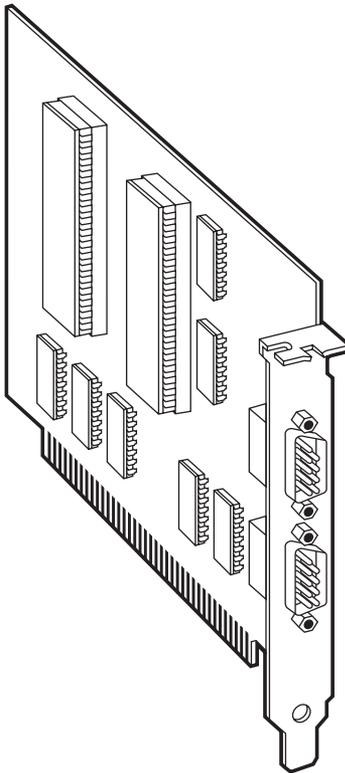




# Dual Port RS-422/485 Serial Interface



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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.*

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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 física 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.

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# 1. Specifications

<b>Number of Ports</b> —	Dual-port RS-422/485
<b>Maximum Data Distance</b> —	Up to 5000 feet (1524 m)
<b>Speed</b> —	115.2 Kbps (RS-422/485); Maximum data rate depends on software, CPU, and cable length
<b>Protocol</b> —	Asynchronous only
<b>Connectors</b> —	(2) DB9 male
<b>Communications Chip</b> —	IC600C: 16550 UART; IC173C: 16850 UART
<b>System Requirements</b> —	ISA bus
<b>Operating Temperature</b> —	32 to 122°F (0 to 50°C)
<b>Storage Temperature</b> —	-4 to +158°F (-20 to +70°C)
<b>Relative Humidity</b> —	90%
<b>MTBF</b> —	> 150,000 hours
<b>MTTR</b> —	< 0.25 hour
<b>Manufacturing</b> —	IPC 610-A Class-III standards adhered to with a 0.1 visual A.Q.L. and 100% Functional Testing; Boards are built to UL® 94V0 rating and are 100% electrically tested. Most boards are solder mask over bare copper or tin nickel.

## DUAL PORT RS-422/485 SERIAL INTERFACE

### Power —

Supply Line	+5 VDC	+12 VDC	-12 VDC
Rating (mA)	195 mA	25 mA	25 mA

### Board Size —

Half card; Board length is approximately 4.6 inches (11.7 cm). The height of the board measured from the motherboard edge connector is approximately 4.2 inches (10.7 cm).

### Shipping Weight —

2 lb. (0.9 kg)

## 2. Introduction

### 2.1 Description

The Dual Port RS-422/485 Serial Interface provides two async serial ports which can interface to RS-422 or RS-485.

The Dual Port RS-422/485 Serial Interface board (IC600C) utilizes the 16550 UART chip. This chip features programmable baud rate, data format, and interrupt control, and a 16-byte FIFO. The IC173C features the 16850 UART, which provides a 128-byte FIFO.

Each serial port can be set as COM1 or as COM2, providing total compatibility with most communications software and languages. Drivers and receivers for RS-422/485 are provided on the serial port.

### 2.2 Features

- Supports RS-422/485 interface connections.
- Directly address up to 64 RS-485 devices right from your PC.
- No additional line driver or converter is needed.
- Each port occupies 8 consecutive I/O locations and has base addressing that's user-selectable.
- Multiple cards can share the same IRQ level (2 through 5).
- RTS and CTS control signals provided on both ports.
- Includes self-explaining utility software for diagnostics.

### 2.3 RS-422/485 Specifications

RS-422 allows very-long-distance (5000 feet at 9600 bps) communications with virtually error-free differential drive characteristics. RS-422 is similar to RS-232 in that it is optimized as a single-node protocol: Typically only one RS-422 device is connected to a single port. RS-422 signal levels are the standard electrical specification used in RS-449 and EIA-530. This allows interfacing with equipment that meets these specifications by using a DB9 to DB37 adapter cable.

RS-485 is backward-compatible with RS-422; however it is optimized for partyline or multi-drop applications. The output of the RS-422/485 driver is capable of being active (enabled) or tri-state (disabled). This capability allows multiple ports to be connected in a multi-drop bus and selectively polled. Half-duplex two-wire communications are possible by connecting TX+ to RX+ and TX- to RX- in your cable hood. The enable to the driver is connected to the UART Request To Send (RTS) line for RS-485 communications. This allows the RS-485 driver to be tri-stated (disabled) when inactive on a multi-drop polled network. The software that you are using must know how to enable the driver when it is answering a poll. *Setting this jumper wrong can cause transmitter contention problems, thus preventing operation by any nodes on the network.*

#### NOTE

**To permanently enable the driver (normal RS-422 point-to-point mode), remove E4 for Port 1 and E3 for Port 2.**

**Table 2-1. RS-422/485 Connector Pinouts: (J1 for Port 1, J2 for Port 2)**

<b>Signal</b>	<b>Name</b>	<b>Pin #</b>	<b>Mode</b>
TX+	Transmit Data Pos.	4	Output RS-422/485
TX-	Transmit Data Neg.	3	Output RS-422/485
RTS+	Req. To Send Pos.	6	Output RS-422/485
RTS-	Req. To Send Neg.	7	Output RS-422/485
GND	Ground	5	
RX+	Receive Data Pos.	1	Input RS-422/485
RX-	Receive Data Neg.	2	Input RS-422/485
CTS+	Clear To Send Pos.	9	Input RS-422/485
CTS-	Clear To Send Neg.	8	Input RS-422/485

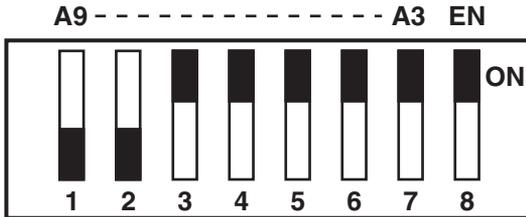
### 3. Address Selection

Each serial port on the Dual Port RS-422/485 Serial Interface occupies 8 consecutive I/O locations. DIP-switch S1 is used to set the base address for Port 1; DIP-switch S2 is used to set the address for Port 2. Be careful when selecting the base address, since some selections conflict with existing PC ports. The following table shows several examples that usually do not cause a conflict.

**Table 3-1. Address-Selection Table**

Address Hex	Binary A9———A0	Switch Position Setting						
		1	2	3	4	5	6	7
280-287	1010000XXX	OFF	ON	OFF	ON	ON	ON	ON
2A0-2A7	1010100XXX	OFF	ON	OFF	ON	OFF	ON	ON
2E8-2EF	1011101XXX	OFF	ON	OFF	OFF	OFF	ON	OFF
2F8-2FF	1011111XXX	OFF	ON	OFF	OFF	OFF	OFF	OFF
3E8-3EF	1111101XXX	OFF	OFF	OFF	OFF	OFF	ON	OFF
300-307	1100000XXX	OFF	OFF	ON	ON	ON	ON	ON
328-32F	1100101XXX	OFF	OFF	ON	ON	OFF	ON	OFF
3F8-3FF	1111111XXX	OFF	OFF	OFF	OFF	OFF	OFF	OFF

The following illustration shows the correlation between the DIP-switch setting and the address bits used to determine the base address.



In this example, the address 300 Hex through 307 Hex is selected. 300 Hex equals 11 0000 0XXX in binary representation.

Note that setting the switch “On” or “Closed” corresponds to a “0” in the address, while leaving it “Off” or “Open” corresponds to a “1.”

Each port on the Dual Port RS-422/485 Serial Interface can be enabled or disabled with switch position 8 on the DIP switch. The port is enabled with the switch “On” or “Closed” and disabled when “Off” or “Open.” If any port is disabled, be sure to also disable the interrupt request for that port by removing the IRQ jumper (see Figure 4-1).

## 4. Option Selections

### 4.1 E1 and E2

Select the interrupt request for each serial port, E1 for Port 1 and E2 for Port 2. If the address for COM1: is selected, this jumper must be on the IRQ4 setting. If the address for COM2: is selected, this jumper must be on IRQ3.

#### NOTE

Most communications-software applications default COM3: to IRQ4 and COM4: to IRQ3. This requires the sharing of interrupts between COM1: and COM3:, and between COM2: and COM4:. While this is the default, it is not always the best setting. Check your software's configuration instructions to determine the most appropriate IRQ selection.

#### IMPORTANT

Both ports can be set to the same IRQ, if desired, because of the interface's unique open-collector/pull-up IRQ drive circuit. Consult your particular software for IRQ selection. If no interrupt is desired, remove this jumper.

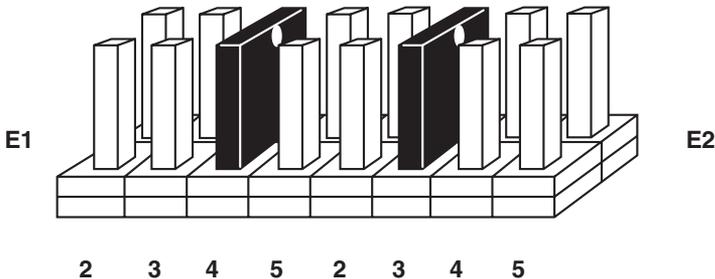
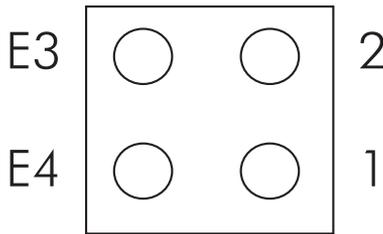


Figure 4-1. Header E1 and E2.

## 4.2 E3 and E4

E3 and E4 select whether the RS-485 driver is enabled by the UART signal Request To Send (RTS) or is always enabled. With the jumper installed, RTS enables the driver. Removing the jumper enables the driver regardless of RTS. E3 controls Port 2 while E4 controls Port 1. This jumper should only be installed if you are running the board in a multi-drop polled environment such as RS-485. For normal point-to-point RS-422 (such as terminal emulation), remove this jumper.



**Figure 4-2. Header E3 and E4.**

## 5. Interface Options

### 5.1 Line Termination

Typically, each end of the RS-422/485 bus must have line-terminating resistors. A 100-ohm resistor is across each RS-422/485 input and a 1-Kohm pull-up/pull-down combination biases the receiver inputs. If multiple (more than two) RS-485 nodes are configured in a multidrop network, only the nodes at each end of the bus should have the 100-ohm resistors installed.

### 5.2 Oscillator Option

If non-standard data rates are required, such as 31.25 Kbps or 76.8 Kbps, consult your supplier for more information.

# 6. Installation

## IMPORTANT

You **MUST** set up the operating system **BEFORE** you physically install the Card.

### 6.1 Software Installation

If you are installing an ISA adapter in DOS, OS/2®, or QNX, please refer to the appropriate directory on one of the Serial Utilities Disks for instructions.

#### 6.1.1 WINDOWS 3.1X

Please refer to the /WINDOWS sub-directory on the Serial Utilities Diskette for help files and current information on the installation of the Card in this operating environment.

#### 6.1.2 WINDOWS 95/98 USERS

For the ISA card, run setup on disk two of the Serial Utilities Diskettes before installing the card. Make note of the resources that Windows assigns the adapter, and set the adapter to match those resources. Power down the computer and install the adapter as described in **Section 6.2**. If you wish to change any resources assigned to the adapter, refer to the help file installed in the Black Box folder in the **Start, Programs** menu.

#### 6.1.3 WINDOWS NT

For the ISA card, run setup on disk two of the Serial Utilities Diskettes before installing the card. After installing the software, refer to the help file that automatically comes up for installation instructions.

### 6.2 Hardware Installation

The Dual Port RS-422/485 Serial Interface can be installed in any of the PC expansion slots.

To install the card:

- Turn off the PC's power. Disconnect the power cord.
- Remove the PC case.
- Remove the screw holding the blank metal slot cover.
- Remove the blank metal slot cover.
- Gently insert the board. Make sure it is seated properly.
- Replace the blank metal slot cover.
- Replace the screw.
- Replace the PC case.
- Reconnect the power cord.

The installation is complete.

## 7. Troubleshooting

A serial utility diskette is supplied with the Serial Interface and will be used in the troubleshooting procedures. By using this diskette and following these simple steps, most common problems can be eliminated.

- Identify all I/O adapters currently installed in your system. This includes your on-board serial ports, controller cards, sound cards, etc. The I/O addresses used by these adapters, as well as the IRQ (if any) should be identified.
- Configure your Serial Interface so that there is no conflict with currently installed adapters. No two adapters can occupy the same I/O address.
- Make sure the Interface is using a unique IRQ. While the Interface does allow the sharing of IRQs, many other adapters (for example, SCSI adapters and on-board serial ports) *do not*. The IRQ is typically selected via an on-board header block. Refer to **Chapter 3** for help in choosing an I/O address and IRQ.
- Make sure that the Serial Interface is securely installed in a motherboard slot.
- Use the supplied diskette and this manual to verify that the Serial Interface is configured correctly. The supplied diskette contains a diagnostic program, SSD, that will verify if an adapter is configured properly. This diagnostic program is written with the user in mind and is easy to use. Refer to the README file on the disk for detailed instructions on using SSD.
- The following are known I/O conflicts:

The 278 and 378 settings may conflict with your printer I/O adapter.

3B0 cannot be used if a monochrome adapter is installed.

3F8-3FF is typically reserved for COM1.

2F8-2FF is typically reserved for COM2.

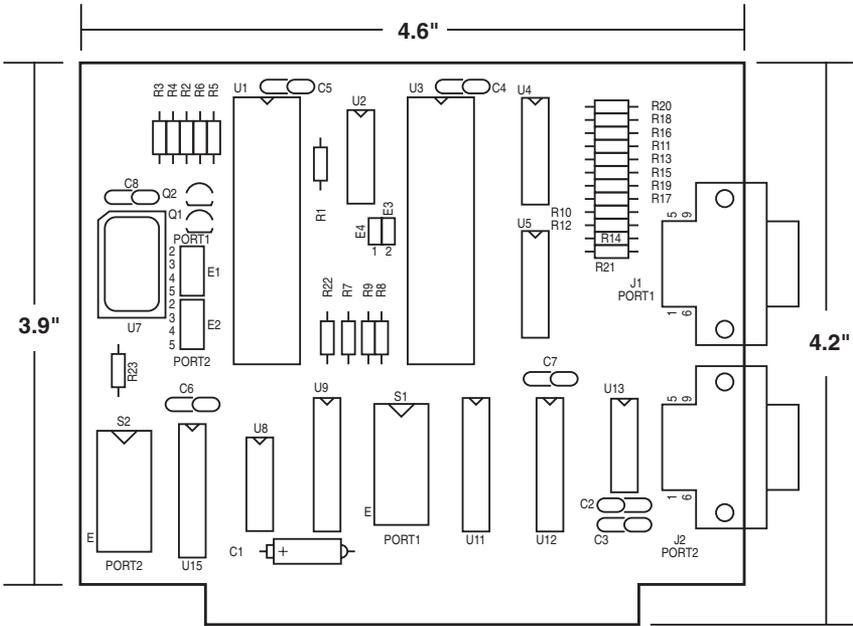
3E8-3EF is typically reserved for COM3.

2E8-2EF is typically reserved for COM4.

## DUAL PORT RS-422/485 SERIAL INTERFACE

- Refer to the diskette for any post-production manual updates and application-specific information.
- Use the diagnostic software when troubleshooting a problem.

# Appendix A: Block Diagram



For in-depth schematic detail, call for technical support.

# Appendix B: Async Communications

Serial data communications implies that individual bits of a character are transmitted consecutively to a receiver that assembles the bits back into a character. Data rate, error checking, handshaking, and character framing (start/stop bits) are pre-defined and must correspond at both the transmitting and receiving ends.

Asynchronous communications is the standard means of serial data communication for PC compatibles and PS/2® computers. The original PC was equipped with a communication or COM: port that was designed around an 8250 Universal Asynchronous Receiver Transmitter (UART). This device allows asynchronous serial data to be transferred through a simple and straightforward programming interface. Character boundaries for asynchronous communications are defined by a starting bit followed by a pre-defined number of data bits (5, 6, 7, or 8). The end of the character is defined by the transmission of a pre-defined number of stop bits (usually 1, 1.5, or 2).

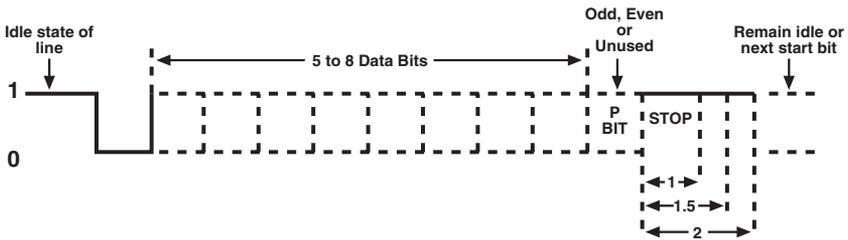


Figure B-1. Asynchronous Communications Bit Diagram.

An extra bit used for error detection is often appended before the stop bits. This special bit is called the parity bit. Parity is the simple method of determining if a data bit has been lost or corrupted during transmission. There are several methods for implementing a parity check to guard against data corruption. Common methods are called even parity (E) or odd parity (O). Sometimes parity is not used to detect errors on the data stream. This is referred to as no parity (N).

Because each bit in asynchronous communications is sent consecutively, it is easy to generalize asynchronous communications by stating that each character is wrapped (framed) by pre-defined bits to mark the beginning and end of the serial transmission of the character. The data rate and communication parameters for asynchronous communications have to be the same at both the transmitting and receiving ends. The communication parameters are baud rate, parity, number of data bits per character, and stop bits (for example, 9600, N, 8, 1).



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