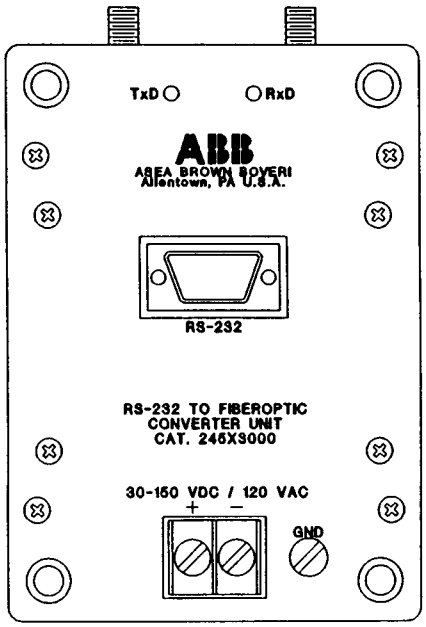
ASEA BROWN BOVERI

IB 7.12.1.7-7
Issue A

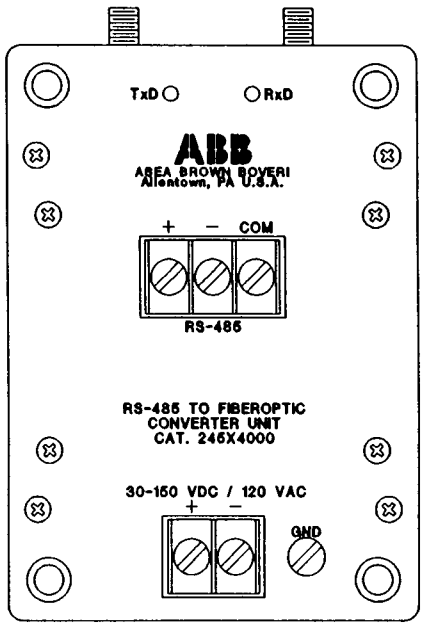
INSTRUCTIONS

Communications Converter Units

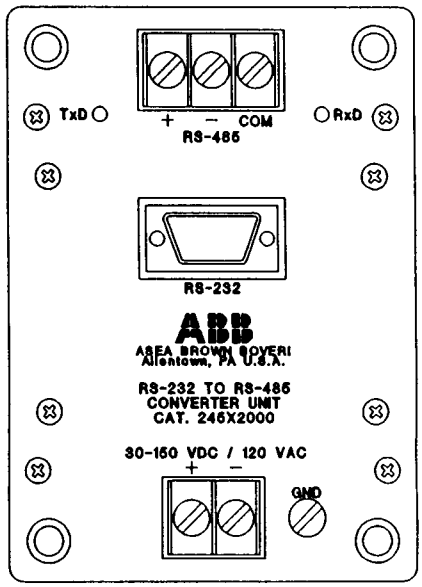
Catalog Series 245X



RS-232 TO FIBEROPTIC



RS-485 TO FIBEROPTIC



RS-232 TO RS-485

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INTRODUCTION

These instructions contain the information required to properly install and operate the Communications Converter Units, ABB catalog series 245X.

The transmission of relay information over long distances or the networking of several relays located in a substation requires the use of a specific communications interface. Often the interface that best suits the particular application and the interface the existing relays provide are not the same. Therefore the relay's communications must be converted to the desired interface. For example, fiber-optics, the transmission of information using optical(light) pulses, is the efficient means of transmitting information over long distances, however, rarely will relays provide optical ports for a direct interface. RS-485 interface is best used for locally networking several relays on a single communications cable, connections not possible with fiber-optic and RS232 standards.

ABB provides three types of converter boxes suitable for most communications applications: RS-232 to RS-485, RS-232 to fiber-optic and RS-485 to fiber-optic. The number of relays involved in the application, the relay's communications interface, and the transmission distance are the main factors that will determine the converters necessary for efficient relay communications.

The converter unit is packaged in a surface mounted case with terminal and communications interface connections clearly labelled on the metal front panel.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contigency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to your local ABB sales representative or the factory.

PRECAUTIONS

The following precautions should be taken when applying these devices:

1. **Incorrect wiring may result in damage. Be sure wiring agrees with connection diagram before energizing.**

2. **Apply only rated control voltage marked on the unit.**

3. **High voltage insulation tests are not recommended. If a control wiring insulation test is required, bond all terminals together before applying the test voltage.**

4. **Caution: Since troubleshooting entails working with energized equipment, caution should be taken to avoid personal shock. When handling the converter's printed circuit board(pcb) and components, Electrostatic Discharge procedures must be practiced. Only competent technicians familiar with good safety practices should service these devices.**

5. **Fiber-optic converter boxes must have their connectors covered by dustproof caps when not used. (It is also recommended that unused fiberoptic cable have their terminations covered by dustproof caps.) Keeping the terminations clean is essential for maintaining low signal losses.**

6. **Converter devices that are baud rate dependent, RS232/RS485 and RS485/Fiber-optic, have been factory set at 9600 baud.**

PLACING THE CONVERTER INTO SERVICE

1. RECEIVING, HANDLING, STORAGE

Upon receipt of the converter, examine for shipping damage. If damage or loss is evident, file a claim immediately and promptly notify the nearest ABB Sales Office. Use normal care in handling to avoid mechanical damage.

2. INSTALLATION

Mounting

The outline dimensions and mounting information are given in Figure 1. Terminal identification is clearly labelled on the front panel of each converter unit.

Connections

A typical connections diagram is shown in Figure 2. This figure represents an example communications network of IMPRS overcurrent relays showing the required connections for each of the three converter boxes.

Special care must be taken to connect control power of proper voltage, frequency and polarity. Reversing plus (+) and minus (-) of the D.C. control power to the converter box will render the box inoperable. Polarity need not be observed when A.C. control power is used.

Fiber-optic Interface

Converter devices with a fiber-optic port accept fiber-optic cable rated 100/140 microns(micrometers) terminated with a SMA connector.

RS-485 Interface

The RS-485 cable should be a shielded, twisted pair with the shield ground connected only at one point -- the COM terminal of an RS-485 conversion unit.

The RS-485 parallel network connections should be of a bus or single-ended configuration, not a star configuration, with a termination resistor of value 120 ohms, 1/2 watt rating placed on the end relay. Cable length should not exceed 100 meters.

RS-232 Interface

The RS-232 connector is a DB-9 type and a typical connections diagram is shown in Figure 2. RS-232 communications cables should be kept to a maximum length of 85 feet. The serial port pin identifications are as follows:

Pin #1 -	No Connection
Pin #2 - Transmit Data:	The converter transmits data from this pin.
Pin #3 - Receive Data:	The converter receives data through this pin.
Pin #5 - Signal Ground	
Pins #4, #6, #7, #8, #9 -	No connections.

Serial Communications and Baud Rate Selection

The RS-485 to Fiber-optic and RS-485 to RS-232 converter units are baud rate dependent. **The baud rate is factory set at 9600.** These units may be configured for 1200 baud by cutting out the jumper located on the printed circuit board. For the RS-485 to Fiber-optic unit, the jumper is labelled **J1** and for the RS-485 to RS-232 unit, the jumper is **J2**. The printed circuit board(pcb) locations of jumpers **J1** and **J2** are shown in Figures 3 and 4, respectively.

RS-485 to Fiber-optic
Cat. 245X4000

Baud Rate	J1
1200	OUT
9600	IN

RS-485 to RS-232
Cat. 245X2000

Baud Rate	J2
1200	OUT
9600	IN

APPLICATION DATA

The RS-485 to RS-232, RS-232 to Fiber-optic, RS-485 to Fiber-optic converter units are applied where the conversion from one communications standard to another standard is required. Together, the converter units provide the means to creating a relay communications network, of IMPRS relays for example, at a substation where communication distances may be as high as 1000 meters. Individually, each converter unit can be used to convert one or a few device's communications format to an existing network's communications format.

In addition to applications involving long distance communications and electrical noise immunity, the fiber-otic converters can be applied where a buffer or dielectric isolation is desired in switchgear line-ups.

RS-232 Communications

The RS-232 connector used in both the RS-232 to Fiber-optic and RS-232 to RS-485 converter units is a type DB-9 connector. A connection diagram is shown in Figure 2. Cable length should not exceed 85 feet(26 meters).

RS-485 Communications

This communications format allows for multidropping (two-wire parallel connections) relays using a shielded, twisted pair cable. The cable shield should be connected only at one end of the system - use the converter box's COM connection. The parallel connnections must be of a bus type configuration with the RS-485 converter box at the beginning of the bus and a 120 ohm terminating resistor, one-quarter watt power rating, connected across the "+" and "-" terminals of the end unit. The maximum number of unit loads on each converter box is 30 and each load must have the capability of being addressable, the ID# of an IMPRS microprocessor-based overcurrent relay system for example. This ensures that only the device addressed responds back over the two lines. A maximium cable length of 328 feet(100 meters) is recommended.

Fiber-optic Communications

The converter units with a fiber-optic interface use a type SMA connecter. The fiber cable size that fits this termination type is 100/140 microns or micrometers. **It is imperative that both the connector and cable ends be kept covered with their protective dustproof caps. Any dust or dirt in the light's path can impair the communications over long distances.** It is suggested that the cable end be wiped with a clean brush before attaching it to the fiber-optic connecter. Since light is the communications means of fiber-optics, fiber-optic communications are immune to electrical noise. Thus, connecting two RS-232 to Fiber-optic converters together will provide electrical isolation between the relay and the system. This electrical buffer is also acheived with two RS-485 to Fiber-optic converters. The maximum recommended fiberoptic cable length of 3283 feet(1000 meters). A minimum cable distance of 6.5 feet(two meters) is required if fiberoptic communications is to be installed.

RATINGS AND TOLERANCES

Operating Temperature Range:	-20 to +70 degrees Centigrade
Control Power:	30 - 150 VDC @ 1 Watt maximum 120 VAC @ 4 VA maximum ,(range 110 - 140 VAC)
RS485 Load Capacity:	30 Unit Loads
Fiber-optic Connecter:	Type SMA (100/140 um fiber)
Dielectric:	Control Power to Any Port -- 1500 VAC, 60 Hz for 60 sec. Control Power to GND -- 1500 VAC, 60 Hz for 60 sec. Chassis Ground to Any Port -- 1500 VAC, 60 Hz for 60 sec.

MAINTENANCE AND TESTING

No routine maintenance is required on these units. It is recommended that inoperable units be returned to the factory for repair.

High Potential Tests

High potential tests are not recommended. If a control wiring insulation test is required, bond all terminals together before applying test voltage.

Disassembling the Units

To change the baud rate of the RS-485 to Fiber-optic or RS-485 to RS-232 converter units, the unit must be disassembled. Use the following sequence when disassembling the unit.

1. Disconnect all cables, wires and control power from the converter completely.

2. Remove the front panel's outer four phillips head screws.

2. Lift front panel and attached printed circuit board(pcb) from case.

3. Remove front panel's remaining four phillips head screws exposing top of pcb.

4. Locate desired jumper and carefully cut the wire out.

To reassemble the unit, follow the above steps in reverse.

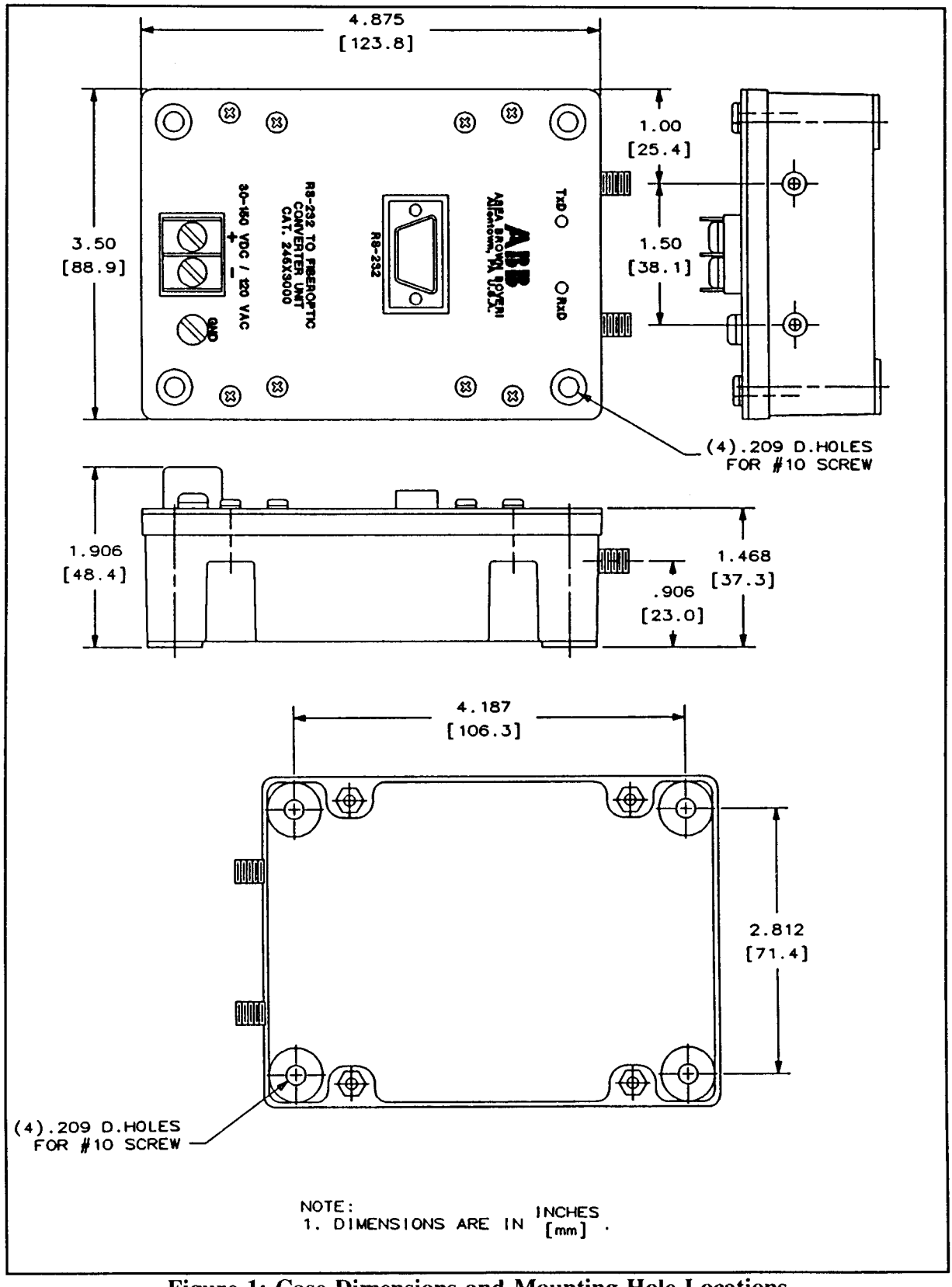

Figure 1: Case Dimensions and Mounting Hole Locations

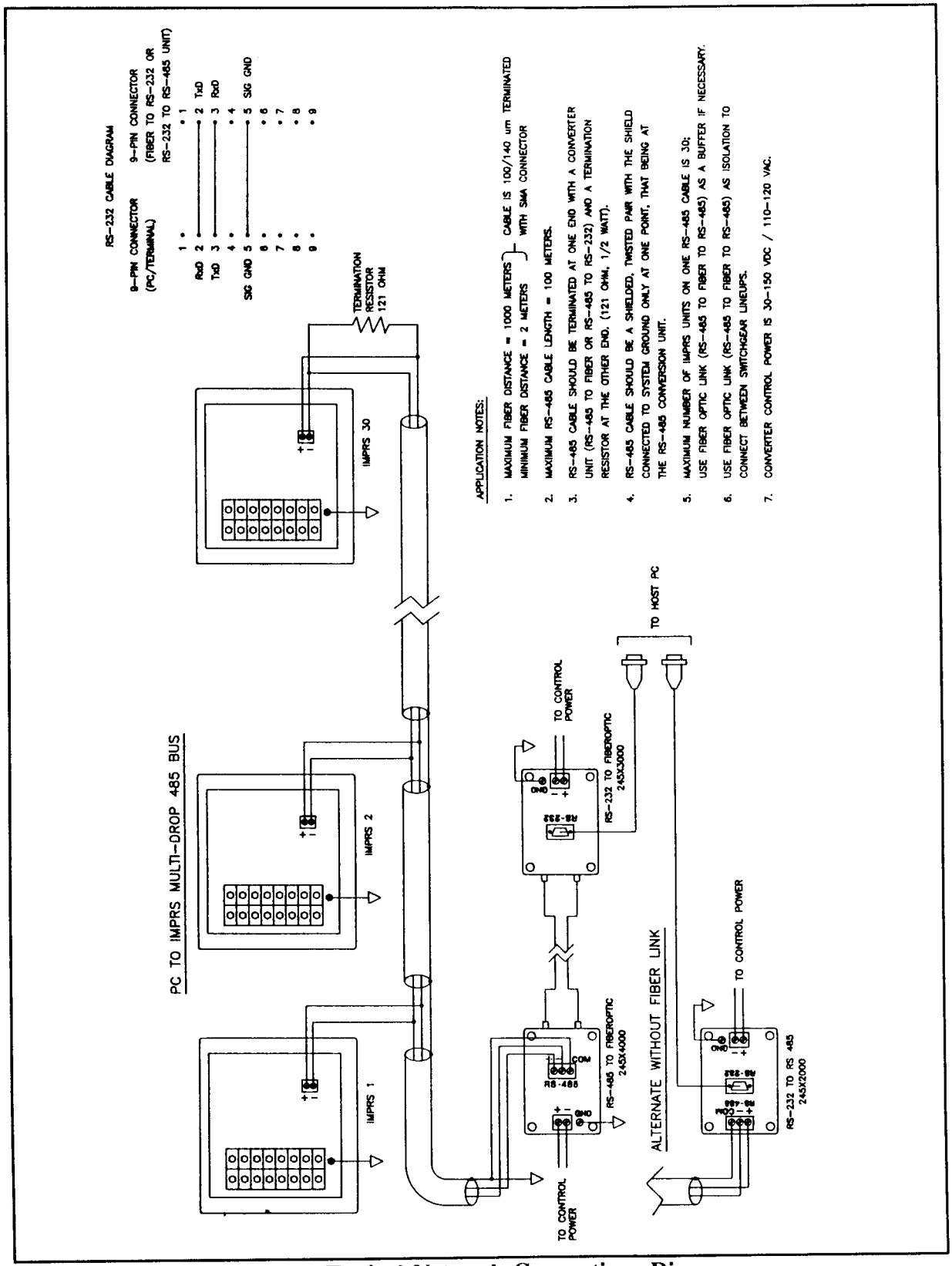

Figure 2: Typical Network Connections Diagram

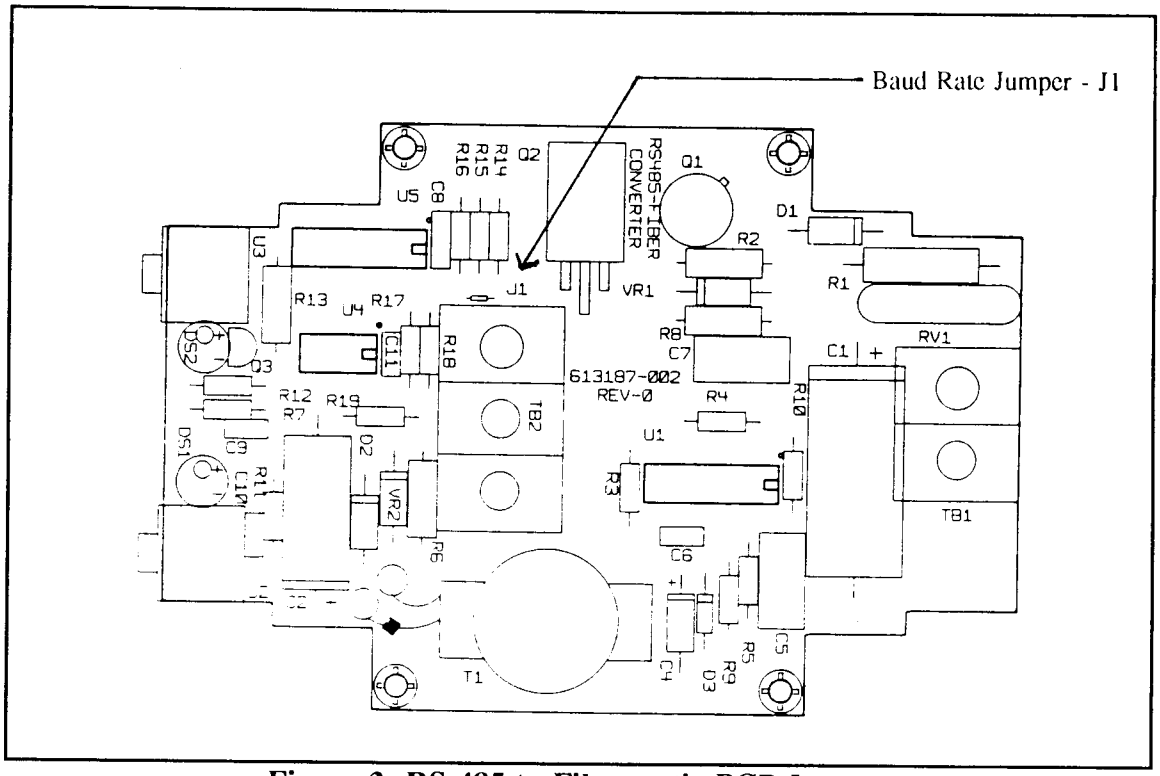

Figure 3: RS-485 to Fiber-optic PCB Layout

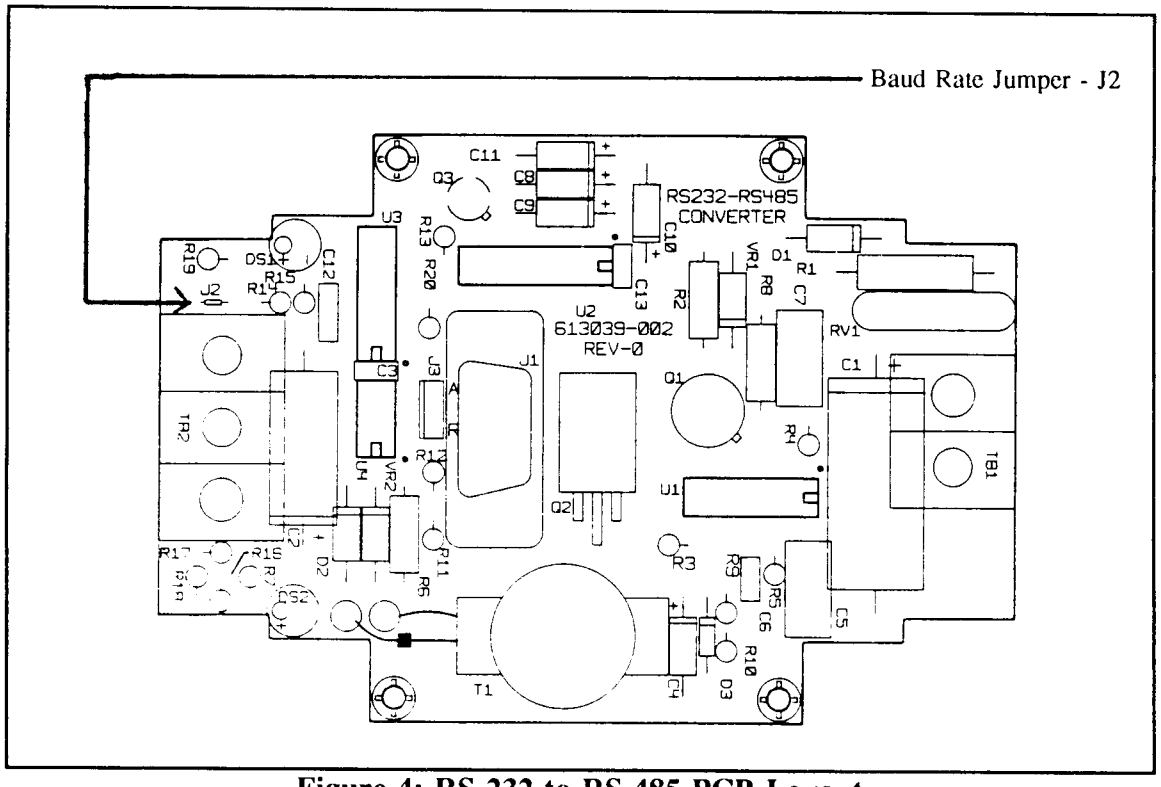

Figure 4: RS-232 to RS-485 PCB Layout

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Issue A (10/92)
New
