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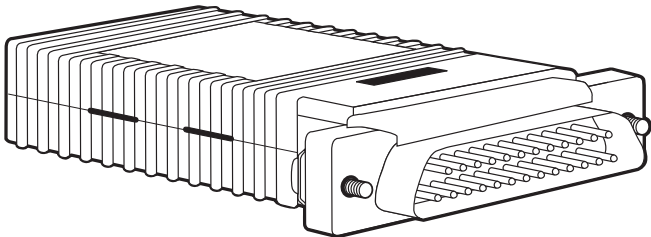
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APRIL 1999  
IC520A-F  
IC520A-M  
IC521A-F  
IC521A-M

## Async RS-232 to 2-Wire RS-485 Converter



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### CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**  
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## FEDERAL COMMUNICATIONS COMMISSION AND INDUSTRY CANADA RADIO FREQUENCY INTERFERENCE STATEMENTS

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 the equipment is 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 necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

*This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.*

*Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.*



The CE symbol on your equipment indicates that it complies with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU).

## NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT

### INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
  - A: El cable de poder o el contacto ha sido dañado; u
  - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
  - C: El aparato ha sido expuesto a la lluvia; o
  - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
  - E: El aparato ha sido tirado o su cubierta ha sido dañada.

### TRADEMARKS

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# 1. Specifications

**Transmission Format** — Asynchronous

**Data Rate** — Up to 115,200 bps

**Distance** — Up to 4000 feet (1219.2 m)  
on Category 5 solid cable

**Connectors** — IC520A-F: (1) DB25 female,  
(1) 4-screw terminal block; IC520A-M: (1) DB25  
male, (1) 4-screw terminal block;  
IC521A-F: (1) DB25 female, (1) RJ-45 female;  
IC521A-M: (1) DB25 male, (1) RJ-45 female

**Interface** — RS-232 is DCE

**Transmit Line** — 2-wire unconditioned twisted pair  
(24 AWG, solid, unshielded twisted pair [CAT-5])

**Transmit Mode** — 2-wire half-duplex

**Surge Protection** — 600 W power dissipation at 1 ms

**Temperature** — 32 to 122 °F (0 to 50 °C)

**Humidity** — 5 to 95%, noncondensing

## ASYNC RS-232 TO 2-WIRE RS-485 CONVERTER

**Power** — Draws operating power from RS-232 data and control signals; no AC power or batteries required

**Size** — 0.7"H x 2.1"W x 2.7"D (1.7 x 5.3 x 6.9 cm)

**Weight** — 0.1 lb. (0.06 kg)

## 2. Introduction

### 2.1 Description

The Async RS-232 to 2-Wire RS-485 Converter provides excellent versatility in a compact package. Requiring no AC power or batteries for operation, the Converter supports asynchronous RS-232 data rates to 115.2 kbps over one unconditioned twisted pair in half-duplex mode. The line is automatically turned around from receiving to transmitting upon the beginning of receiving of RS-232 data. No RS-232 control signal is needed to turn around the line.

The Converter is equipped with either male or female DB25 connectors for RS-232. For the twisted pair connection, you can choose either a 4-wire terminal block or an RJ-45 female connector. Silicon Avalanche Diodes provide 600 watts per wire of protection against harmful data-line transient surges.

## **2.2 Features**

- Operates asynchronously, half-duplex, point-to-point over two wires
- Data rates to 115.2 kbps
- No AC power or batteries are required
- Compact size
- Twisted-pair connection via screw terminals or RJ-45
- Silicon Avalanche Diode surge protection

### 3. Configuration

The Converter requires no configuration. It's factory-configured as Data Communication Equipment (DCE). It connects to Data Terminal Equipment (DTE) via its DB25 RS-232 port. **Figure 3-1** shows the RS-232 DB25 connector and terminal blocks on the printed circuit board.

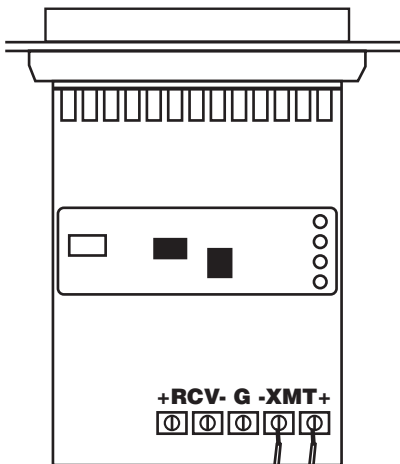


Figure 3-1. Top View of the Converter's Circuit Board.

## 4. Installation

This section tells you how to properly connect the Converter to the RS-485 and RS-232 interfaces, and how to operate the Converter.

### 4.1 Connecting the EIA-232 Interface

The EIA-232 interface is factory-configured as DCE. It connects directly to DTE such as a terminal or PC. If you must use a cable to connect to the DTE and your DTE device uses a DB25 connector, use a straight-through cable no longer than 50 feet (15.2 m).

If your DTE equipment uses a DB9 connector, use one of the two following Black Box DB9 to DB25 adapters: FA520A-R2 (DB9 female to DB25 male) or FA521A (DB9 male to DB25 female).

For your convenience, the Converter comes with either a male or female DB25 connector on the RS-232 side.

### 4.2 Connection to the RS-485 Interface

To function properly, the Converter must have one twisted pair of metallic wire. This pair must be “dry” (unconditioned) metallic wire, solid conductor, unshielded twisted pair, between 19 and 26 AWG (the higher-numbered gauges may limit distance somewhat). We recommend using Category 5 solid 24 AWG cable.

For your convenience, the Converter comes with either an RJ-45 connector or a terminal block on the RS-485 side.

#### 4.2.1 CONNECTING VIA THE RJ-45 INTERFACE

The RJ-45 versions of the Converter use an RJ-45 connector on the RS-485 side. This connector is prewired for a standard telco wiring environment. The signal/pin relationships are shown in **Figure 4-1**.

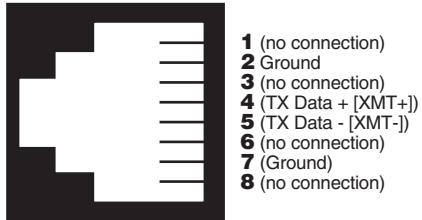


Figure 4-1. RJ-45 Interface for the Twisted Pair Line.

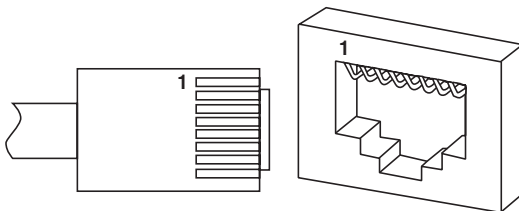


Figure 4-2. Orientation of the RJ Connector.



## ASYNC RS-232 TO 2-WIRE RS-485 CONVERTER

When connecting the twisted-pair cable from the Converter's RJ-45 jack to the RS-485 device, your cable must be connected as shown in **Table 4-1**.

**Table 4-1. Connecting the Twisted Pair to the RS-485 Device.**

Converter	RS-485 Device	
Signal	Pin #	RS-485 Signal
N/C	1	
GND*	2	
N/C	3	
XMT+	4	----- XMT A
XMT-	5	----- XMT B
N/C	6	
GND*	7	
N/C	8	

\*Connection to GND is optional

### 4.2.2 CONNECTING VIA THE TERMINAL BLOCK

The following instructions will tell you how to open the case, connect the bare wires to the terminal blocks, and fasten the strain-relief collar in place so that the wires won't pull loose.

1. Open the case by twisting it open with a small plastic screwdriver.
2. Strip the outer insulation from the twisted pairs about one inch from the end. See **Figures 4-2** and **4-3**.



**Figure 4-2. Stripping the Outer Insulation.**

3. Strip back the insulation on each of the two twisted pair wires about 0.25".



**Figure 4-3. Strip the insulation on each of the two twisted pair wires.**

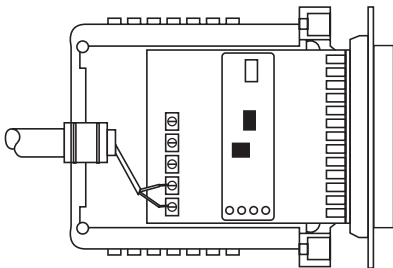
4. Connect the wires to XMT+ and XMT- (transmit positive and negative) on the terminal block, carefully noting which color is positive, and which color is negative.

5. Connect the same pair of wires to XMT A and XMT B on the RS-485 device, respectively, as shown in **Table 4-2**.

**Table 4-2. Crossover Cable Connection.**

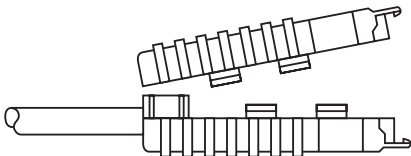
<b>Converter</b>	<b>RS-485 Device</b>
XMT+ -----	XMT A
XMT-----	XMT B

6. Place the two halves of the strain-relief assembly on either side of the telephone wire and press together very lightly. Slide the assembly so that it is about 2 inches (5 cm) from the terminal posts and press together firmly.
7. Insert the strain-relief assembly with the wire going through it into the slot in the bottom half of the Converter case and set it into the recess in the case.



**Figure 4-4. Inserting the strain-relief assembly.**

8. Bend the top half of the case as necessary to place it over the strain-relief assembly. Do not snap the case together yet.



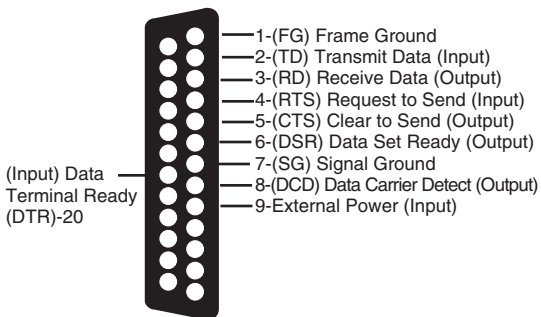
**Figure 4-5. Placing the top half of the case over the strain-relief assembly.**

9. Insert one captive screw through a saddle washer and then insert the captive screw with the washer on it through the hole in the DB25 end of the case. Snap that side of the case closed. Repeat the process for the other side. Cable installation is complete.

## **5. Operation**

Once the Converter is properly installed, it should operate transparently—as if it were a standard cable connection. The Converter derives operating power from the RS-232 data and control signals; there is no ON/OFF switch.

## **Appendix: RS-232 Pin Configuration and DCE Connection Wiring**



**Figure A-1. RS-232 Pin Configuration.**

## ASYNC RS-232 TO 2-WIRE RS-485 CONVERTER

**Table A-1. Direction of the RS-232 Signals.**

Pin Number	Signal Name	Direction
1	Frame Ground (FG)	
2	Transmit Data (TD)	To Converter
3	Receive Data (RD)	From Converter
4	Request to Send (RTS)	To Converter
5	Clear to Send (CTS)	From Converter
6	Data Set Ready (DSR)	From Converter
7	Signal Ground (SG)	
8	Data Carrier Detect (DCD)	From Converter
9	External Power	To Converter

**Table A-2. DCE Connection Wiring Diagram.**

