Dual-Port Multi-Interface (RS-232/RS-422/RS-485) PCI Bus Serial Card
with Send Data Control
Model: 3PCI2

Documentation Number 3PCI2-0903

This product designed and manufactured in Ottawa, Illinois USA
of domestic and imported parts by

B&B electronics
MANUFACTURING COMPANY

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CAUTION: ELECTROSTATIC SENSITIVE DEVICE
Use ESD precautions for safe handling.

Before removing the card from the anti-static protective packaging:

- Discharge any static electricity buildup on your body by touching a large grounded metal surface or the metal chassis on equipment connected to earth ground by a 3-wire power cord.

- Avoid touching the gold connectors or other parts on the card except as necessary to set the configuration jumpers.

- Remove AC power from the computer before inserting the card.

- Retain the ESD bag for handling the card.

Chapter 1: *General Information*

Introduction

The 3PCI2 Dual Port serial interface card is designed to work with Windows based IBM compatible computers with a PCI bus. The card is Plug and Play compatible which permits the Windows Operating System and driver to set the addresses and IRQ used by the card.

If you are developing your own software, make sure that the communications routines support Windows communication drivers and a wide range of COM ports (Com1 to Com16 or higher).

Features

- Dual-Port Multiple Interface PC Serial Card

- Windows 95/98/2000/XP Compatible Drivers

- Buffered High Speed 16C950A UARTs (16C550 Compatible) 128 byte FIFOs for input/output with selectable trigger thresholds

- Supports baud rates to 460.8K baud

- RS-232/422/485 mode independently selectable each port

- RS-232 Mode – All eight signals including DCD & RI

- RS-422 Mode – Supports Transmit & Receive signal pairs

- RS-485 Mode – Supports Transmit & Receive signal pairs for half or full duplex connections.

- 2-wire or 4-wire RS-485 Operation (Half or Full Duplex)

- Automatic Send Data Control for RS-485 Operation

- Com Port Rename – Advanced Driver Function

- Standard DB9 Male Connectors

Quick Start

CAUTION: ELECTROSTATIC SENSITIVE DEVICE

1. Before removing the card from the anti-static protective packaging, discharge any static electricity on yourself.

2. Set the Operating Mode Jumpers for each port to match the mode desired. *Use the Jumper/Mode Table in Chapter 2.*

3. Unplug the computer Power Cord to prevent accidentally turning the computer on during installation.

4. Install the Card, replace the cover.

5. Reconnect the Power Cord.

6. While power is off, connect your cables (or wait Step 15).

7. Start the computer (as Administrator 2000/XP).

8. Insert the driver disc in your CD-ROM drive.

9. Wait until new hardware is detected.

10. Proceed with Installation according to your Operating System. See Chapter 3.

11. Check for new Com ports in Device Manager.

12. Select Driver Settings for DTR Control.

13. Set Com number as needed.

14. Prepare your cable connections to match the connector pinouts*. See Chapter 5 (RS-232) or 6 (RS-422 or RS-485).*

15. Shut down your computer before connecting the cables.

16. Connect your RS-232 or RS-422/RS-485 cables.

17. Power up your computer.

18. Verify operation of each port with your hardware.

Specifications

Bus:	PCI bus (33MHz/32-bit) +5V bus power.
Slot:	Requires one PCI slot
Dimensions:	4.79 x 3.77 in (12.16 x 9.57 cm) card edge
	(Mounting bracket: 1.23 x 12.06 x 0.85 cm)
I/O Connections:	Two 9-pin male D-sub (DB9M) connectors
OS Supported:	Windows 95, 98, 2000, XP
Baud rates:	460.8K baud maximum - RS-232/422/485
UARTs:	16C950 (128-byte FIFO TX and RX buffers) 16C550 compatible
Character length:	5, 6, 7 or 8 bits
Parity:	Even, odd or none
Stop bits:	1, 1.5, or 2

RS-232 Data Lines Drivers/Receivers:

Transceiver Device:	SP211H (or equivalent)
High level output voltage:	5.0 V minimum
Low level output voltage:	-5.0 V minimum
Output current limited to:	±25 mA
Input high threshold voltage:	1.7 V maximum
Input low threshold voltage:	0.8 V minimum
Device will withstand:	±15 V

RS-422/485 Driver/Receiver:

Transceiver Device:	SP491 (or equivalent)
Differential driver output voltage:	1.5 - 5 V
Differential input high-threshold voltage:	0.2 V maximum
Differential input low-threshold voltage:	-0.2 V minimum

Automatic RS-485 Driver Control Timing:

Driver is enabled by Tx input buffer data. Driver remains enabled until all data in Tx buffer is sent.

Receiver Biasing:
4.7K pull-up/pull-down for 32 standard (12-15K) nodes
Provision for custom biasing (R14, R13, R16, R17)

Termination: none. Provision for custom termination (R15/18)

Max Power Consumption: All ports loaded

Voltage (V)	Current (mA)	Power (W)
+5	240	1.2
+12	<1uA	-
-12	<1 uA	-
Total	**240**	**1.2**

Typical Baud Rates
75
110
134
150
300
600
1200
1800
2400
4800
7200
9600
14.4K
19.2K
38.4K
57.6K
115.2K
230.4K
460.8K

Any baud rate that is a common divisor of 460.8K can be used if the application software supports it.

Accessories:

Software: Driver CD-ROM Disc for Windows 95/98/2000/XP

Manual: Instruction Manual (paper copy of this booklet)

Chapter 2: *Setup*

Inspection

Your 3PCI2 serial card was tested for proper operation before packaging. It should be in perfect mechanical and electrical condition upon receipt.

CAUTION: ELECTROSTATIC SENSITIVE DEVICE

Use ESD precautions for safe handling.

Before removing the card from the anti-static protective packaging:

- Discharge any static electricity buildup on your body by touching a large grounded metal surface or the metal chassis on equipment connected to earth ground by a 3-wire power cord.

- Avoid touching the gold connectors or other parts on the card except as necessary to set the configuration jumpers.

- Remove AC power from the computer before inserting the card.

- Retain the ESD bag for handling the card.

- Save the packaging for storage or shipping.

Before Starting…

The card is normally pre-configured for RS-232 operation.

Check/Set 3 operating Mode/Jumpers for each port.

Device Driver Setting for RS-485 Mode:

After driver installation, set DTR Operation to **RS-485 Mode**.

See Chapter 4, *Setting Driver Options.*

Selection of Operating Mode

The hardware address and IRQ is set by the Windows Operating System using driver information files and the Plug and Play OS.

The Operating Mode is set using Jumpers, Device Manager Driver Settings and by your cable connections and software.

Set the Jumpers

Set JP1 and JP2 Jumpers to match your Operating Mode.
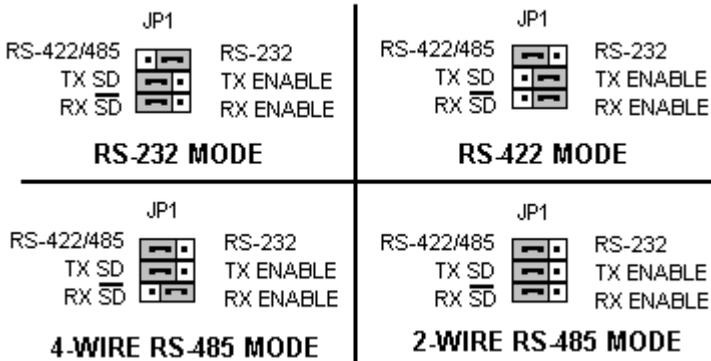
Port 1 (bottom connector)

Port 1 Jumpers	RS-232	RS-422 4-Wire	RS-485 4-Wire	RS-485 2-Wire
JP1 Top	232 (Right)	422/485 (left)	422/485 (left)	422/485 (left)
JP1 Middle	----- No effect	TX ENABLE (right)	TX SD (left)	TX SD (left)
JP1 Bottom	----- No effect	RX ENABLE (right)	RX ENABLE (right)	RX SD (left)

Table 1 – Port 1 (near bus) Jumper/Mode Table

Port 2 (top connector)

Port 2 Jumpers	RS-232	RS-422 4-Wire	RS-485 4-Wire	RS-485 2-Wire
JP2 Top	232	422/485 (left)	422/485 (left)	422/485 (left)
JP2 Middle	----- No effect	TX ENABLE (right)	TX SD (left)	TX SD (left)
JP2 Bottom	----- No effect	RX ENABLE (right)	RX ENABLE (right)	RX SD (left)

Table 2 – Port 2 (near top of card) Jumper/Mode Table

The top jumper sets DB9 connections for either 232 or 422/485.

RS-232 operation requires setting only the Top jumper.

The middle jumper sets the RS-422/RS-485 transmitter for RS-485 or RS-422 operation*. In RS-485 mode, the transmitter is tri-stated when not sending data. In RS-422 mode, the transmitter is always enabled.*

The bottom jumper sets the RS-422/RS-485 receiver for half-duplex RS-485 operation or full-duplex RS-422/RS-485 operation*. In half-duplex RS-485, the receiver is enabled when not transmitting. In dull-duplex RS-422/485 operation, the receiver is always enabled.*

For more operating mode information, see the related chapter.

Install the Card

1. Shut down your computer.

2. Unplug the power cord to remove power to prevent accidentally turning on the computer during installation.

3. Remove the cover of the computer.

4. Locate an empty PCI expansion slot.

5. Remove the expansion slot cover. Save the retaining screw.

6. Ground yourself to the computer chassis before and while inserting the card.

7. Install the card into the unused slot. Be certain that the card is inserted completely (fully seated) in the slot.

8. Secure the card with the mounting screw from step 5.

9. Replace the cover, plug in the power cord.

10. Connect your cables.

11. Power up the system.

12. Install the drivers as indicated in Chapter 3.

Chapter 3: *Software Driver Installation*

Windows 95 or 98

The 3PCI2 drivers are unique to this series of cards. If at some point in the future, you want to update these drivers, remove these drivers before installing the new version. See Removal at page 17.

Windows 98 screens are shown for this section. Windows 95 will have other screen names and text shown. Windows Classic settings used as standard.

1. Configure each port on card and install it – see Chapter 2.

2. Make sure PnP OS is set in the BIOS. Power up the computer.

3. Windows will detect the PCI card, start the Add New Hardware Wizard, and begin driver installation

4. The driver installation goes through several steps after finding the driver files. The first part installs the driver for the card, then after Finish, the second part installs the serial driver each Com port. Do not remove the disc until completed.

5. Click **Next.**

Add New Hardware Wizard

What do you want Windows to do?

○ Search for the best driver for your device. (Recommended).

○ Display a list of all the drivers in a specific location, so you can select the driver you want.

< Back | Next > | Cancel

6. Select **Search**, Click **Next**.

Add New Hardware Wizard

Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected locations. Click Next to start the search.

☐ Floppy disk drives

☑ CD-ROM drive

☐ Microsoft Windows Update

☐ Specify a location:

C:\3PCI2

Browse...

< Back | Next > | Cancel

7. Insert Disc. Select **CD-ROM Drive**, Click **Next**.

Windows will find "B&B 3PCI2 Dual-Port Serial Card" and the driver BBPCI.inf file.

Add New Hardware Wizard

Windows driver file search for the device:

B&B 3PCI2 Dual-Port Serial Card

Windows is now ready to install the best driver for this device. Click Back to select a different driver, or click Next to continue.

Location of driver:

D:\BBPCI.INF

[< Back] [Next >] [Cancel]

8. Click **Next.**

Add New Hardware Wizard

BB 3PCI2 Dual-Port Serial Card

Windows has finished installing the software that your new hardware device requires.

[< Back] [Finish] [Cancel]

9. Click **Finish.** Installation will complete automatically.

New Hardware Found

B&B Communications Port

Windows is installing the software for your new hardware.
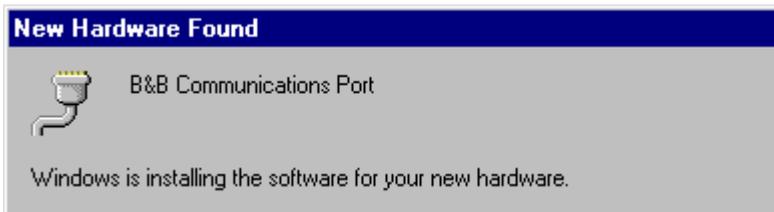
Another similar screen will be shown before the above, and after. The second time the above is shown, installation will have completed. Wait for the process to complete.

To verify the installation, open **Start**, **Settings**, **Control Panel**, **System**.

System Properties

| General | Device Manager | Hardware Profiles | Performance |

○ View devices by type   ○ View devices by connection

- Disk drives
- DISPLAY
- Floppy disk controllers
- Hard disk controllers
- Keyboard
- Monitors
- Mouse
- Multi-function adapters
  - B&B 3PCI2 Dual-Port Serial Card
- Network adapters
- Ports (COM & LPT)
  - B&B Communications Port (COM5)
  - B&B Communications Port (COM6)
  - Communications Port (COM1)
  - Communications Port (COM2)
  - ECP Printer Port (LPT1)

Properties   Refresh   Remove   Print...

OK   Cancel

Then select the **Device Manager** Tab.

Click the **Multifunction adapters** view the card. If you want other details, Select **Properties**.

Click **Ports (COM & LPT)** to view the COM numbers assigned by Windows to the card.

You will have two new B&B com ports as shown (prior page).

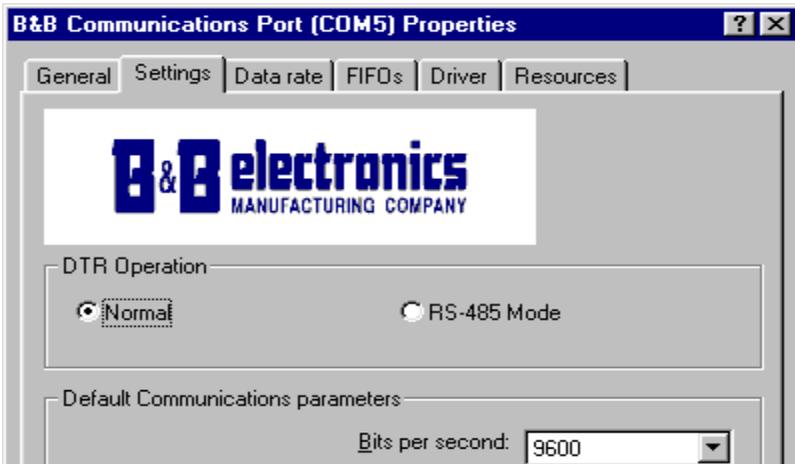Select **Properties** or double-click on one of the new com ports, to set driver options.

Set DTR Operation

Set DTR Operation to **Normal** for RS-232.

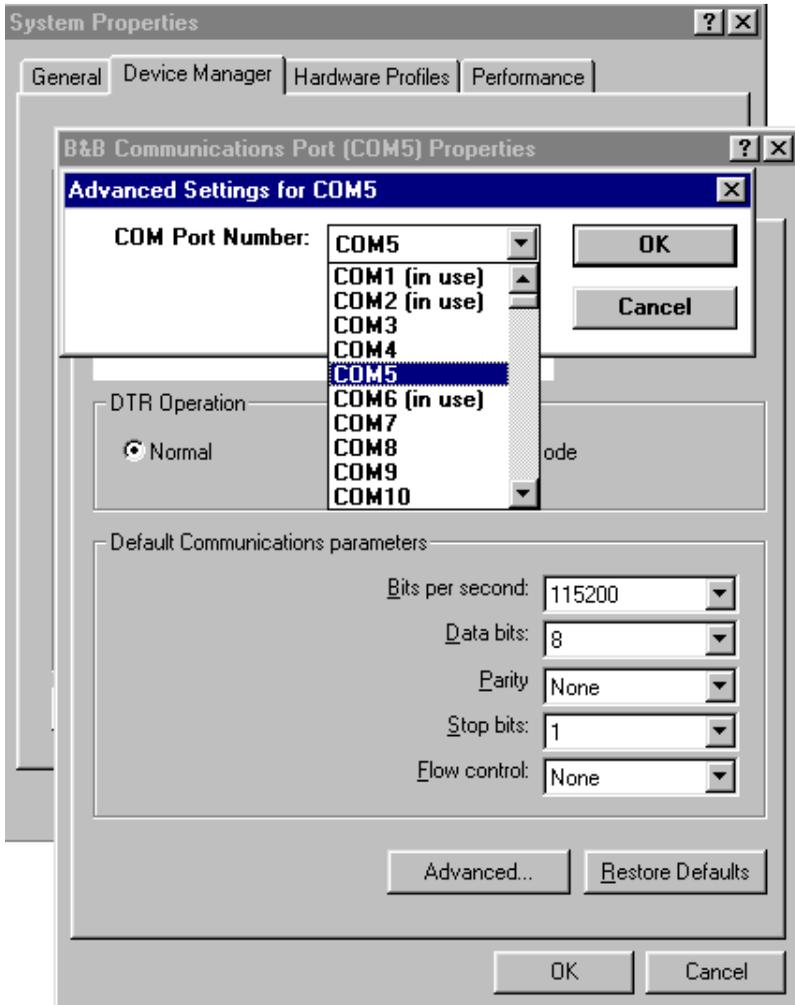Set DTR Operation to **RS-485 Mode** for 2-wire or 4-wire RS-485 operation.

Either setting can be used for RS-422.

The card jumpers must be set for the same mode. See Chapter 2.

Changing Com Port Number

From the Device Manager, Select **Properties**, **Settings**, **Advanced**.

Available names for Com numbers are shown. Select a new number from those not "in use". Com numbers from Com1 to Com256 may be available. Com numbers "in use" may be used by motherboard ports, modems, virtual com ports for network serial server devices or FAX modem. Formerly installed USB to serial adaptors, PCI cards or other hardware may have reserved a com number. The device may need to be added back to the system, or the registry may need to be edited with Reg. Edit or a similar utility.

After selecting a new com number, Click **OK**, then **OK** again on the **Settings** page.

After returning to the Device Manager screen, select **Refresh**. Then double-click Ports again.

You should see the two ports renamed as shown below:
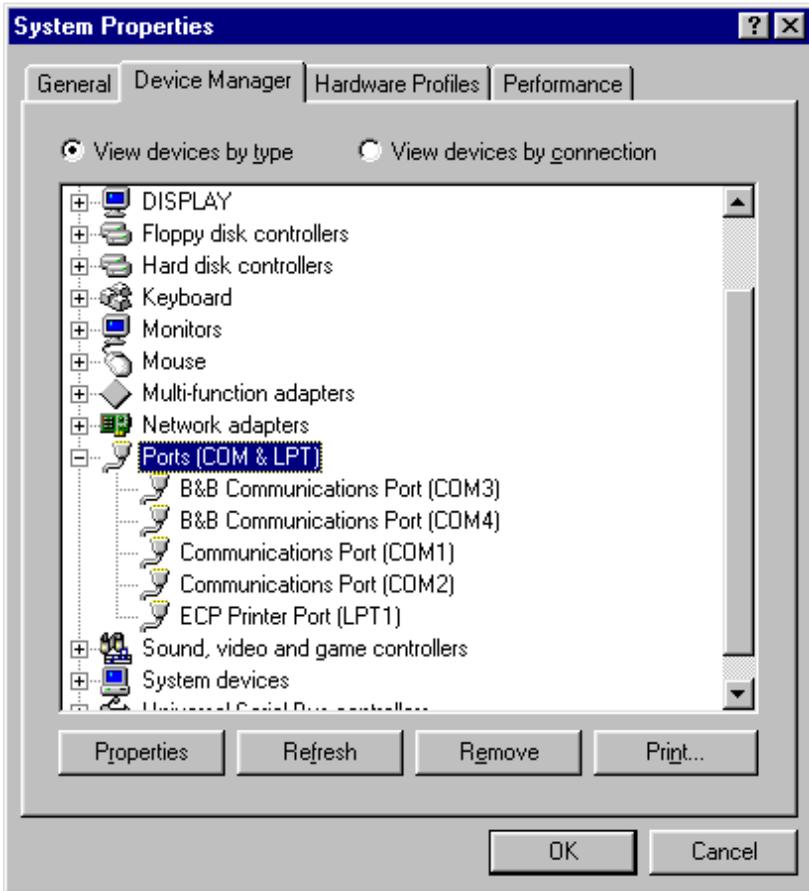
Example – After renaming B&B Ports from Com5 and Com6 double-click or select each port to finish selecting other properties.
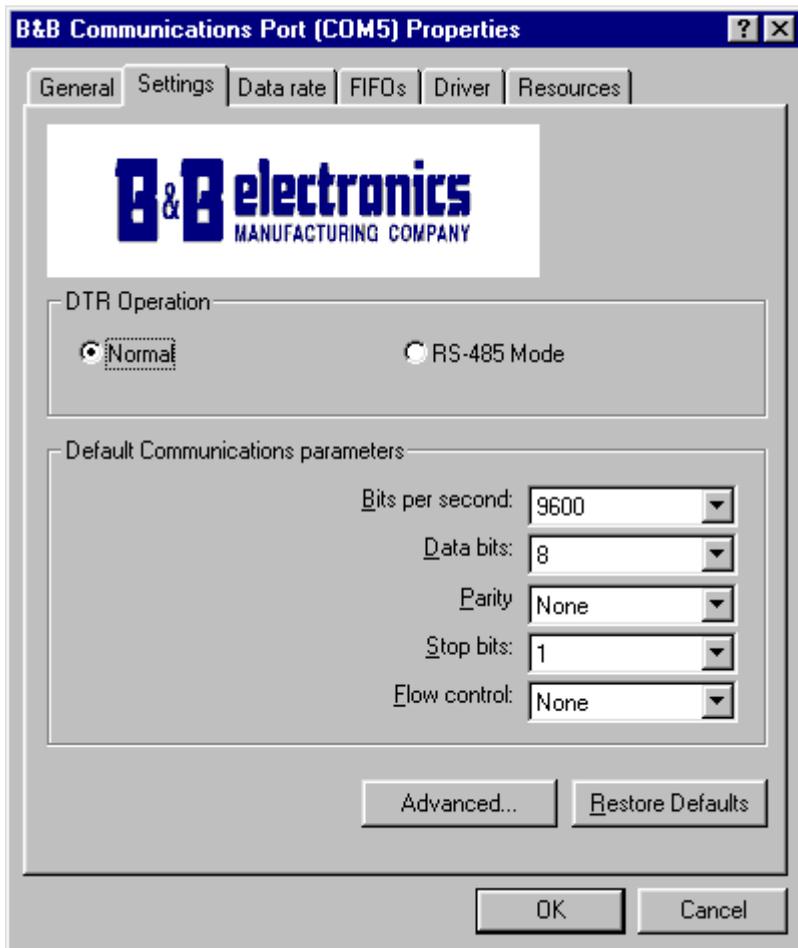
The Default Com parameters are normally overridden by the software application.

Continue in Chapter 4, **Setting Driver Options,** for Data Rate Clock Speed and FIFO settings.

Make your connections, RS-232 in Chapter 5, or RS-422/485 in Chapter 6.

Removal of Drivers/Card

If you need to install a possible future driver update or want to remove the card from your system:

1. Open **My Computer**, **Control Panel**, **System** (or Start, Setting, Control Panel, System).

2. Select the **Device Manager** page.

3. Select the **B&B Com port**. Click the **Remove** button.

4. Select the other **B&B Com port**. Click the **Remove** button.

5. Click **Multifunction Adaptors**, then select **B&B 3PCI2 Dual-Port Serial Card** which matches the card installed.

6. Click the **Remove** button.

Next find the C:\WINDOWS\INF directory, select View, Details, Arrange Icons, By Name. (You can use Windows Explorer instead)
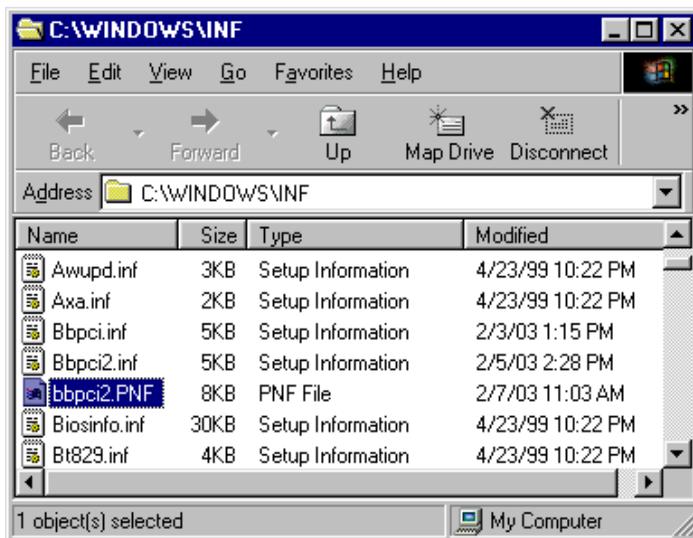
7. Find the files, Bbpci.inf, Bbpic2.inf, bbpci2.PNF, and remove them.

The bbpci2.PNF is a compiled version of the same named .inf and can be viewed with Notepad if you want to confirm the content before removing.

8.   Remove Bbpci.inf in **Other** subdirectory within INF.

If the inf folder can't be found, select My Computer, View, Folder Options, Files and Folders, select **Show all files**.

Removing the card first in the device manager clears the registry.
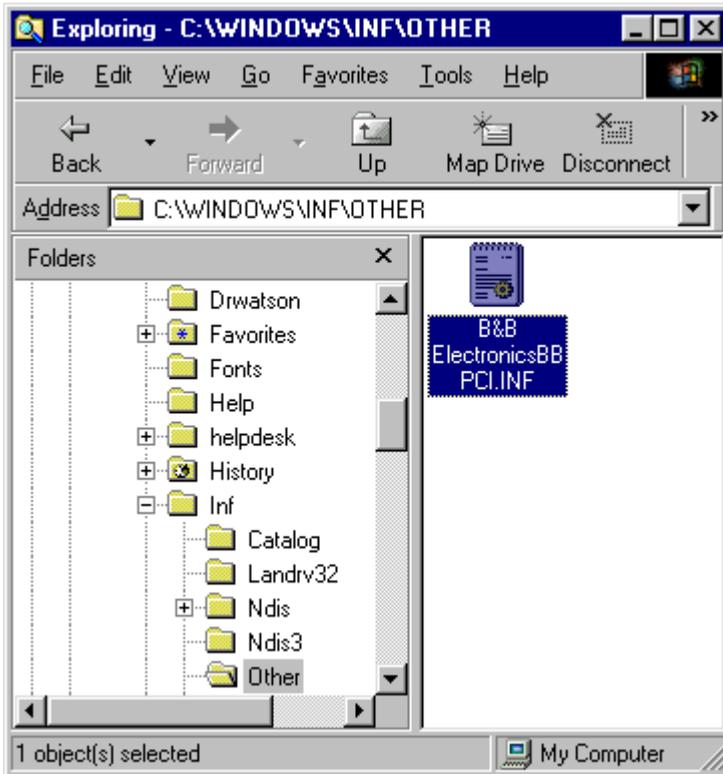
8. Shut down the computer.

9. Remove the card.

Windows 2000 Professional

This section covers the first part of device driver installation for Windows 2000 Professional. Windows Classic settings used as standard.

The 3PCI2 drivers are unique to this series of cards. If at some point in the future, you want to update these drivers, remove these drivers before installing the new version. See Removal on page 35.

1. Configure each port on the card for the desired RS-232/422/485 mode using the 3 jumpers for each port. See Chapter 2.

2. Install the card in the slot. Start the computer as Administrator or ask your system administrator to install the software.

3. Windows will detect the PCI card and start Found New Hardware Wizard, to begin driver installation

4. Windows 2000 will find new hardware twice. After the driver for the PCI Serial Card installs, new Com ports will be found and the serial drivers for the Com ports will be installed.

5. Click **Next** to continue.

Found New Hardware Wizard

Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.

This wizard will complete the installation for this device:

PCI Serial Port

A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.

What do you want the wizard to do?

○ Search for a suitable driver for my device (recommended)

○ Display a list of the known drivers for this device so that I can choose a specific driver
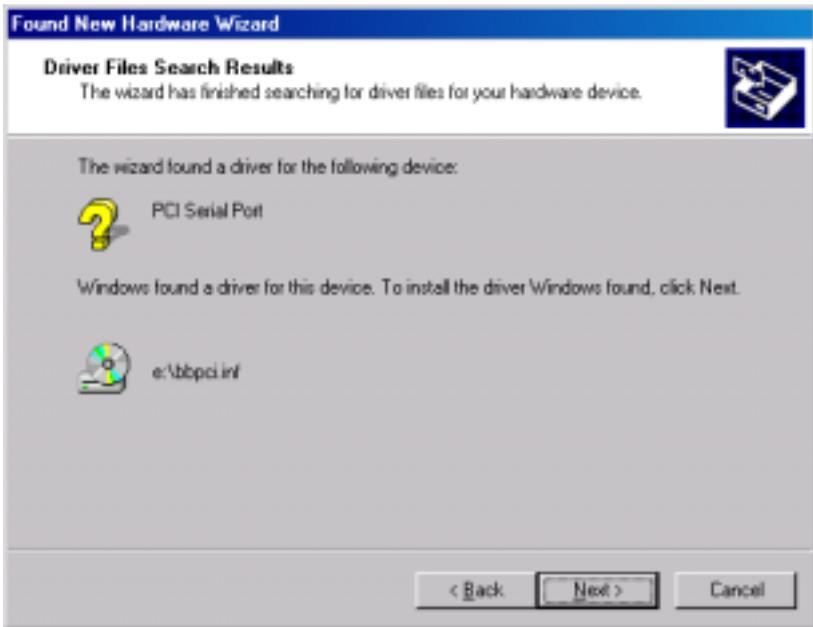
< Back   Next >   Cancel

6. Select **Search** and Click **Next** to continue.

Found New Hardware Wizard

Locate Driver Files
Where do you want Windows to search for driver files?

Search for driver files for the following hardware device:

PCI Serial Port

The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.

To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.

Optional search locations:
☐ Floppy disk drives
☑ CD-ROM drives
☐ Specify a location
☐ Microsoft Windows Update

< Back   Next >   Cancel

7. Insert the driver disc in the **CD-ROM drive**. Click **Next**.

---

8. Click **Next**.

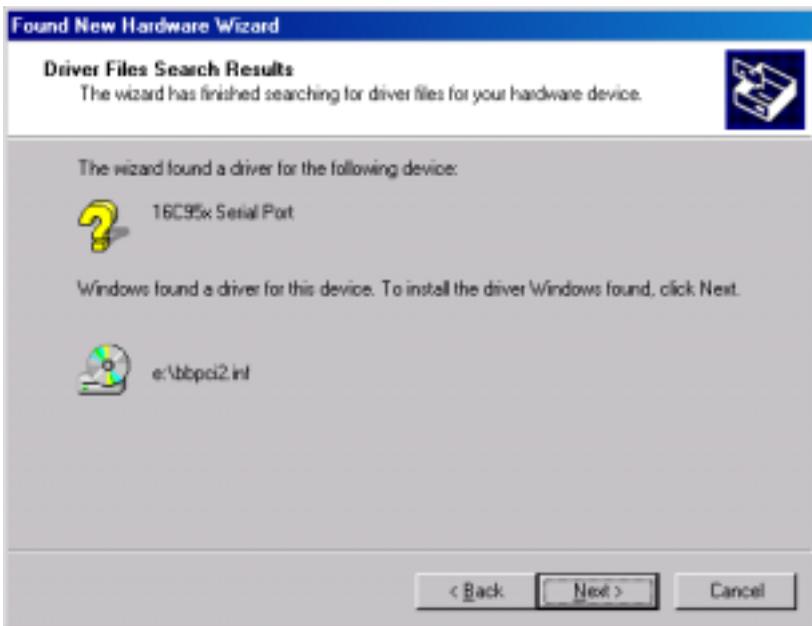9. Click **Finish** to complete the first part of installation.

10. Next Windows finds a new type of serial port. Click **Next.**

1. Click **Next** to search a second time.

Found New Hardware Wizard

Locate Driver Files
Where do you want Windows to search for driver files?

Search for driver files for the following hardware device:

16C95x Serial Port

The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.

To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.

Optional search locations:
☐ Floppy disk drives
☑ CD-ROM drives
☐ Specify a location
☐ Microsoft Windows Update

< Back   Next >   Cancel

12. Select **CD-ROM drives**. Click **Next**.

Found New Hardware Wizard

Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.

The wizard found a driver for the following device:

16C95x Serial Port

Windows found a driver for this device. To install the driver Windows found, click Next.

e:\bbpci2.inf

< Back   Next >   Cancel

13. Click **Next** when the bbpci2.inf file is found.

Found New Hardware Wizard

Completing the Found New Hardware Wizard

BB Communications Port

Windows has finished installing the software for this device.

To close this wizard, click Finish.

< Back   **Finish**   Cancel

14. Click **Finish.**

Wait for the process to complete. Check and verify that a new B&B Com port is now available.

13. Open **Start, Settings**, **Control Panel**, **System.** Then select the **Hardware** tab on System Properties.

14. Skip over the first part of software driver installation for XP which follows. The second part applies to both 2000 and XP.

Windows XP Professional

This section covers the first part of device driver installation for Windows XP Professional. Windows Classic settings used as standard.

The 3PCI2 drivers are unique to this series of cards. If at some point in the future, you want to update these drivers, remove these drivers before installing the new version. See Removal on page 35.

1. Configure each port on the card for the desired RS-232/422/485 mode using the 3 jumpers for each port. See Chapter 2.

2. Install the card in the slot. Start the computer as Administrator or ask your system administrator to install the software.

3. Windows will detect the PCI card and start Found New Hardware Wizard, to begin driver installation. Windows XP will find new hardware three times. After the driver for the PCI Serial Card installs, the serial driver for each Com port will be installed.

4. Insert your driver disc in the CD-ROM drive.
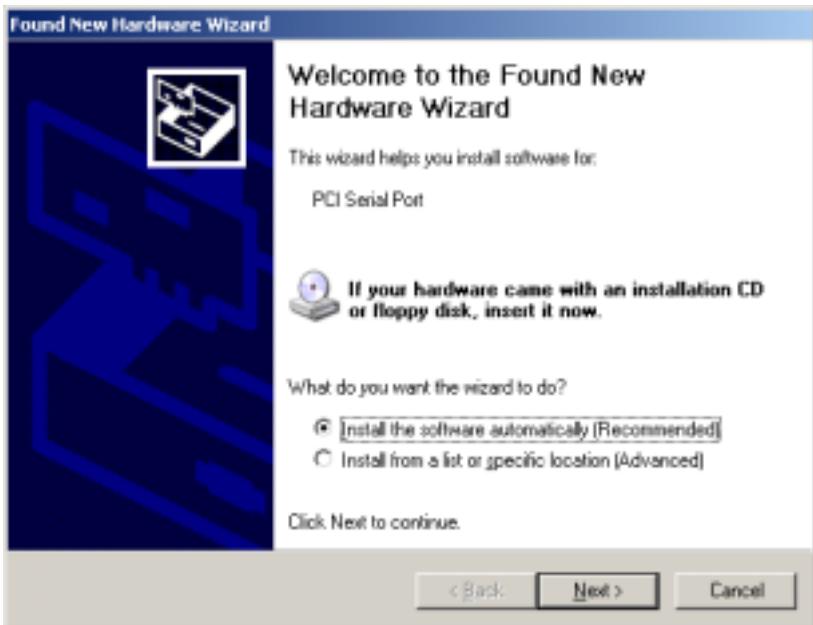
5. Select **Install the software automatically**. Allow a few seconds for the drive to become ready after inserting disc. Click **Next**.

6. Windows will find the drivers on the CD, then provide a notice concerning Windows Logo testing for XP.

   This new feature of XP simply indicates that these drivers have not yet undergone the Microsoft testing procedures required to use the Windows XP Logo on the packaging. Driver compatibility is not affected.
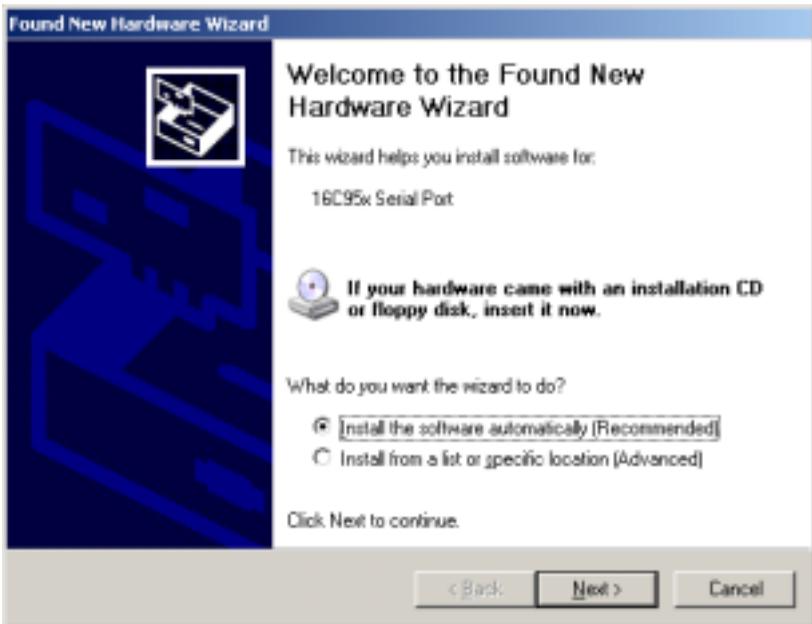

7. Click **Continue Anyway**.

Continued next page

Completing the Found New Hardware Wizard

BB 3PCI2 Dual-Port Serial Card

Windows has finished installing the software for this device.

To close this wizard, click Finish.

| < Back | Finish | Cancel |

8. Click **Finish** to continue installation.

Welcome to the Found New Hardware Wizard

This wizard helps you install software for:

16C95x Serial Port

If your hardware came with an installation CD or floppy disk, insert it now.

What do you want the wizard to do?

○ Install the software automatically [Recommended]
○ Install from a list or specific location [Advanced]

Click Next to continue.

| < Back | Next > | Cancel |

9. Select **Next.**

10. Windows provides the Logo notice for Com Port Driver.

Hardware Installation

⚠️ The software you are installing for this hardware:

BB Communications Port

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.

[Continue Anyway] [STOP Installation]

11. Click Continue Anyway.

Found New Hardware Wizard

Completing the Found New Hardware Wizard

The wizard has finished installing the software for:

B&B Communications Port

Click Finish to close the wizard.

[< Back] [Finish] [Cancel]

12. Click **Finish**. Repeat Step 9, 10, 12 for second Com Port.

13. After Finish for the second Com port on the card, this part of software driver installation is complete.

Check and verify that a new B&B Com port is now available within the **Control Panel**, **System**, **Device Manager**.

If you are more familiar with Windows 95/98/2000, you may want to select the Windows Classic look for the Start Menu.

Position the mouse **pointer** over the **Taskbar**, then **Right Click**, Select **Properties**.

Select the **Start Menu tab**, then select **Classic Start Menu**.

Open **Start, Settings**, **Control Panel**, **System.** Then select the **Hardware** tab on **System Properties**.

Continued next page

System Properties/Hardware/Device Manager
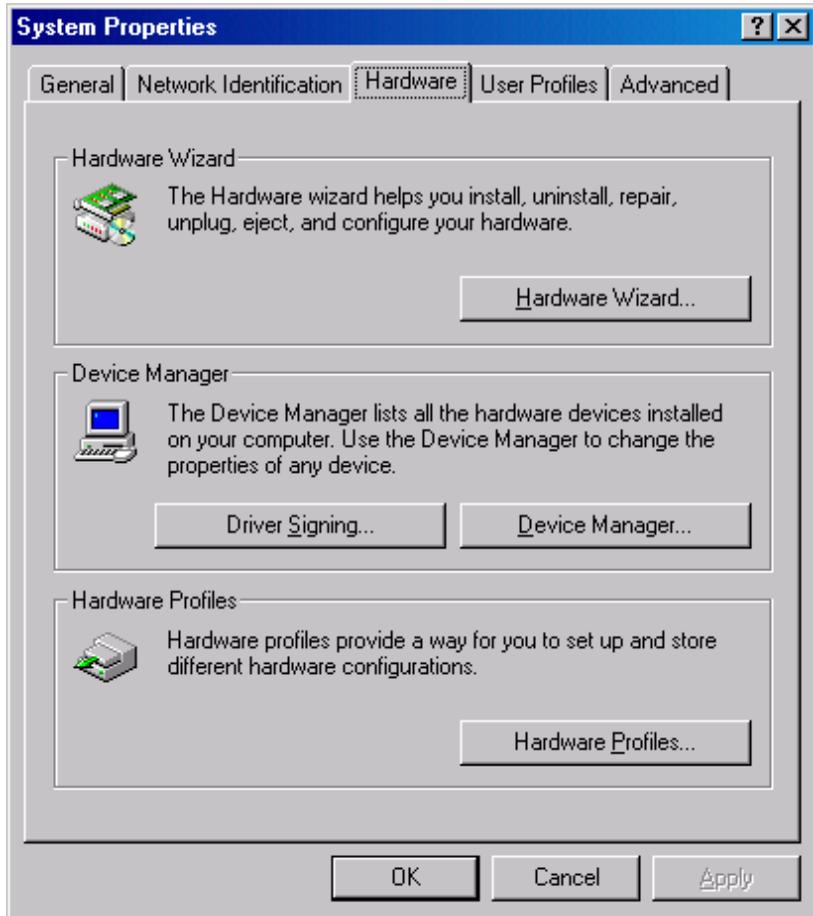
Select **Device Manager**, then view the hardware list.
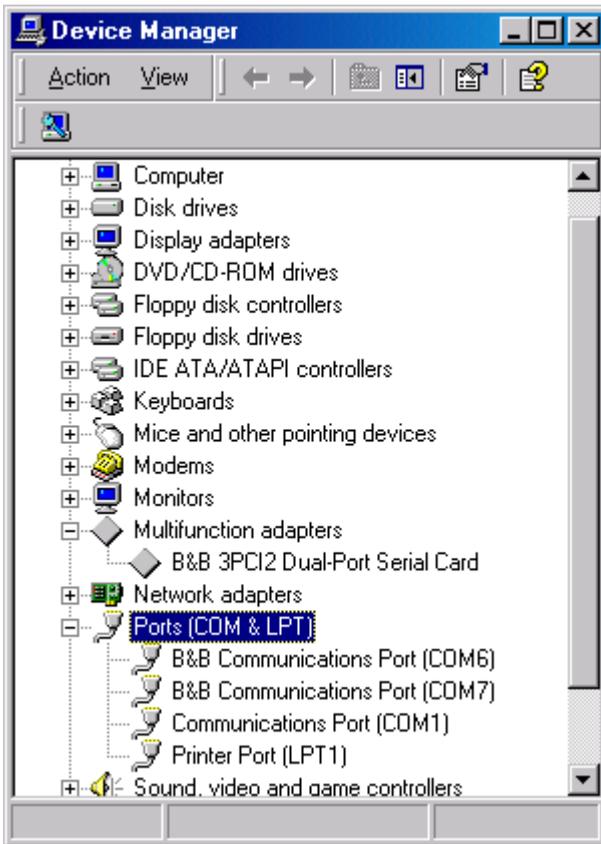
Under **Multifunction Adapters**, the B&B 3PCI2 Dual-Port Serial Card is installed.

Under Ports, B&B Com Port (COM6) and (COM7) was assigned.

*If Com ports between COM1 and COM6 are not "in use" by other hardware or software, we can change the B&B Com port to another available Com number using Properties, Settings, **Advanced.***

Double-click on COM6 to access the **Properties**.

Next select **Settings.**

Set DTR Operation

Set DTR Operation to **Normal** for RS-232.

Set DTR Operation to **RS-485 Mode** for 2-wire or 4-wire RS-485 operation.

Either setting can be used for RS-422.

The card jumpers must be set for the same mode. See Chapter 2.
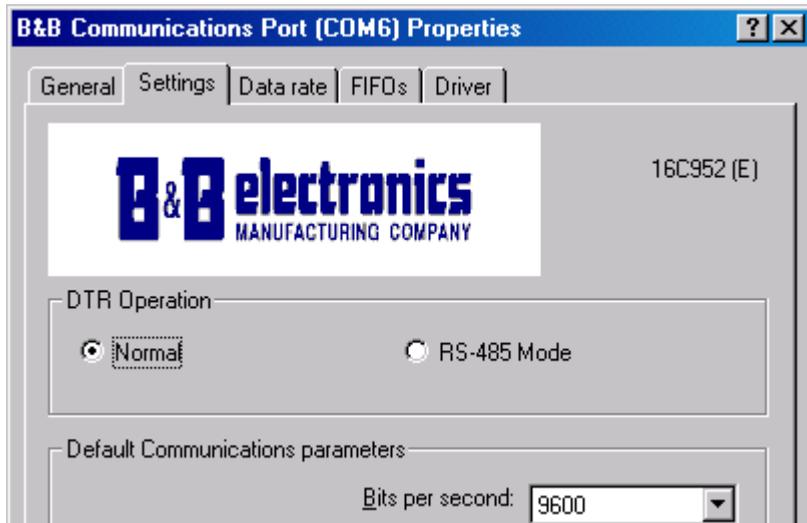
The Default Com parameters are normally overridden by the software application.

You can now remove the driver disc, close the Windows, and check the new ports with your software.

Continued next page

Changing Com Port Number
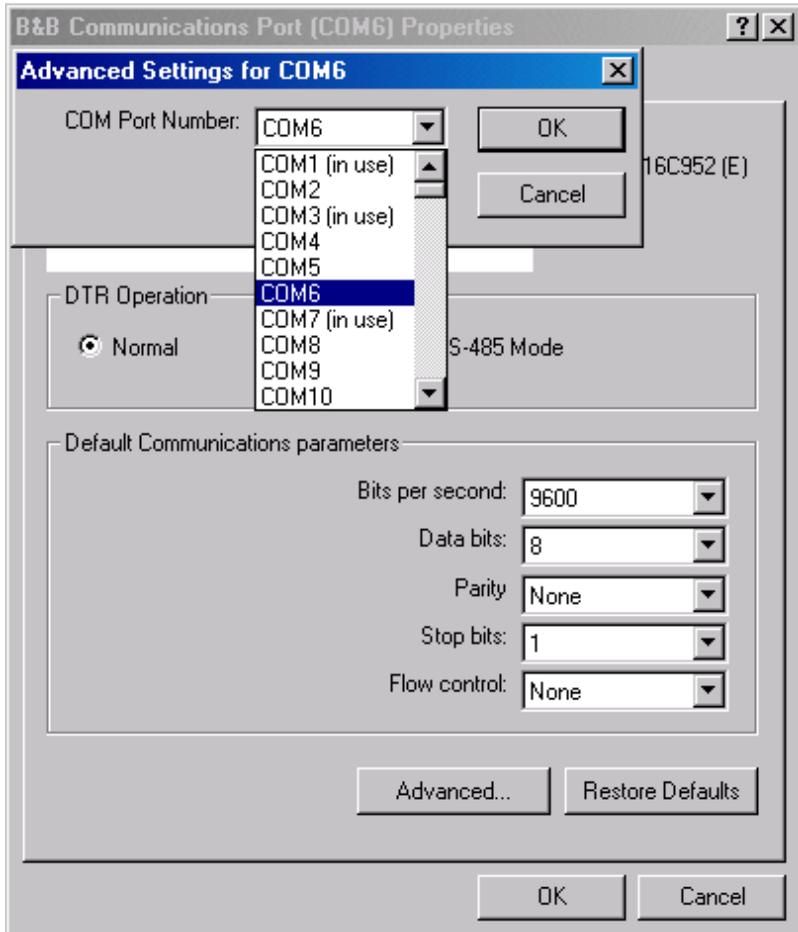
From the **Device Manager**, Select **Properties**, **Settings**, **Advanced.**

Available names for Com numbers are shown. Select a new number from those not "in use". Com numbers from Com1 to Com256 may be available. Com numbers "in use" may be used by motherboard ports, Modems, virtual com ports for network serial server devices or FAX modem. Formerly installed USB to serial adaptors, PCI cards or other hardware may have reserved a com number. The device may need to be added back to the system, then the software removed.

Advanced editing of the registry may needed to clean up the problem. Special permissions are required with 2000 or XP.

After selecting a new com number, Click **OK,** then **OK** again on the **Settings** page.

After returning to the Device Manager screen, it should refresh automatically. Then double-click Ports again.

You should see a B&B port renamed as shown below:
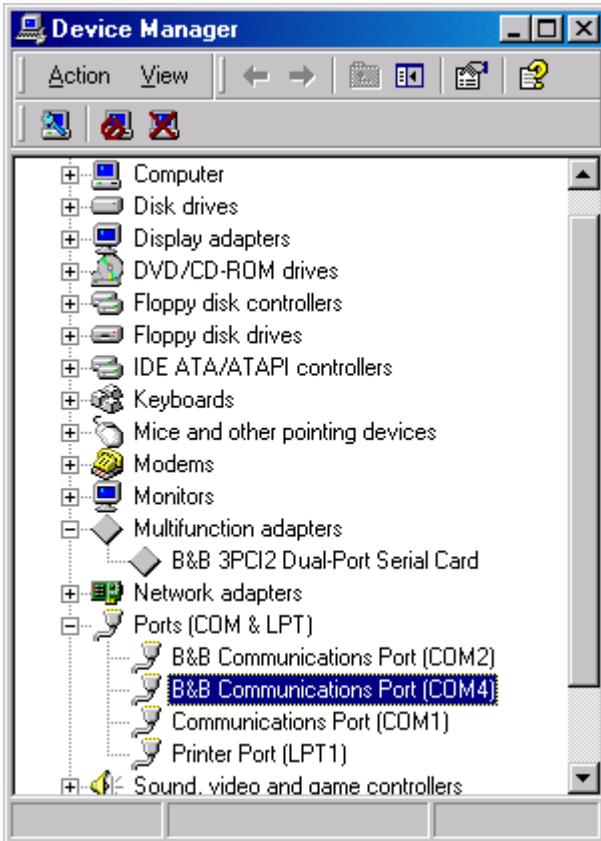
Example – After renaming B&B Port to Com2 & Com4

Double-click or select the port to finish selecting other properties.

Continue in Chapter 4, **Setting Driver Options**

Software installation is complete.

Make your connections, RS-232 in Chapter 5 or RS-422/485 in Chapter 6.

Removal of Drivers/Card

If you need to install a possible future driver update or want to remove the card from your system:

1. Click on the B&B Com Port under **Ports (COM & LPT)** and select Uninstall (right click).

2. Click on Multifunction Adapters, select the B&B 3PCI2 Dual-Port Serial Card. Select **Uninstall.**

   This step cleans the entries in the Registry which cannot be easily edited under 2000 or XP.

3. Remove the two sets of driver files from the Windows INF directory. *See the screen on the next page*.

   (These are named by the OS in the sequence of installation. On a clean system they are: Oem0.inf & Oem0.PNF and Oem1.inf & Oem1.PNF. The .inf versions should be verified by opening it with Notepad, then checking that it is a B&B Electronics file for the card. The PNF version is a compiled copy of the same information.)

   You can use the **Find**, *File or Folder* function to search for the text *3PCI2*, *B&B or 3pci* within the files.

   Windows Explorer can also be used to find the OEM files. Explorer view shown next page.

   You may need to set your Views (under My Computer) to show all files and folders if the INF directory and .inf files are not visible. Example after Windows Explorer screen.
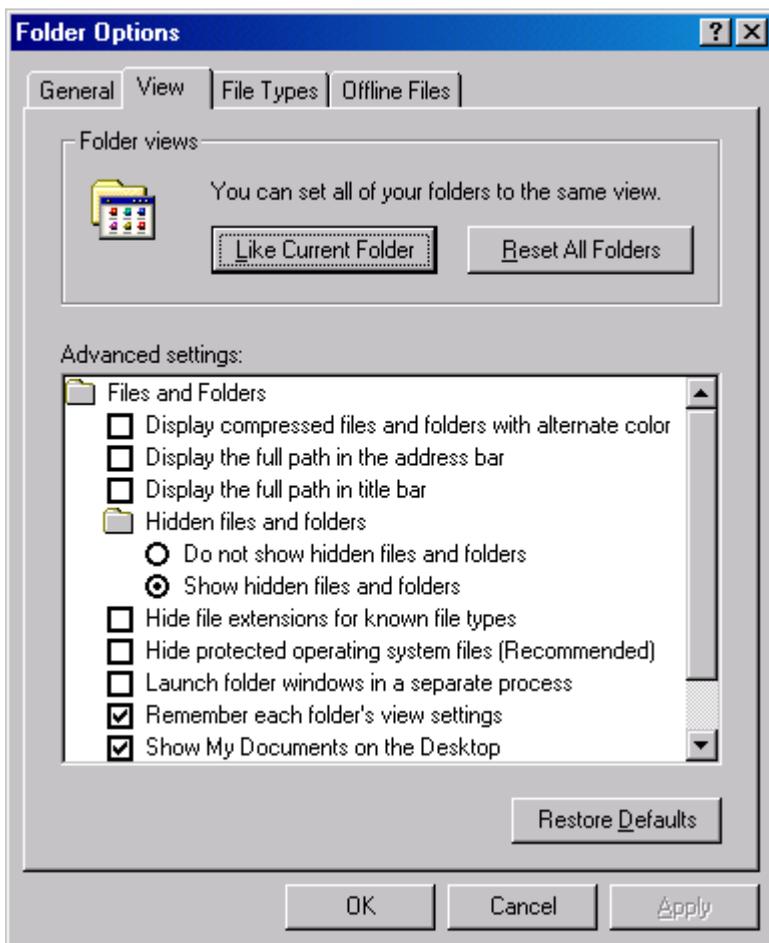
4. Shut down the system and remove the card.

Windows Explorer, WINNT, INF, Oem2 and Oem3 files.
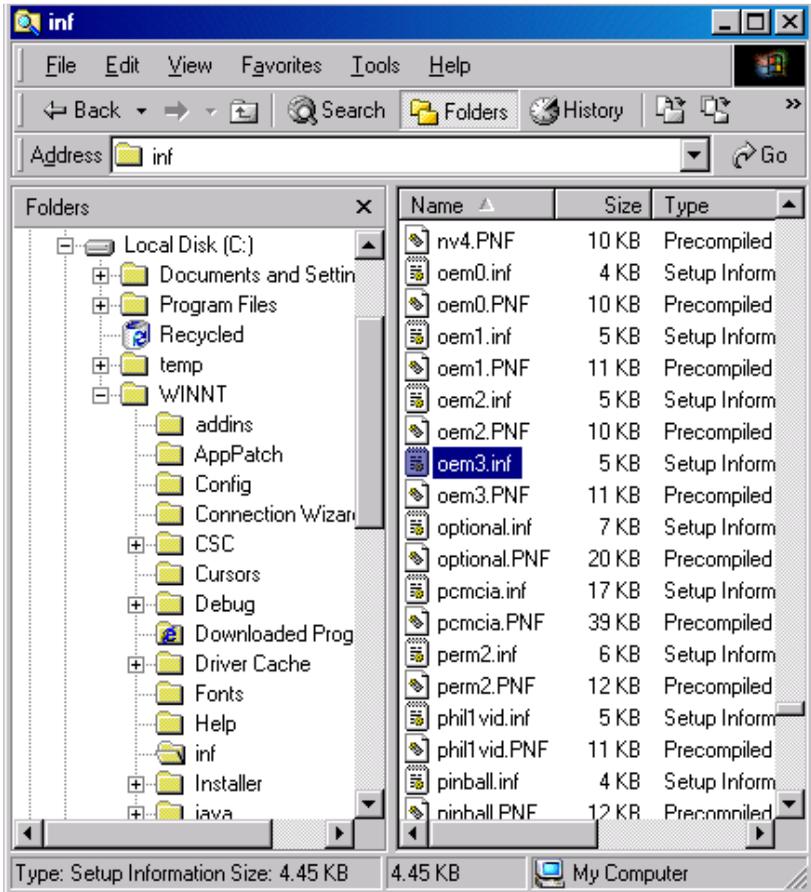
Finding the OEMx.inf and OEMx.PNF files for removal.
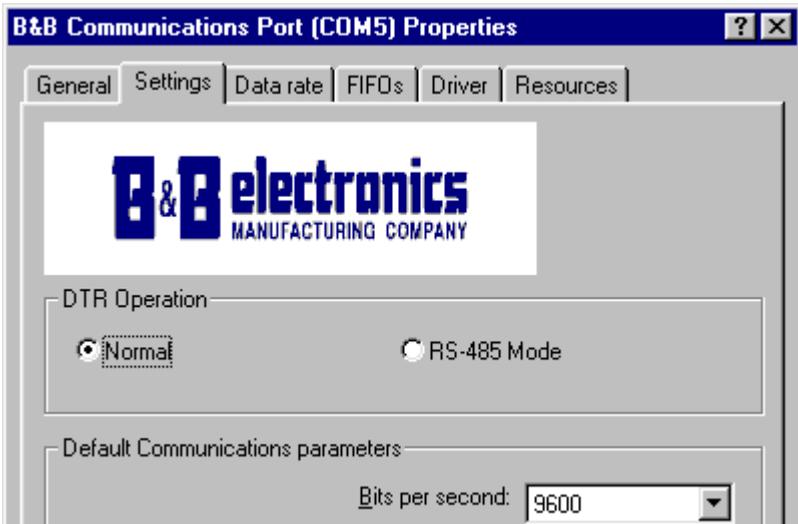
Continued next page

Show Hidden Files and Folders

End of Removal section.

Chapter 4: *Setting Driver Options*

DTR Operation

Example - DTR Operation Screen (Windows 98)

Select **Normal** for RS-232 operation.

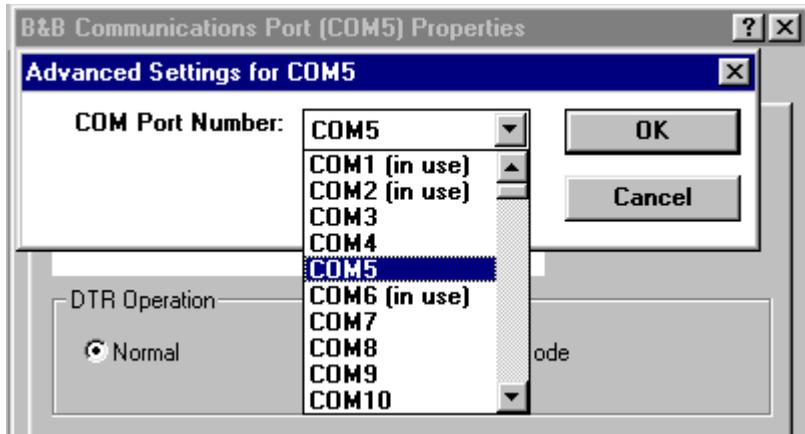Select **RS-485 Mode** for Automatic RS-485 Driver Control.

Use either setting for RS-422 operation.

Continued next page

Advanced – Com Port Renaming

Select to change port name to another Com number.

From the **Device Manager**, Select **Properties**, **Settings**, **Advanced**.

Example - Advanced Settings (Windows 98)

Available names for Com numbers are shown. Select a new number from those not "in use". Com numbers from Com1 to Com256 may be available. Com numbers "in use" may be used by motherboard ports, Modems, virtual com ports for network serial server devices or FAX modem. Formerly installed USB to serial adaptors, PCI cards or other hardware may have reserved a com number.

After selecting a new com number, Click OK, then OK again on the Settings page.

Continued next page

Data Rate - 1X or 4X Clock Speed

Each 3PCI2 port in the Device Manager has Data Rate, Clock Speed settings for normal 1X or 4X.

The 4X position provides a compatibility mode for software which requires it. In the 4X position, all specified baud rate settings are multiplied 4 times. For example, if the software specifies 57.6K baud, the actual baud rate will be 230.4K baud, 115.2K becomes 460.8K baud. Each port can be set separately.


Example – Data Rate, Clock Speed, 4x (Windows 98)

Refer to Specifications in Chapter 1 for baud rates available.

In many systems, faster baud rates can improve throughput significantly. Actual throughput and faster baud rates are only proportional if the system can keep up with the communications, otherwise increasing the baud rate effectively only increases the idle time between characters.

Continued next page

FIFO Settings
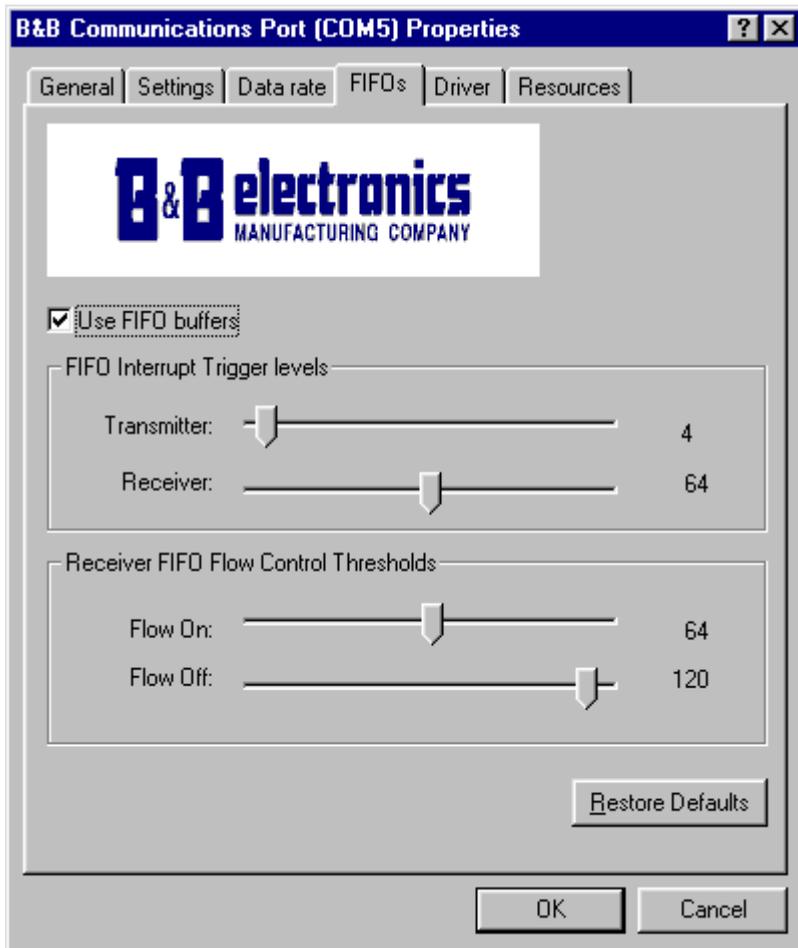
The default FIFO settings should minimize overhead and work well for most users.

The FIFO Interrupt Trigger levels setting determines how often the host processor services the serial port to send or receive data.

The Transmitter Trigger level sets how low the output buffer gets before it triggers a request for more data from program memory.

The Receiver Trigger level sets how much data is in the input buffer before it triggers a request to read the data from the buffer to program memory.

The optimum setting for each depends on the nature of your data, how it fits within the buffer, how fast your computer operates, etc.

Receiver FIFO applies when Handshaking is used for Hardware or Software control.

For Connections, refer to Chapter 5, RS-232 or Chapter 6, RS-422 or RS-485.

Chapter 5: *RS-232 Connections/Operation*

The DB-9 male connectors on the card are configured as standard RS-232 (DTE) serial ports. **Table 3** shows the signal names and pin numbers.

Table 3: RS-232 Pinouts

Name	Description	Direction (DTE)	DB9M Pin
DCD	Data Carrier Detect	Input	1
RD	Receive Data	Input	2
TD	Transmit Data	Output	3
DTR	Data Terminal Ready	Output	4
GND	Signal Ground	------	5
DSR	Data Set Ready	Input	6
RTS	Request to Send	Output	7
CTS	Clear to Send	Input	8
RI	Ring Indicator	Input	9

RS-232 Operation

RS-232 signal lines are referenced to Ground and each signal can alternate above and below ground by the rated voltage (see Specifications for RS-232 Transmitter/Receiver). Typical input voltage levels range from -11 to -3 Volts or +3 to +11 Volts.

The primary RS-232 signals are Transmit (Tx) and Receive (Rx), so together with Ground, they make a "3-wire" interface.

The RTS and CTS signals are Handshaking lines used to indicate to the other device that data can be sent or received. These lines may be enabled or disabled on a byte-by-byte basis and are used to prevent buffer overrun or the loss of data. Auto hardware support.

Two secondary Handshaking signals are DTR and DSR. They are usually enabled when the device is powered up and the port is open. They may be used for flow control by some devices instead of RTS and CTS.

DCD is used by a modem to indicate Carrier to the computer so data can be sent/received. RI is output by a modem to indicate that the phone or FAX line has a incoming call, so it can be handled.

There are two types of RS-232 ports, DTE (Computer) and DCE (Modem). Connected directly together using a modem cable wired pin to pin, the inputs match the outputs of the other.

When two of the same type (DTE to DTE or DCE to DCE) are interconnected, a crossover (null modem) cable is needed to route the outputs of one to the inputs of the other. This type of cable is needed to interconnect two computers with RS-232.

RS-232 devices which require hardware handshaking require connection of RTS/CTS and/or DTR/DSR lines in order to operate properly.

Programs for RS-232 may chose to use only Receive and Transmit and ignore hardware handshaking (None) inputs, or may require connections to verify that a cable and device is ready for access.

Some devices may use Software Handshaking using Xon/Xoff characters to start and stop the incoming or outgoing data. These unprintable characters have the value (17) and (19), and can often be generated in a terminal program with CTL+Q or CTL+S.

DTR Operation In RS-232 Mode
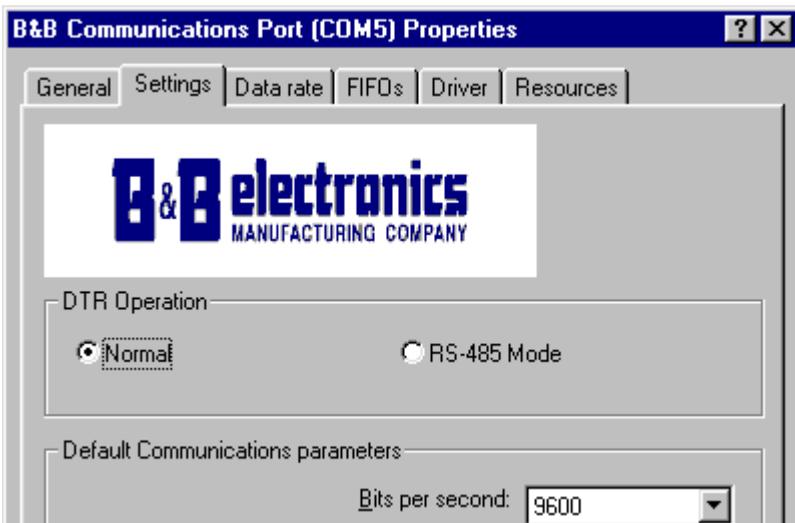
Example – DTR Operation – Select Normal (Windows 98)

In RS-232 mode, the card supports software and hardware handshaking. For normal DTR Operation select Normal.

Chapter 6: *RS-422/RS-485 Connections/Operation*

These modes support 2 channels - transmit and receive. The pinouts of the DB-9 male connector are given in **Table 4**.

Table 4: RS-422/485 Pinouts

Name	Description	Direction	DB9M Pin
RD(A) –	Receive Data A	Input	1
TD(B) +	Transmit Data B	Output	2
TD(A) –	Transmit Data A	Output	3
GND	Signal Ground	------	5
RD(B) +	Receive Data B	Input	9

Connect only to specified pins for proper operation.
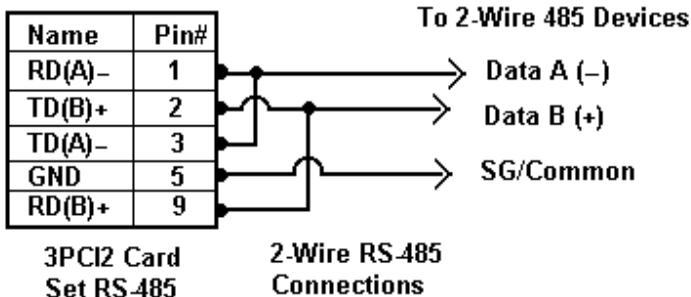
2-Wire RS-485 Connections

Fig. 6.1

2-Wire RS-485: Your cables must bridge pins #1 & #3 and pins #2 & #9 in order to receive and transmit. Connect from Pin #2 to Data B(**+**) of your devices and from pin #3 to Data A(-) of your devices. Make sure your Mode/Jumpers are set, and that the driver Setting for DTR Operation is **RS-485 Mode** in the Device Manager.

Note that the EIA RS-422 Specification labels data lines with an "A" and "B" designator. Some RS-422 or RS-485 equipment uses a "–" and "+" designator. In most cases, the "A" line is the equivalent of the "–" line and the "B" line is the equivalent of the "+" line. Some device manufacturers may not follow the standard designation for RS-422 or RS-485, using the A connection for "+" and the B for "-". In such cases, reversing the line pair permits operation.

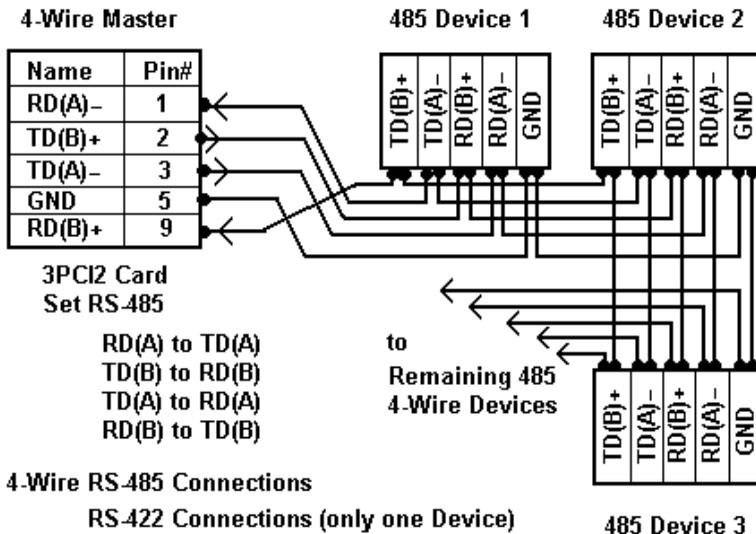### 4-Wire RS-422 or RS-485 Connections

Figure 6.2

Note: With RS-422 Devices, connect only one device to computer.

Connect the TD(B) pin #2 on the computer to RD(B) on the device.

Connect the TD(A) pin #3 on the computer to RD(A) on the device.

Connect the RD(B) pin #9 on the computer to TD(B) on the device.

Connect the RD(A) pin #1 on the computer to TD(A) on the device.

Connect the Signal Ground pin #5 to Signal Ground on the device.

In a 4-wire RS-485 system, each receive line connects to the same receive terminal on all slaves, and each transmit line connects to the same transmit terminal on all slaves. The master to the first slave is connected as above.

In a multi-slave RS-422 connection, TD(B) and TD(A) connect to RD(B) and RD(A) on all the slaves. If the slaves have Transmit connections, only one device can be connected back to the master. *See Fig. 6.3 on next page*.
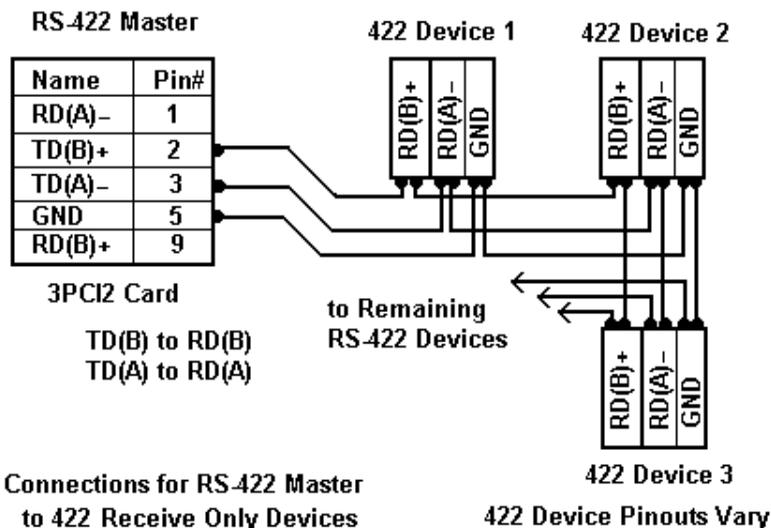
Figure 6.3

RS-422 & RS-485 Differential Signals

In RS-422 and RS-485 modes each signal is differential. When one line is high (4.4V) the other is low (0V), they alternate voltage with data. The receiver is differential so that common mode noise picked up on the twisted pair of wires is cancelled. Receiver sensitivity is rated at 200mV. A separate signal ground/common connection provides a common mode reference for the transmitter and receiver. These factors provide reliable communications at much greater distances than RS-232.

RS-422 Operation

In RS-422 mode, the transmitter is enabled (TX ENABLE) all the time, and the receiver is enabled (RX ENABLE) all the time. Typical connections are for two devices, one device at each end. The transmit lines of one device are connected to the matching receive lines of another. The second device transmit lines are connected to the receive lines of the first.

In another common mode of connection, the transmit lines of the master device are connected to the receive lines of many listening slave devices. None of the listening devices reply to the master.

This limitation is due to the fact that the transmitter is active all the time, and the line pair is set so that the TD(B) line is high during Mark state, and the TD(A) line is set low. If another transmitter output is connected to the same wire pair, and attempts to send data by setting the line pair to Space state, the first transmitter is still trying to hold the opposite state and neither can communicate. To overcome this limitation, the RS-485 mode was established, where each transmitter tri-states to a high impedance when not transmitting. See following.

RS-485 Operation

In RS-485 mode the transmit driver must be enabled during transmit (TX SD) and tri-stated to a high impedance when the data has been sent. In the 2-wire (half-duplex) mode, the receiver is enabled when not transmitting, and disabled (RX SD) during transmit (echo off).

The 3PCI2 provides Send Data (SD) Control for the RS-485 Driver and Receiver. This is hardware controlled based on the contents of the UART output buffer. When data is present, the driver is enabled, when the output buffer becomes empty, it is disabled. This automatically handles whatever baud rate is used.

The RS-485 transmitter and receiver have separate settings for 2-wire modes (TX SD, RX SD) or 4-wire (TX SD, RX ENABLE).
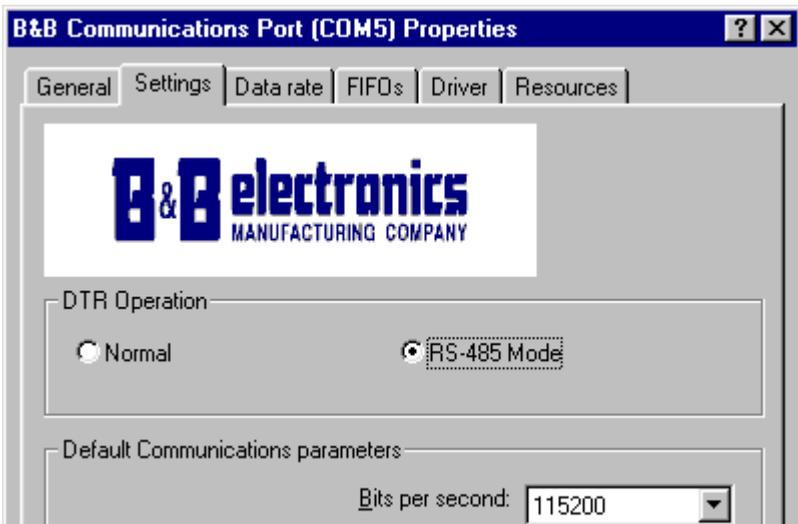
Example - Settings, DTR Operation, RS-485 Mode selected.
(Windows 98 shown)

The RS-485 mode is set using 3 jumpers per port, and by selecting the **RS-485 Mode** for **DTR Operation** on that com port.

RS-485 Network Biasing

In an RS-485 network, the transmitter tri-states to a high impedance state. Unlike RS-422 where the transmitter holds the TD(B) line high and the TD(A) line low (Mark state) when not transmitting data.

To establish and maintain the Mark state for all RS-485 receivers, Biasing is required. Biasing maintains a positive voltage difference from RD(B) relative to RD(A) above the receiver threshold of 200mV for all devices on that section of the network. If the biasing is not maintained, the first data bit of a signal may not be detected, and one or more devices may not respond to commands, or may operate intermittently.

The RS-485 receivers on the 3PCI2 are biased with a 4.7 KΩ pull-up resistor on the Receive Data B line and a 4.7 KΩ pull-down resistor on the Receive Data A line. These values are usually adequate for networks without termination and 31 or fewer nodes. When termination is used, biasing must be increased, calculated according to the termination value and number of nodes. Through-hole pads are provided for adding smaller value pull-up and pull-down resistors.

Port 1 (Low: R2/14, Hi: R3/13) R2 = R3 = 4.7K
Port 2 (Low: R4/16, Hi: R5/17) R4 = R5 = 4.7K

Combination of termination and bias must not fall below 54 Ohms.

Termination: Not installed. Not required for baud rates 19.2K or less.

Port 1 (R15) , Port 2 (R18) R15/R18 • 120 ohms

Chapter 7: *Troubleshooting*

If you have any trouble starting your system after installing the card, the card may not be properly seated in the slot. Remove and re-insert it or try a different slot. Check that BIOS is set for PnP OS.

If you are unable to communicate with the card using your software and hardware devices:

1.   Check your pinouts In RS-422 or RS-485 mode the "A" lines should match your "A" or "−" lines. "B" lines should match your "B" or "+" lines. *Note: RS-422/485 pinouts are non-standard.*

2.   Use the ComTest program provided on the disc with a loopback to check the card. Double-click on the ComTest folder to open it.
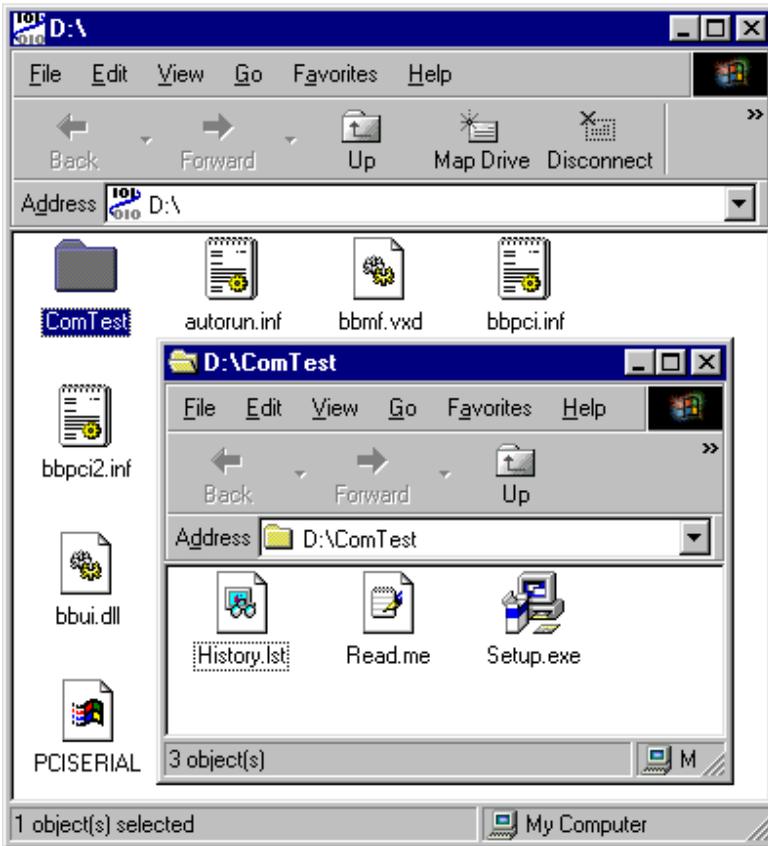
3. Run Setup.exe to install COMTest on your program menu under B&B Electronics.

4. Check your Card Jumpers, and Driver Settings. See Chapter 2.

5. Make sure you have DTR Operation set to the correct mode. Normal for RS-232, RS-485 Mode for RS-485. RS-422 mode works in either setting provided that the mode jumpers are set correctly.

6. A loopback connection for RS-232 connects the Transmit output to the Receive input (pins #2 & #3 on the DB9 connector). Use connections below to check all.

RS-232 Loopback Connections

DTE (Computer) Loopback   **DB9**   Connections

Pin# DB9 RS-232 Signal Names	Signal Direction
#1 Carrier Detector (DCE)	
#2 Receive Data (Rx)	
#3 Transmit Data (Tx)	
#4 DTE Ready/Data Terminal Ready (DTR)	
#5 Signal Ground/Common (SG)	CD Option
#6 DCE Ready/Data Set Ready (DSR)	
#7 Request to Send (RTS)	
#8 Clear to Send (CTS)	
#9 Ring Indicator (RI)	
Soldered to DB9 Metal - Shield	RI Option

Note: CD & RI are inputs from Modem device - use DTR Connection

Fig. 7.1 RS-232 Loopback w/Handshaking Connections

7. For RS-422 or 4-wire RS-485, connect the TD(A) to RD(A) and the TD(B) to RD(B). Then use the COMTest program to send characters, and observe the characters being received.
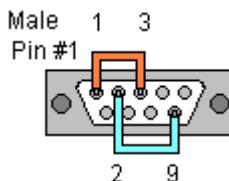
Male   1   3
Pin #1

2   9

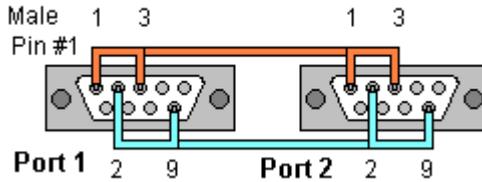### Fig. 7.2 RS-422 or 4-wire RS485 Loopback Connections

Fig. 7.3 RS-485 Connections for 2-Wire Mode

8. To check 2-wire RS-485, you must either enable the receiver by moving the receive jumper to RX ENABLE mode (Table 1), or use one port to transmit to another by cross connecting (Fig. 7.3) and loading COMTest twice, one copy for each port.

   Characters typed in one copy of COMTest will appear in the receive window of the other. Note that software must ignore the RS-232 handshaking lines in RS-422/RS485 mode, the input lines (CTS, DSR, DCD, RI) are not pulled high.

9. Some manufacturers label their data connections for A and B reverse of the standard for RS-422 or RS-485, so that the A line is (+) and B line is inverted (-) following the IC standard. In such a case, just swap the wires and try it. No damage occurs in the RS-485 mode, just no devices will respond. The EIA standard for signal labels defines the B line as positive relative to A during the "MARK" state.

10. Try another software package for troubleshooting.

11. Check our website for available FAQ's or troubleshooting hints.

12. Contact B&B Electronics Technical Support for troubleshooting assistance.

   USA Office

   Technicians are available at (815) 433-5100 to answer your questions from 8 AM - 5 PM weekdays (Central Time).
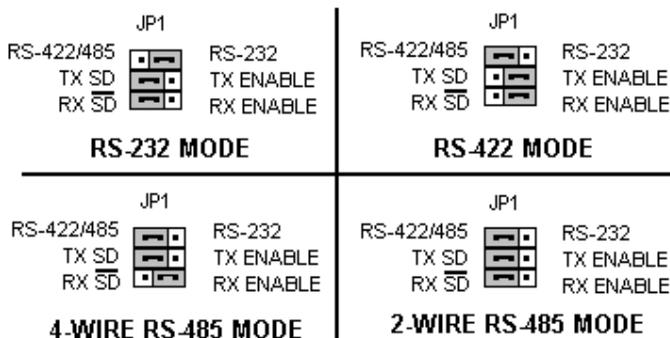   **Email: <support@bb-elec.com>**

   European Office

   Technicians are available at +353 91 792444 to answer your questions from 8:30 AM – 5 PM weekdays (GMT Time).
   Email: <support@bb-europe.com>

Appendix A*: Jumper/Mode Settings*

Set JP1 and JP2 Jumpers to match your Operating Mode.

RS-232 MODE

RS-422 MODE

4-WIRE RS-485 MODE

2-WIRE RS-485 MODE

Port 1 (bottom connector)

Port 1 Jumpers	RS-232	RS-422 4-Wire	RS-485 4-Wire	RS-485 2-Wire
JP1 Top	232 (Right)	422/485 (left)	422/485 (left)	422/485 (left)
JP1 Middle	----- No effect	TX ENABLE (right)	TX SD (left)	TX SD (left)
JP1 Bottom	----- No effect	RX ENABLE (right)	RX ENABLE (right)	RX SD (left)

Table A.1 – Port 1 (nearest bus) Jumper/Mode

Port 2 (top connector)

Port 2 Jumpers	RS-232	RS-422 4-Wire	RS-485 4-Wire	RS-485 2-Wire
JP2 Top	232	422/485 (left)	422/485 (left)	422/485 (left)
JP2 Middle	----- No effect	TX ENABLE (right)	TX SD (left)	TX SD (left)
JP2 Bottom	----- No effect	RX ENABLE (right)	RX ENABLE (right)	RX SD (left)

Table A.2 – Port 2 (nearest card top) Jumper/Mode

The top jumper sets either 232 or 422/485 DB9 connections.

Only the Top JP1 or JP2 position affects RS-232 mode.

The middle jumper sets either 485 or 422 transmit enable.

The bottom jumper sets either 485 (half duplex) or receive enable.
Full duplex 4-wire modes must select RX ENABLE.

Appendix B: *Connector Pinouts*

Table B.1: RS-232 Pinouts

Name	Description	Direction (DTE)	DB9M Pin
DCD	Data Carrier Detect	Input	1
RD	Receive Data	Input	2
TD	Transmit Data	Output	3
DTR	Data Terminal Ready	Output	4
GND	Signal Ground	------	5
DSR	Data Set Ready	Input	6
RTS	Request to Send	Output	7
CTS	Clear to Send	Input	8
RI	Ring Indicator	Input	9

Table B.2: RS-232 DB9 to DB25 Conversion Cable

Name	DB9 Pin (DTE)	DB25 Pin (DTE)
DCD	1	8
RD	2	3
TD	3	2
DTR	4	20
GND	5	7
DSR	6	6
RTS	7	4
CTS	8	5
RI	9	22
Chassis GND	Shield (DB9 Shell)	1

Table B.3: RS-422/485 Pinouts

Name	Description	Direction	DB9M Pin
RD(A) –	Receive Data A	Input	1
TD(B) +	Transmit Data B	Output	2
TD(A) –	Transmit Data A	Output	3
GND	Signal Ground	------	5
RD(B) +	Receive Data B	Input	9

With 2-wire RS-485 mode operation, your connection cable must jumper TD(A) to RD(A) and TD(B) to RD(B). Connect from TD(A) and TD(B) to the Data A(–) and Data B(+) wires of your RS-485 network.

See Chapter 6 for example connections.

Note that the EIA RS-422 Specification labels data lines with an "A" and "B" designator. Some RS-422 equipment uses a "–" and "+" designator. In almost all cases, the "A" line is the equivalent of the "–" line and the "B" line is the equivalent of the "+" line. *More information on RS-422 communications can be found in the B&B Electronics **RS-422/485 Application Note** (available on our website).*
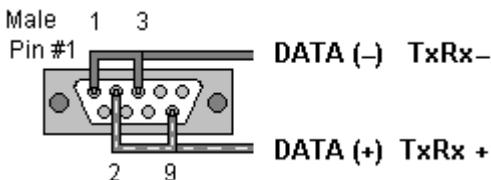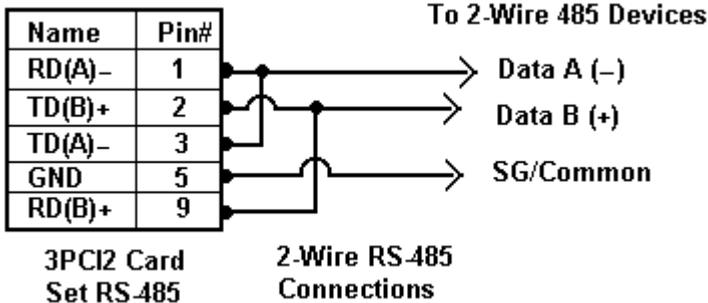
Appendix C: *Troubleshooting With ComTest*

Included on the CD-ROM disc is a test program called ComTest. See Chapter 7.

ComTest is a simple 32-bit Windows (Windows 95, 98, 2000, XP or NT 4.0) COM port test program. It allows multiple ports at any address and IRQ, to be opened at any given time.

ComTest can also be found on our Support webpage at: www.bb-elec.com.

B&B Com Test

- A Windows Terminal Program for Simple Checks of Serial Ports. Works with USB Serial Converters & ISA or PCI Serial Cards.

- Serial Port Access under Windows 95/98/2000/XP – Com1-Com8 or above.

- Dual Windows show typed transmit characters in separate window from received characters.

- Transmit & Receive Activity Indicators.

- Unprintable Characters Shown in Hex – 2 Digits Within Left & Right Angle Brackets.

- Visual Indication of Handshaking Lines – DTR DSR DCD and RTS CTS. (Red = Hi)

- Option for Setting DTR or RTS lines high or low.

- Option for Repeat Mode – last character or Function Character Sequence is repeated until set off.

- Configuration Settings:

  - Baud Rates 150, 300, 600, 1200, 2400, 9600, 19.2, 28.4, 57.6, 115.2K (9600 recommended)

  - Parity: None, Odd, Even, Mark, Space (None default)

  - Data Bits: 5, 6, 7, 8 (8 default)

  - Stop Bits: 1, 1.5, 2 (1 default)

Start ComTest

1. Make loopback connections.

2. Select Start, Programs, B&B Electronics, ComTest, ComTest.

3. ComTest Starts with a Select Port Window.

4. Select the Com port to access or test. (The drop down box shows available ports not in use).

5. Click Ok. Configure Port is shown.

6. Select the needed baud rate, parity, data bits, stop bits. (Defaults are common settings).

7. Type characters – they will appear in the upper window.

8. If performing a loopback test, observe the received characters in the lower window.

9. Use the Option to set DTR high or low, observe the DSR line and if connected the DCD line follow. (RS-232 only)

10. Use the Option to set the RTS line high or low, observe the CTS input line follow. (RS-232 only)

Exit

When testing is completed, close the program.

Appendix D: Declaration of Conformity Statement

DECLARATION OF CONFORMITY

Manufacturer's Name:	B&B Electronics Manufacturing Company
Manufacturer's Address:	P.O. Box 1040
	707 Dayton Road
	Ottawa, IL 61350 USA
Model Numbers:	3PCI2
Description:	2-port RS232/422/485 PCI Serial Card
Type:	Light industrial ITE equipment
Application of Council Directive:	89/336/EEC
Standards:	EN 55022
	EN 50082-1
	EN 61000 (-4-2, -4-3, -4-4, -4-6)

CE

William H. Franklin III, Director of Engineering