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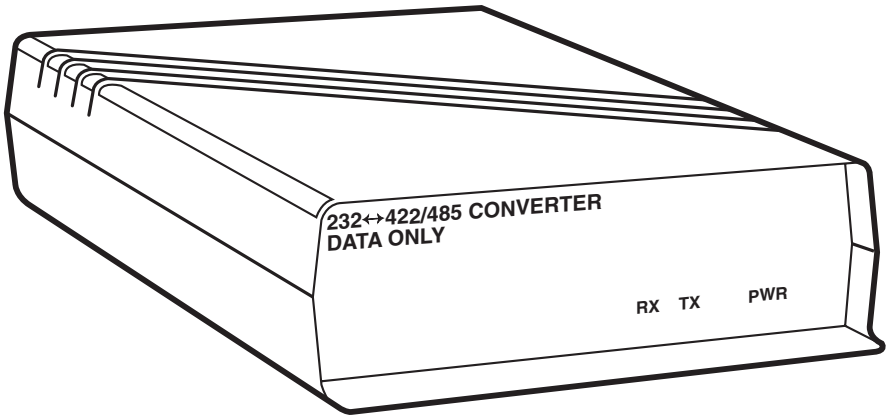
NETWORK SERVICES

NOVEMBER 1993
IC107A

RS-232↔RS-422/485 Converter (Data Only)



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FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment generates, uses and can radiate radio frequency energy and if not installed and used properly, that is in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Contents

1. Specifications

Speed — Up to 64 Kbps

Maximum Distance — 4000 feet (1219 m)

Operation — 4-wire, full-duplex; point-to-point or multipoint; user-configurable DTE/DCE RS-232 port

Leads supported — RS-232 port: 1-8, 20; RS-422/485 port: TXA, TXB, RXA, RXB

Indicators — (3) LEDs: TX, RX, POWER

Flow control — Transparent to flow control

Interface — Asynchronous RS-422/485; asynchronous RS-232

Connectors — (1) DB25 female; (1) four-pin terminal block

Temperature — Operating: 32° to 122° F(0° to 50° C); Storage: -4° to 158° F (-20° to 70° C)

Humidity — 0 to 95% noncondensing

Mean Time Between Failures (MTBF) — 200,000 hours

Power — Primary: 115 VAC/60 Hz model, @ 70 mA, or 230 VAC/50 Hz model, @ 35 mA; Secondary: 17 volt center tapped, 0.7 ma; Connector pinning:

Pin	Function
1	Frame ground
2	Secondary
3	Secondary
4	Signal ground (center tap)

Size — Standalone unit: 1.8"H x 5.5"W x 8.5"D (4.6 x 14x 22 cm); Rackmount card: 4.7"H x 7.4"W (12 x 19 cm)

Weight — Standalone unit: 1 lb. (0.5 kg); wallmount power supply: 0.5 lb. (0.2 kg); Rackmount card: 0.5 lb. (0.2 kg)

2. Introduction

The RS-232↔RS-422/485 Converter (Data Only) allows your RS-232 and RS-422/485 equipment to communicate. It operates over 4-wire lines, in full-duplex operation.

A four-wire terminal block on the RS-422/485 port makes installation easy. And this interface converter is flexible: it can work in either point-to-point or multidrop-network applications. The RS-232 interface is user-selectable as either Data Terminal Equipment (DTE) or Data Communications Equipment (DCE) for a wide range of applications. The converter is available in either standalone or rackmount card units.

2.1 Typical Applications

Figs. 2-1 and 2-2 illustrate typical applications using the RS-232↔RS-422/485 converter. The connections shown are for the RS-422/485 port. A resistor shown in the circuit indicates that the termination resistor has been selected via switch S2. (Please note that although Fig. 2-2 shows only two converters networked together, up to 64 units can be connected in a multipoint network).

Both figures.show the signal flow for the RS-232↔RS-422/485 Converter in full-duplex operation for both point-to-point and multi-point applications. (Direction of signal flow is indicated by arrows). Also shown are the locations of the indicator LEDs.

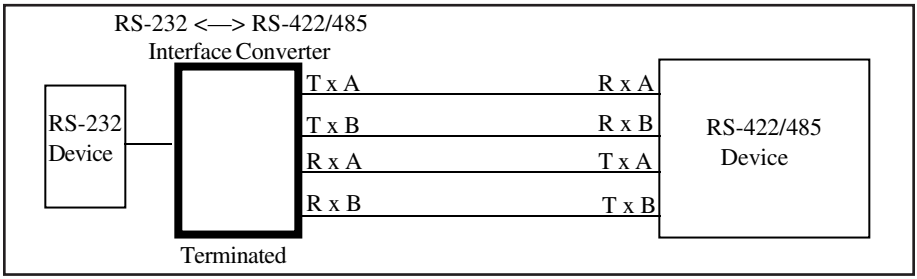

Fig. 2-1. 4-Wire Point-to-Point Application (Full-Duplex Operation).

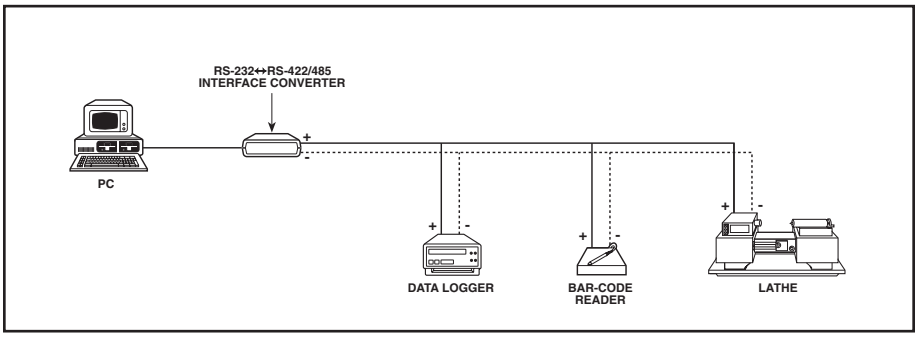

Fig. 2-2. 4-Wire Multipoint Application (Full-Duplex Operation).

3. Installation

Here's how to install the RS-232↔ RS-422/485 converter. Refer to Fig. 3-1 for the location of components on the unit's circuit board.

Follow these steps to configure the converter for your application:

1. Set the unit's RS-232 port for your application by configuring it for either DTE or DCE operation. For your RS-232 port to appear as a DTE device, put the DIP-shunt jumper (shown in Fig. 3-1) in socket XW1B. For the RS-232 port to appear as a DCE device, put the DIP-shunt jumper in socket XW1A.
2. Set strap W15 to select how the converter's RS-422/485 driver is enabled. If you place the jumper across W15 Pins B and C, the RS-422/485 driver is always enabled. If W15 is in the factory-set default position (jumper across Pins A and B), you can use W18 to configure the RS-422/485 driver to be enabled by either DTR or RTS on the RS-232 interface.

   For DTR to enable the driver, leave W18 in the default position (jumper across Pins A and B). For RTS to enable the driver, place the jumper across Pins B and C.

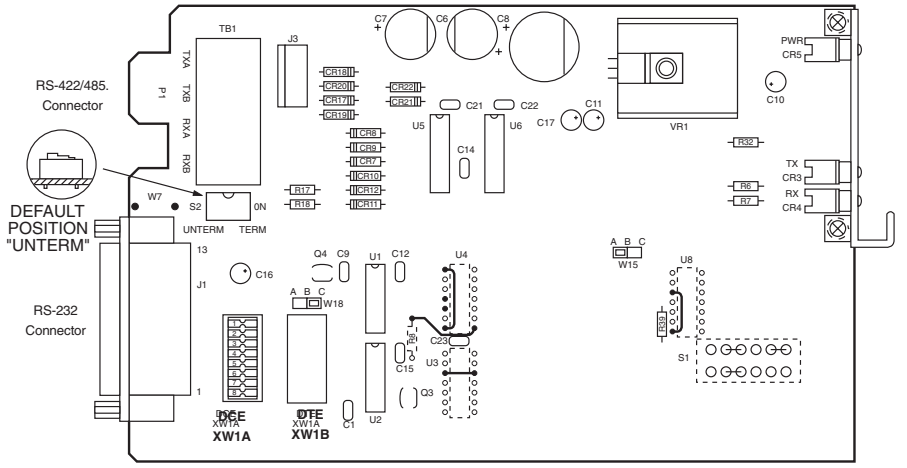

Fig. 3-1. The RS-232↔RS-422/485 Converter's Circuit Board.

3. Some applications require the RS-422/485 interface to be terminated. A resistor network provides this termination on the converter at the RS-422/485 input receiver pins (RXA and RXB). You set terminated or unterminated operation through Switch S2 (see Fig. 3-1).

   When S2 is placed in the "TERM" position, the resistor network is connected across the line, and the RS-422/485 interface is terminated. When S2 is placed in the "UNTERM" position, no connection to the resistor network is made, and the interface is not terminated.

4. Component W7 can be set to tie signal ground to frame ground. The position is left open at the factory. If you want to connect signal ground to frame ground, we recommend that you solder a 100 Ohm, 0.5 Watt resistor in location W7. A wire jumper can also be used; however, care must be taken to ensure that ground-loop currents are limited to acceptable levels. Otherwise the converter could sustain damage due to voltage differences between the RS-232 and RS-422/485 interfaces.

After you complete these steps, attach the cables from your RS-232 and RS-422/485 devices to the appropriate connectors on the converter and power up all three devices.

You're ready to go.

4. Operation

4.1 RS-232 Circuitry

The RS-232 side of the converter is composed of the RS-232 drivers and receivers, the delay circuitry, and other circuitry necessary to operate the RS-232 control lines.

Data traveling from the RS-232 interface to the RS-422/485 interface: When the RS-232 port is configured as DCE (see Fig. 4-1), data received on RS-232 Pin 2 (TD) will be transmitted out through TXA and TXB on the RS-422/485 port. For this transmission, RTS (or DTR, depending on the position of W18) must be asserted. In other words, before you can send any data through the converter from the RS-232 side to the RS-422/485 side, one of these conditions must be met: Either (1) you must assert RTS/DTR and then receive CTS true (ask for and then be given permission to send), or (2) the converter must be set in the mode where the RS-422/485 driver is always enabled (W15 set to the B and C position).

In DTE operation (see Fig. 4-2), Pin 8 (CD) performs the same function as RTS/DTR did for DCE; Pin 8 asks for permission to send. Again, you can constantly enable the RS-422/485 driver by setting the W15 jumper in the B and C position.

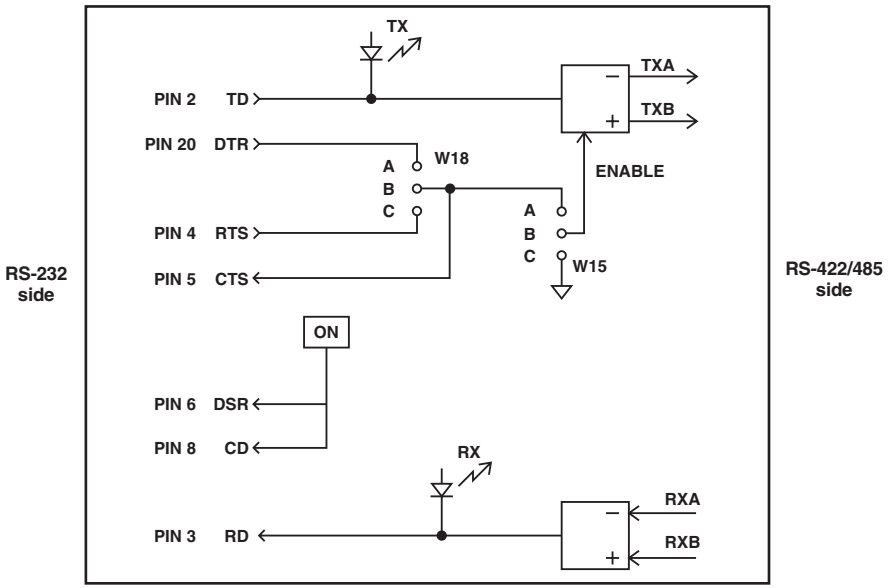

Fig. 4-1 Block Diagram of Converter Functions in DCE Mode.

Data going from the RS-422/485 interface to the RS-232 interface: When the RS-232 interface is configured as DCE, data received on the RXA and RXB pins of the RS-422/485 port will be transmitted out Pin 3 (RXD) of the RS-232 interface.

When the RS-232 interface is configured as DTE, data received on RXA and RXB pins of the RS-422/485 interface will be sent out Pin 2 (TXD) of the RS-232 interface

For more on the RS-232 pinning, see the Appendix of this manual.

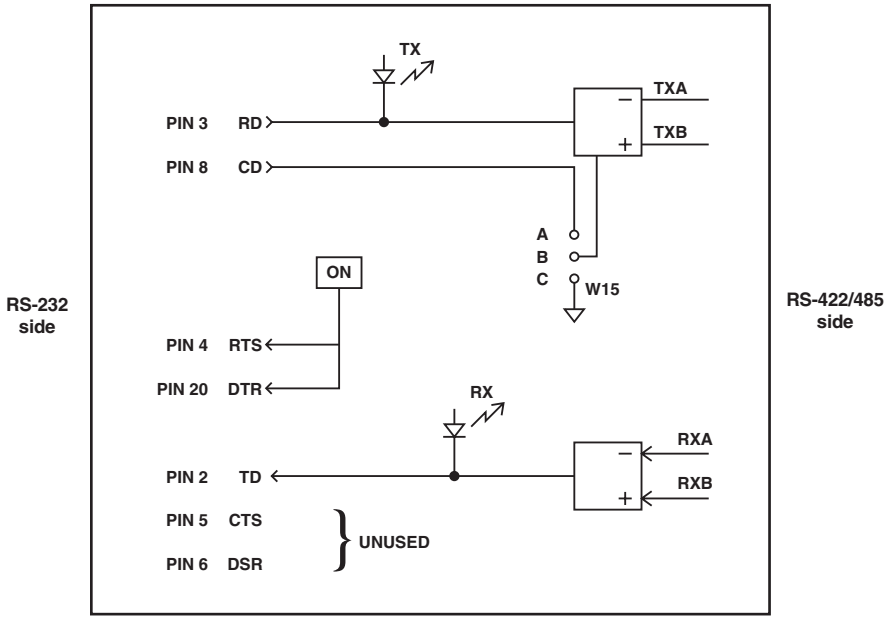

Fig. 4-2 Block Diagram of Converter Functions in DTE Mode

4.2 RS-422/485 Circuitry

The RS-422/485 side of the converter is made up of the driver, receiver and line-termination networks. Switch S2 has been provided to allow the user to either select the termination network for the receiver to be connected to the line (terminated), or left unconnected (unterminated).

Having the line terminated will reduce distortion and improve the overall signal quality in most applications. For point-to-point systems where only two devices are connected to the line, each device should have the termination network connected to the line. In multipoint applications, only the two devices at the extreme ends of the line should have the termination network connected to the line. If any of the other converters were configured as "terminated," the amount of signal distortion would increase and probably cause errors in the data being transmitted. For more on the RS-422/485 connector pinning, see the Appendix.

Appendix: Connector Pinning

Table A-1. RS-232 Pinning Chart

Pin1 — Frame Ground	Connects the converter's frame ground to the frame ground of the RS-232 device.
Pin 2 — TD	When the converter is set to DCE, data is received on Pin 2 and the TX LED lights up when Pin 2 is a "space"(logical zero). When the converter is set for DTE, data is output on Pin 2, in which case the RX LED lights up when Pin 2 is a "space".
Pin 3 — RD	When the converter is set for DCE, data is output on Pin 3. The RX LED lights up when Pin 3 is a "space". When the converter is set for DTE, data is received on Pin 3 and the TX LED lights up when Pin 3 is a "space".
Pin 4 — RTS	When the converter is set for DCE, RTS is an input which turns on the RS-422/485 driver when true. When the converter is set for DTE, RTS is always an output and is always true. (In DTE mode, CD controls the RS-422/485 driver.)
Pin 5 — CTS	When the converter is set for DCE, CTS is an output that follows the RTS/DTR input. When the converter is set for DTE, CTS is not used.
Pin 6 — DSR	When the converter is set for DCE, DSR is true. When the converter is set for DTE, DSR is not used.
Pin 7 — Signal Ground	Connects the circuit ground of the converter to the circuit ground of the RS-232 device.
Pin 8 — CD	When the converter is configured DCE, CD is always true (and RTS controls the RS-422/485 driver). When the converter is set for DTE, CD is an input which turns on the RS-422/485 driver when true.
Pin 20 — DTR	When the converter is set for DTE, Pin 20 is true.

Table A-2. RS-422/485 Connector Pinning Chart

RS-422/485 Pin Name	Description
TXA and TXB	Data received by the converter from the RS-232 port is transmitted out of the unit over twisted-pair wires via these two outputs. The "TX" LED indicates the state of these two leads. When the TXA lead is positive with respect to the TXB lead (a zero is being transmitted), the "TX" LED is lit.
RXA and RXB	These are the received data inputs for the RS-422/485 port. The status of these leads is monitored by the "RX" LED. When the RXA lead is positive with respect to the RXB lead (a zero is being received), the "RX" LED is lit.

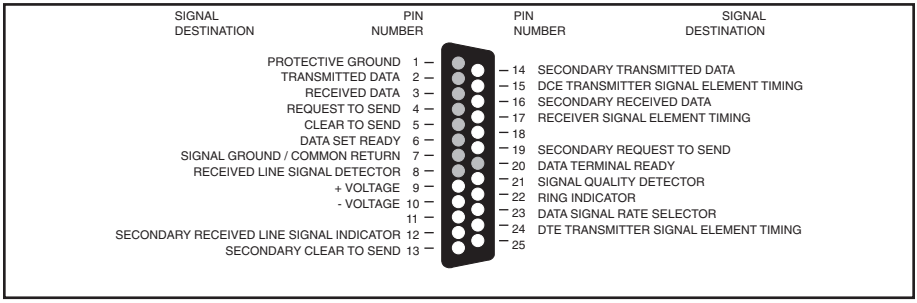

Fig. A-1. The RS-232 DB25 Female Connector.