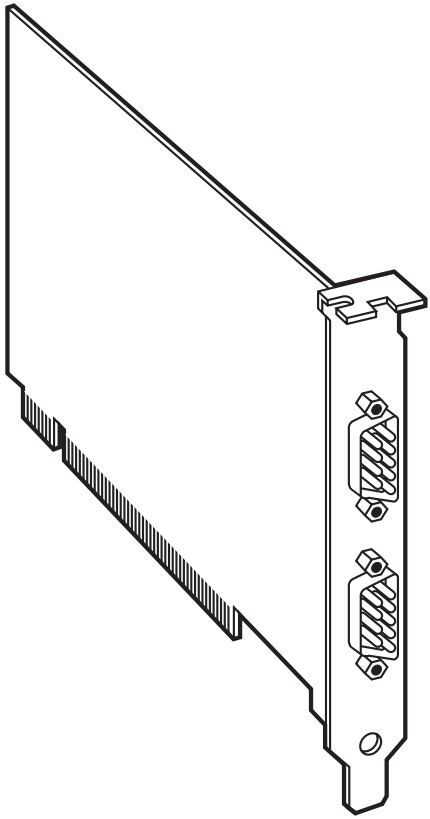
BLACK BOX®
NETWORK SERVICES

AUGUST 2001
IC140C-R2
IC143C
IC191C

2-Port RS-232 PCI Bus Serial Host Adapter



CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: **www.blackbox.com** • E-mail: **info@blackbox.com**

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 la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

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 connectado 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 lineas de energia.

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 objectos liquidos 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: Objectos 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

IBM, AT, and OS/2 are registered trademarks of International Business Machines Corporation.

Windows and Windows NT are registered trademarks of Microsoft Corporation.

Any other trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

Contents

1. Specifications

Communications Chip: IC140C-R2: 16650 UART; IC143C: 16750 UART; IC191C: 16850 UART

Maximum Data Rate: 460.8 kbps

Maximum Distance: 50 ft. (15.2 m)

Operation: RS-232

Protocol: Asynchronous

Connectors: (2) DB9 male

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

Humidity: 10 to 90% noncondensing

Power: From the interface: +5 V @ 250 mA; +12 V @ 60 mA; -12 V @ 100 mA

Size: 3.3"H x 4.9"L (8.4 x 12.5 cm) (half-card)

2. Introduction

2.1 Overview

The 2-Port RS-232 PCI Bus Serial Host Adapter is a two-channel adapter for the PC and compatibles. It provides two RS-232 serial ports supporting data rates up to 460.8 kbps. Three models are available:

- IC140C-R2 (16650 UART) features a 32-byte FIFO buffer and can handle sustained data rates of up to 460.8 kbps.
- IC143C (16750 UART) features a 64-byte FIFO buffer and can also handle sustained data rates of up to 460.8 kbps. It delivers better performance because of its larger buffer.

For even better performance, you can upgrade the IC140C-R2 or IC143C to a 16850 UART, which features a 128-byte FIFO buffer. Or choose the following adapter:

- IC191C (16850 UART, already installed) features a 128-byte FIFO.

The Serial Host Adapter works seamlessly with the standard operating system serial driver.

2.2 What's Included in Your Package

The Serial Host Adapter package contains the following items. If anything is missing or damaged, please contact Black Box immediately at 724-746-5500.

- Serial Host Adapter (IC140C-R2, IC143C, or IC191C)
- Installation software diskettes.
- This users' manual

2.3 Factory-Default Settings

When shipped from the factory, the Adapter's default settings are:

Port #	Clock Mode
Port 1	DIV4
Port 2	DIV4

To install the Adapter using factory-default settings, refer to **Chapter 4**.
For your reference, record installed Adapter settings below:

Port #	Clock Mode
Port 1	
Port 2	

3. Configuration

3.1 Address and IRQ Selection

The Serial Host Adapter is automatically assigned I/O addresses and IRQs by the motherboard BIOS. You can modify the I/O address.

Adding or removing other hardware may change the assignment of I/O addresses and IRQs.

3.2 Clock Modes

The Serial Host Adapter uses a unique clocking option that allows you to select from "divide by 4" and "divide by 1" clocking modes. These modes are selected at Headers E1 and E2.

To select the baud rates commonly associated with COM: ports (2400, 4800, 9600, 19.2,...115.2 kbps), put the jumper in the "divide by 4" mode (DIV4) position.

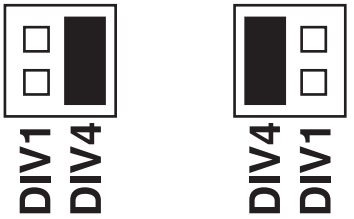


Figure 3-1. Clocking Mode "Divide by 4."

To select the maximum data rate (460.8 kbps), put the jumper in the "divide by 1" (DIV1) position.

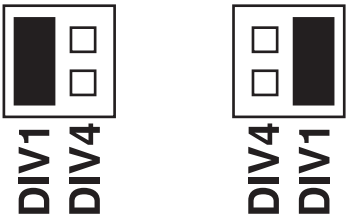


Figure 3-2. Clocking Mode "Divide by 1."

3.3 Baud Rates and Divisors for the "DIV1" Mode

For This Data Rate	Choose This Data Rate
1200 bps	300 bps
2400 bps	600 bps
4800 bps	1200 bps
9600 bps	2400 bps
19.2 kbps	4800 bps
57.6 kbps	14.4 kbps
115.2 kbps	28.8 kbps
230.4 kbps	57.6 kbps
460.8 kbps	115.2 kbps

If your communications package allows the use of baud-rate divisors, choose the appropriate divisor from the following table:

For This Data Rate	Choose This Divisor
1200 bps	384
2400 bps	192
4800 bps	96
9600 bps	48
19.2 kbps	24
38.4 kbps	12
57.6 kbps	8
115.2 kbps	4
230.4 kbps	2
460.8 kbps	1

4. Installation

IMPORTANT

You must set up the operating system (see Section 4.1) before you physically install the Card.

4.1 Setting Up the Operating System

4.1.1 Windows 3.1x

Refer to the Win3x.hlp file in the \Win31 directory on Disk 1 of 1 labeled "Serial Utility Software SeaCOM DOS, Linux, QNX, Win 3.1x, and Other O/S."

4.1.2 Windows 95/98/Me/2000/Windows NT

If you are installing the Adapter in Windows 95, 98, Me, 2000, or Windows NT, run setup on Disk 1 of 2 labeled "Serial Utility Software SeaCOM Drivers and Utilities for Win 95/98/Me/NT/2000" before installing the adapter. Power down the computer and install the adapter. The resources are automatically configured for the Adapter. Refer to the appropriate help file in the Black Box folder located in the **Start**, **Programs** menu for changing those resources.

Selecting the PCI COM Number in Windows 95 or 98

When installing the Serial Host Adapter in Windows 95 or 98, the default COM numbers assigned to the two ports will be COM5 and COM6 if those numbers are not already assigned. If they are assigned, the next available COM numbers will be assigned to the ports.

To change the two ports so that Windows assigns them as COM3 and COM4:

1. Double-click the "Systems" icon in the control panel or right-click on "My Computer" and choose "Properties" to bring you to "System Properties."

2. Choose the Device Manager tab and double-click on the "Multi-Function Adapter" heading. This will show all the information concerning the Adapter.

3. Choose the "Resources" tab, which will show all resources assigned to the Adapter. Uncheck the "Use Automatic Settings" box. There are three input/output (I/O) ranges listed. The first I/O range is for the PCI bus and should not be changed. The second and third I/O ranges are the ones that you need to change in order to have those ports numbered as COM3 and COM4.

4. Double-click on the second I/O range, which will allow you to change the address. Highlight the entire I/O range and type `03e8-03ef` for COM3. Click **OK**. Windows will inform you that you have made modifications that may affect other devices. Click **OK**.

5. Double-click on the third I/O range. Highlight the entire I/O range and type `02e8-02ef` for COM4. Again, Windows will inform you that you have made modifications that may affect other devices. Click **OK**.

Following these steps will change the COM number assignments on both ports to COM3 and COM4.

4.1.3 WINDOWS NT

If you are installing an Adapter in Windows NT, run setup on Disk 1 of 2, which is labeled "Serial Utility Software SeaCOM Drivers and Utilities for Win 95/98/Me/NT/2000" before installing the adapter. After the software installation is complete, power down the computer, install the adapter, then power up. Since resource allocation is automatic, the installation is now complete.

4.1.4 DOS

Refer to the Readme.txt file found in the \DOS directory on Disk 1 of the Serial Utilities software.

4.2 Installing the Hardware

You can install the Serial Host Adapter in any of the PCI expansion slots. It contains several jumper straps for each port that you must set for proper operation.

1. Power off the PC. Disconnect the power cord.
2. Remove the PC cover.
3. Locate an available PCI slot and remove the blank metal slot cover.
4. Gently insert the Adapter into the slot. Make sure that it is seated properly.
5. Replace the screw.
6. Replace the cover.
7. Connect the power cord.

Hardware installation is complete.

5. Technical Description

5.1 Interrupts

A good analogy of a PC interrupt is a telephone ringing. The phone bell is a request for us to stop what we are currently doing and take up another task (speak to the person on the other end of the line). This is the same process the PC uses to alert the CPU that a task must be performed. The CPU, upon receiving an interrupt, makes a record of what the processor was doing at the time and stores this information on the "stack"; this allows the processor to resume its predefined duties after the interrupt is handled, exactly where it left off. Every main sub-system in the PC has its own interrupt, frequently called an IRQ (short for Interrupt ReQuest).

5.2 Why Use an ISP?

The Interrupt Status Port (ISP) is a read-only 8-bit register that sets a corresponding bit when an interrupt is pending. Port 1 interrupt line corresponds with Bit D0 of the status port, Port 2 with D1, etc. The use of this port means that the software designer now only has to poll a single port to determine if an interrupt is pending.

The ISP is at Base+7 on each port (Example: Base=280 Hex, Status Port=287, 28F...etc.). The Adapter will allow any one of the available locations to be read to obtain the value in the status register. Both status ports on the Adapter are identical, so any one can be read. Example: This indicates that Channel 2 has an interrupt pending.

Bit Position:	7	6	5	4	3	2	1	0
Value Read:	0	0	0	0	0	0	1	0

5.3 RS-232 Connector Pin Assignments

Abbreviation	Name	Pin #	Mode
TD	Transmit Data	3	Output
RTS	Request to Send	7	Output
DTR	Data Terminal Ready	4	Output
GND	Ground	5	—
RD	Receive Data	2	Input
DCD	Data Carrier Detect	1	Input
DSR	Data Set Ready	6	Input
CTS	Clear to Send	8	Input
RI	Ring Indicator	9	Input

NOTE

These assignments meet EIA/TIA/ANSI-574 DTE for DB9 connectors.

Appendix A: Troubleshooting

A.1 Using the Serial Utility Diskettes

Three Serial Utility diskettes come with the Serial Host Adapter for use in troubleshooting. Disk 1 of 1 is labeled "Serial Utility Software SeaCOM DOS, Linux, QNX, Win 3.1x, and Other O/S." Disks 1 of 2 and 2 of 2 are labeled "Serial Utility Software SeaCOM Drivers and Utilities for Win 95/98/Me/NT/2000." If you still cannot solve a problem after reading this chapter, call for technical support.

1. Identify all I/O adapters currently installed in your system, including your on-board serial ports, controller cards, sound cards, etc. Identify the I/O addresses used by these adapters, as well as the IRQ (if any).

2. Configure your Serial Host Adapter so that there is no conflict with currently installed adapters. No two adapters can occupy the same I/O address.

3. Make sure the Adapter is using a unique IRQ. While this Adapter does allow the sharing of IRQs, many other adapters (such as 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.

4. Make sure the Adapter is securely installed in a motherboard slot.

5. When running DOS, Windows 3.x, Linux, or QNX, refer to Serial Utilities Disk 1 of 1 and this manual to verify that the Adapter is configured correctly.

6. For Windows 95/98/2000/Me and Windows NT, the diagnostic tool "WinSSD" is installed in the Adapter folder on the Start Menu during the startup process. First find the ports using the Device Manager, then use "WinSSD" to verify that the ports are working.

A.2 Calling Black Box

If you determine that your Adapter is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

A.3 Shipping and Packaging

If you need to transport or ship your Adapter:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the Adapter for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Authorization (RA) number.

Appendix B: RS-232 Electrical Interface

The most widely used communication standard is RS-232. It's been defined and revised several times and is sometimes also called EIA/TIA-232. The IBM® AT® computer defined the RS-232 port on a DB9 connector and subsequently the EIA/TIA approved this implementation as the EIA/TIA-574 standard, which is defined as the "9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange."

RS-232 can operate at data rates of up to 20 kbps at distances less than 50 ft. (15.2 m). The absolute maximum data rate may vary depending on line conditions and cable lengths. RS-232 is a single-ended or unbalanced interface, meaning that a single electrical signal is compared to a common signal (ground) to determine binary logical states. The RS-232 and the EIA/TIA-574 specification define two types of interface circuits, Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The Serial Host Adapter is a DTE device.

Appendix C: Asynchronous Communication

In serial data communication, 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 communication is the standard means of serial data communication for PC and compatible computers. The original PC was equipped with a communication or COM port that was designed around an 8250 Universal Asynchronous Receiver Transmitter (UART), which allows asynchronous serial data to be transferred through a simple and straightforward programming device. The Serial Host Adapter uses much newer UARTs that also feature buffering. (The IC140C-R2 uses a 16650 UART; the IC143C uses a 16750 UART. The IC191C uses a 16850 UART.)

Asynchronous communication works this way: A start bit, followed by a pre-defined number of data bits (5, 6, 7, or 8) defines character boundaries for asynchronous communication. The end of the character is defined by the transmission of a pre-defined number of stop bits (usually 1, 1.5, or 2).

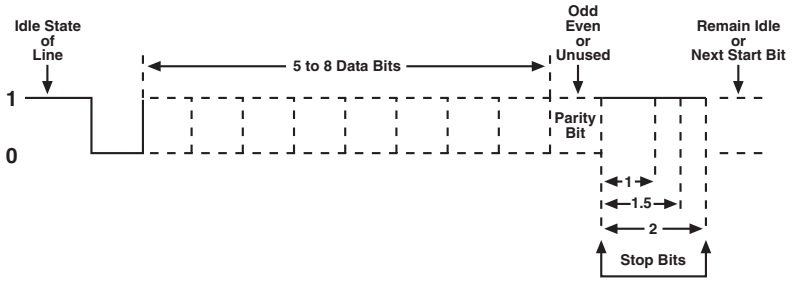


Figure C-1. Asynchronous Communication Bit Diagram.

An extra bit used for error detection is often appended before the stop bits.

This special bit is called the parity bit. Parity is a simple way to determine 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 [E]ven Parity or [O]dd Parity. Sometimes parity is not used to detect errors on the data stream (this is called [N]o Parity). Because each bit in asynchronous communication is sent consecutively, it 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 communication 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.

Appendix D: Board Layouts

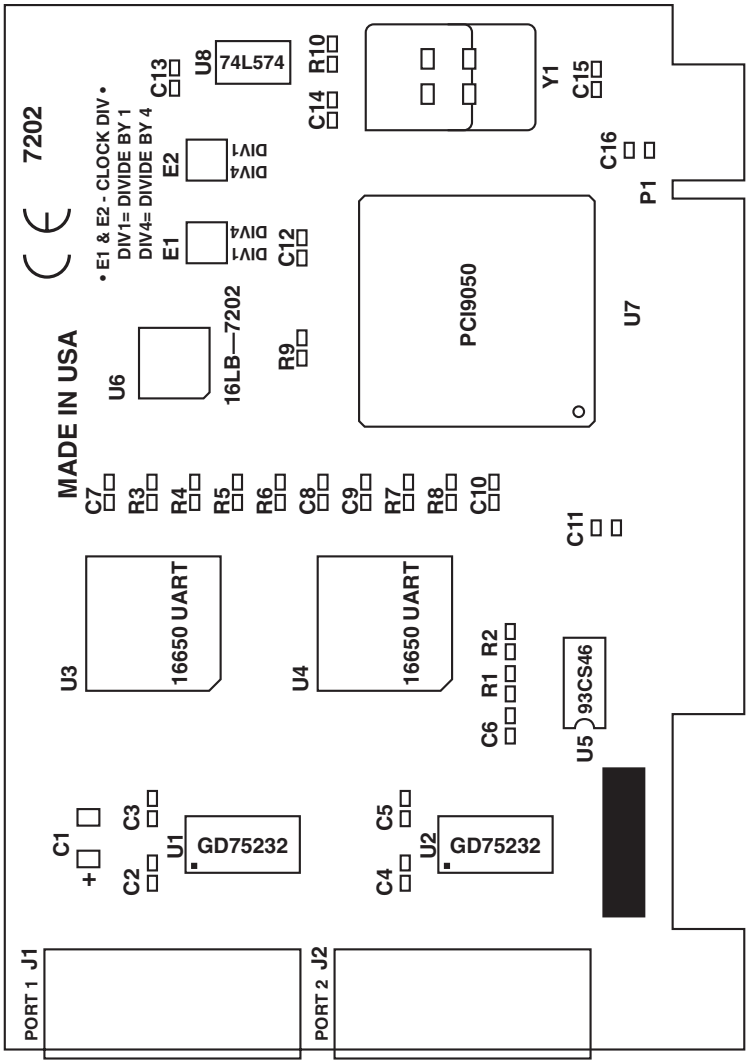


Figure D-1. Board Layout, IC140C-R2.

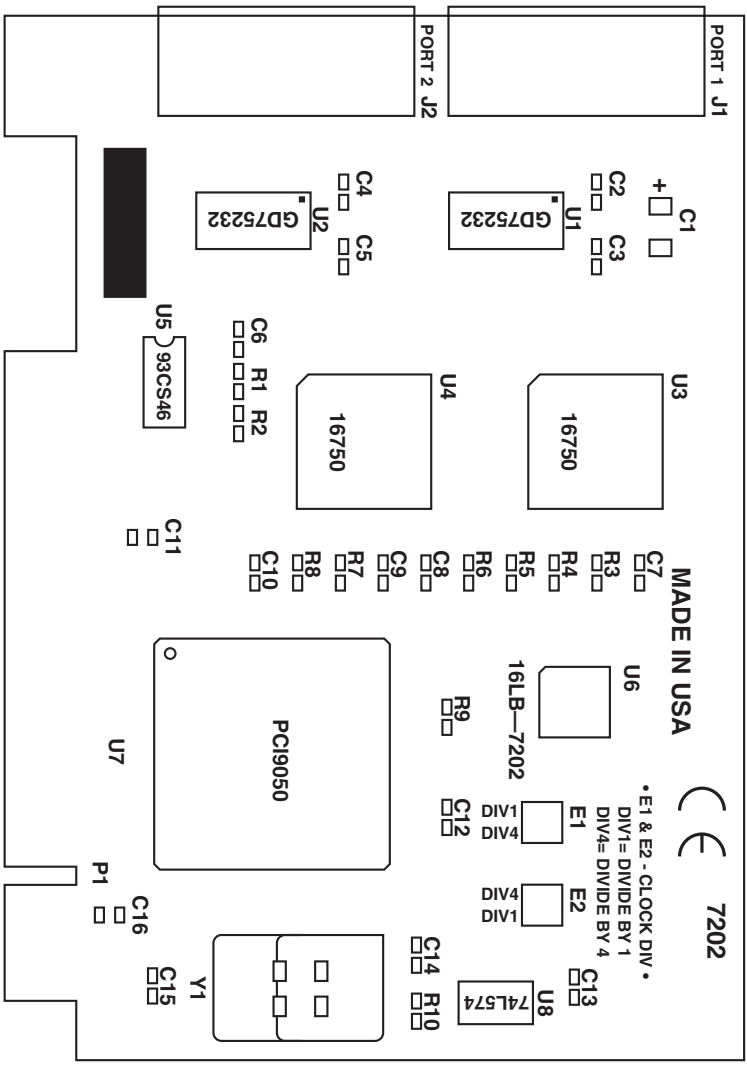


Figure D-2. Board Layout, IC143C.

Appendix E: Compliance Notices

E.1 Federal Communications Commission Statement

See page 1.

E.2 EMC Directive Statement

CE

Products bearing the CE Label fulfill the requirements of the EMC directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission.

To obey these directives, the following European standards must be met:

- EN55022 Class A - "Limits and methods of measurement of radio interference characteristics of information technology equipment"
- EN50082-1 - "Electromagnetic compatibility—Generic immunity standard" Part 1: Residential, commercial and light industry
- EN60950 (IEC950) - "Safety of information technology equipment, including electrical business equipment"

Always use cabling provided with this product if possible. If no cable is provided or if an alternate cable is required, use high-quality shielded cabling to maintain compliance with FCC/EMC directives.

1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746