure
A measure of how reliable is a hardware product or component. For most components, the measure is typically in thousands or even tens of thousands of hours between failures.

Megabyte
One million bytes, but commonly used to indicate 1,048,576 bytes.

NC - Normally Closed
The description of a relay in the open position when the coil is deenergized.

NO - Normally Open
The description of a relay in the closed position when the coil is deenergized.

Optical Power Budget
In a fiber-optic communication link, refers to the allocation of available optical power (expressed in dB) among various loss-producing mechanisms such as coupling loss, fiber attenuation, splice losses, and connector losses. This insures that adequate signal strength is available at the receiver.

Point-to-Point Configuration
Communications system where channel(s) are available between only two equipment locations or nodes.

Port
1. The physical connection between a device and a circuit. It's capacity determines the greatest amount of data that can be transmitted at any given time.
2. A 16-bit integer used by Internet Protocol (IP) that identifies where to deliver data. Port numbers 0-1023 are reserved for assigned applications, and 1024-65535 are available for user applications. The IP suite transfers data between hosts based on IP addresses and distributes data to processes and applications on a host based on the port number.

Route
A connection path that consists of an originating node, the node through which the route passes (transfer point), and a destination node. Routes can be defined as either primary or alternate.

Routing
The process of selecting a communication path through the network.

Teleprotection
A type of communication terminal equipment used by the relaying industry for sending discrete contact logic signals from point to point with a high degree of security and dependability.

Timing
Refers to the source of clock signals used to synchronize the network (e.g., internal timing, external timing).