This manual covers the following B&B Electronics' model serial cards:

RS-422/RS-485 Serial Card CE

Model 422ICCA

Documentation Number 422ICCA3001

This model is an RS-422/RS-485 serial card. The model number of the card is printed on a sticker on the board.

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

B&B Electronics

International Headquarters

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Chapter 1: Introduction and General Information

The B&B Electronics' 422ICC serial interface cards are designed for the IBM PC, XT, AT and compatibles. Port connections are made on a DB25 Male style connector.

422ICC cards offer exceptional setup flexibility. The 422ICCA serial card has the ability to use addresses COM1 - COM4 and any interrupt 2 -7. You can install as many serial ports as will physically fit in a machine.

Features

- 422ICCA Port jumper configurable for hex address COM1-COM4 only
- 422ICCA Port configurable for any interrupt: 2 - 7
- 422ICCA Port configurable for RS-422 or RS-485
- Baud rates up to 90K bits per second
- RS-422 mode supports lines: TD, RD, RTS, CTS, DTR, DSR, and CD
- RTS control of RS-485 driver enable
- Can be wired for two or four wire RS-485 communications

Specifications

Bus: IBM PC ISA Bus

Slot: Requires 1 half length slot (8 Bit Card)

Dimensions: 4.8 x 3.2 in (12.1 x 8.1cm)

I/O connection: DB25 Male

Character length: 5, 6, 7, or 8 bits

Parity: Even, odd or none

Stop bits: 1, 1.5, or 2

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Chapter 2: Quick Installation Guide

The following steps will help you install the Model 422ICC Serial Card. Please follow (step-by-step) the following numbered instructions and refer to any corresponding chapters for more details.

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. After setting the jumper, ground yourself to the computer chassis before and while inserting the card.
- Remove AC power from the computer and unplug the power cord before inserting the card.
- Retain the ESD bag for handling the card.

  Save the packaging for storage or shipping.

1. Make sure you have an available ISA slot for installing your B&B Electronics Serial Card. You may have to remove the cover of your PC.
2. Determine what addresses and IRQ's are free to use on your PC by checking your operating system for unused addresses and IRQ's. Each port uses eight I/O address spaces starting at the base address that you select. Each port I/O address and interrupt request (IRQ) must be set as well. See "Checking Device Manager for Available Address/IRQ's" in Chapter 3 for your operating system. Write down the address and IRQ you select to use. Do not physically install the ISA card at this point.
3. Add New Hardware – This consists of adding a port or ports to your operating system. See "Adding Serial Ports" in Chapter 3 for specific instructions for your operating system.
4. Assign Address and IRQ – The address and IRQ are set in the operating system that you are using. This is the final step of adding new hardware. See Chapter 4 for more details.

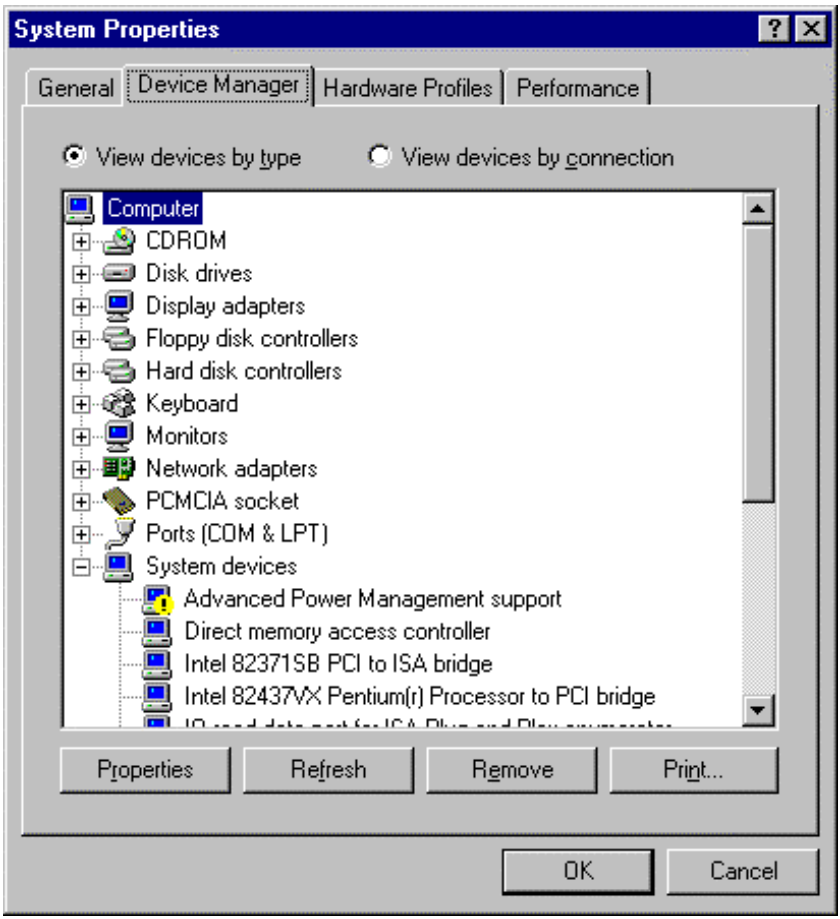
5. Set up the address (with jumpers) and IRQ (with jumpers) on the serial card to reflect unused addresses and IRQ's that you want to use. The address jumper reflects a particular hex address (COM1 – COM4). The IRQ is set via a little black jumper. See Chapter 4 for an explanation of address and IRQ settings as well as details on configuring the card itself.
6. Set serial card hardware jumpers for the communication parameters that you desire. See Chapter 5 for an explanation of serial parameters and details on how to configure them.
7. Shut down the PC before installing the serial card.
8. Install ISA serial card into an available ISA slot in the PC.
9. Physical Hook-up and Troubleshooting – pinout, cable data, and troubleshooting information. See Chapter 6 for more details.

Chapter 3: Windows Installation

Checking Device Manager for Available Address/IRQ's (Windows 95/98)

Click on Start / Settings / Control Panel and double-click on System Properties.

Left-click on Device Manager.



Double-click on Computer.

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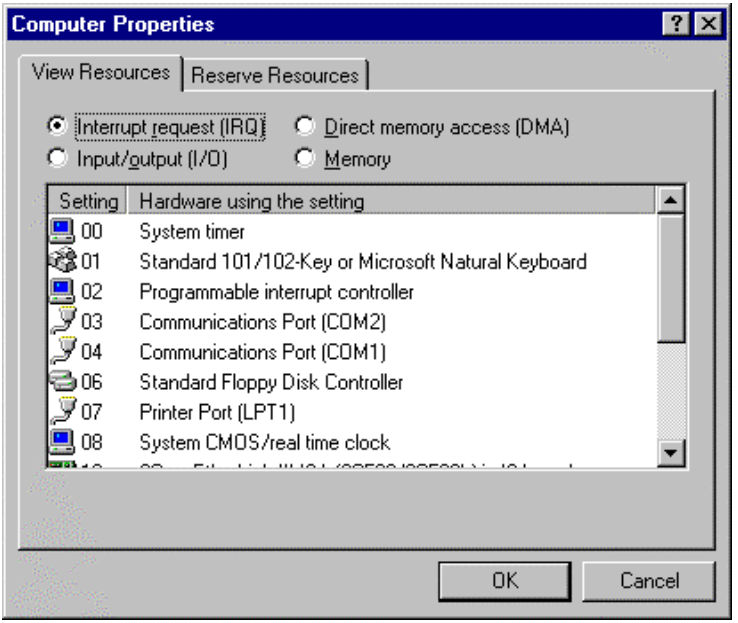

Left-click on Interrupt Request.

Find a free IRQ in the displayed list. Any number that is seen on the left hand side of this screen is an IRQ that is currently being used. The object is to find a number of IRQ(s) that are **not** listed and set your port(s) using those IRQ's.

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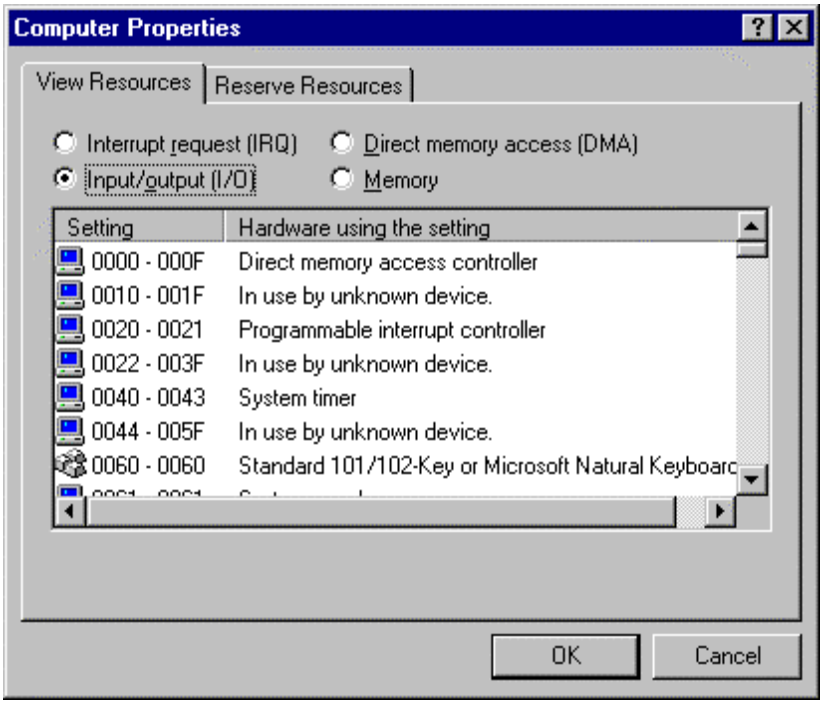
Left-click on Input/Output (I/O).



Scroll through the list, check 03F8H, 02F8H, 03E8H, 02E8H. If one of these is available, use it. If not, check alternates.

Find a free address in the list. Keep in mind that COM1 – COM4 only can be used with this card. Other COMpPorts may have to be disabled or reassigned to open up a COM1 – COM4 slot. Most desktop PC's have a COM1 and possibly a COM2 already on their system which will be seen in the list. You might have to start at COM3 or COM4 to begin addressing the ISA card. Write these open addresses and IRQ's down for later reference.

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Adding Serial Port(s) in Windows 95/98

Go to Start Menu / Settings / Control Panel.

Run the Windows Add New Hardware utility found in the control panel. Click Next.

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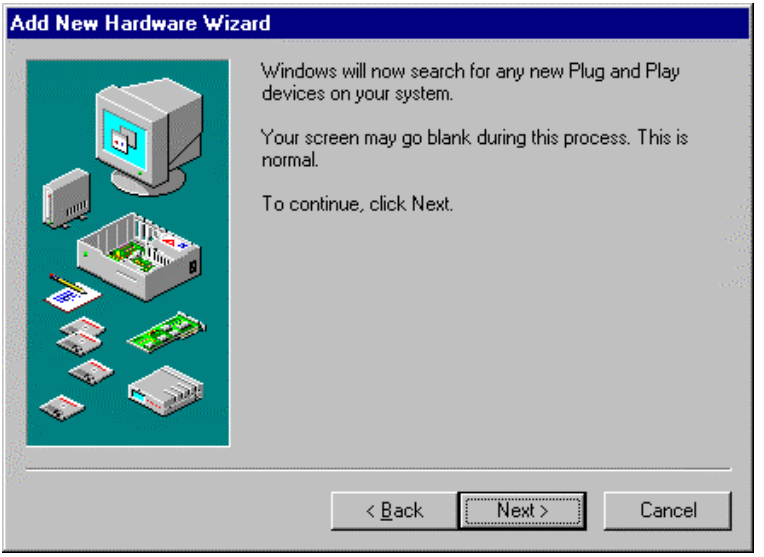

Click Next.

Select Yes/No for the device in the list. Click Next.

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Select No (you do not want Windows to search for your new hardware). Click Next.

Select Ports (COM & LPT). Click Next.

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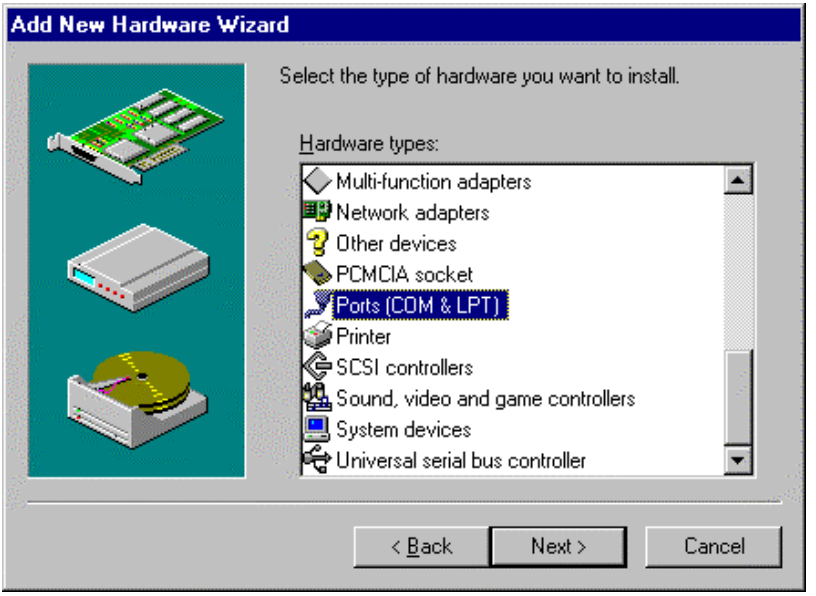
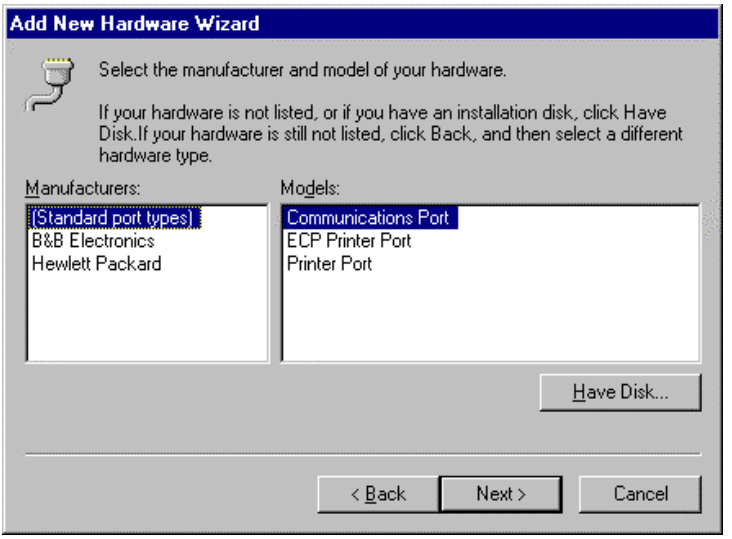


Select (Standard port types) and Communication Port. Click Next.



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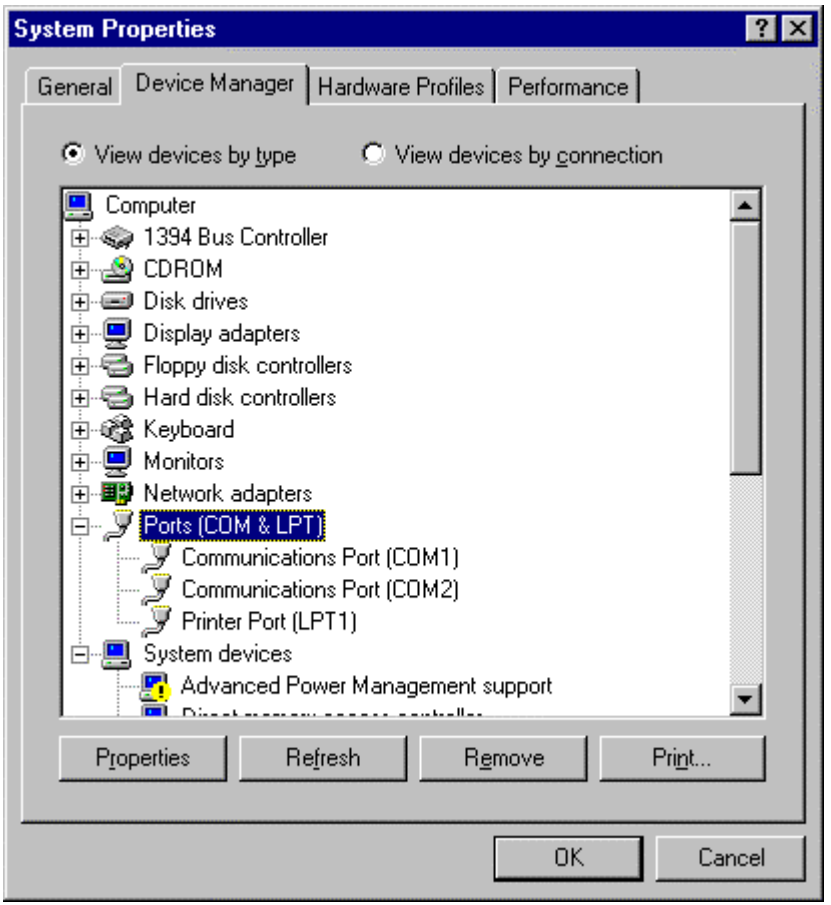
The next screen will show the address and interrupt request of the port. These may not match your configuration. For now, simply click Next. Windows may ask for the Windows 95/98 disk/CD to be inserted.

Finally, click Finish.

Changing COM Port Resources in Windows 95/98

Click Start / Settings / Control Panel and double-click on System Properties.



Click on Device Manager (make sure “View devices by type” is enabled.

Double-click on Ports (COM & LPT).

Double-click on the new port that has been added.

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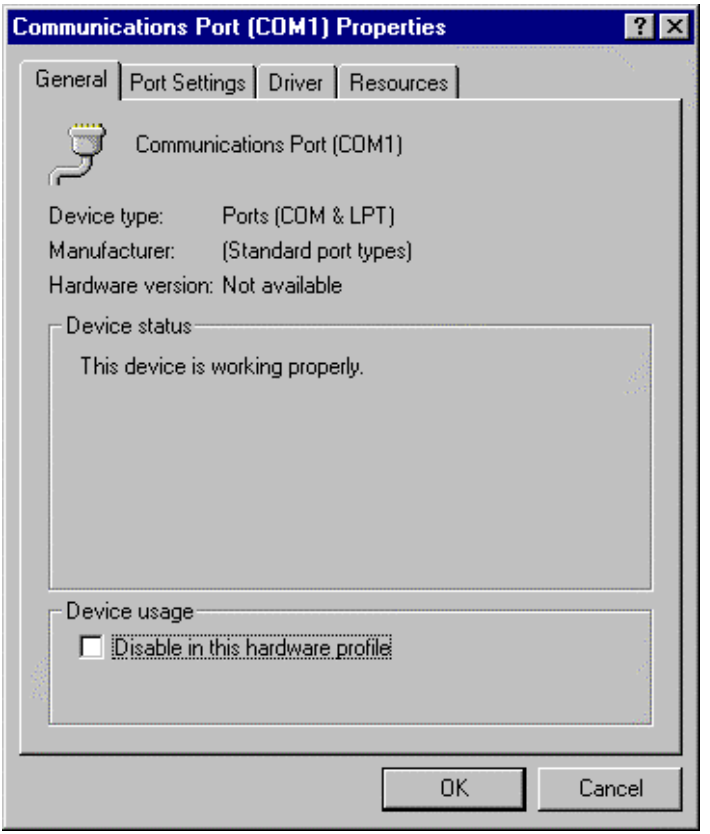
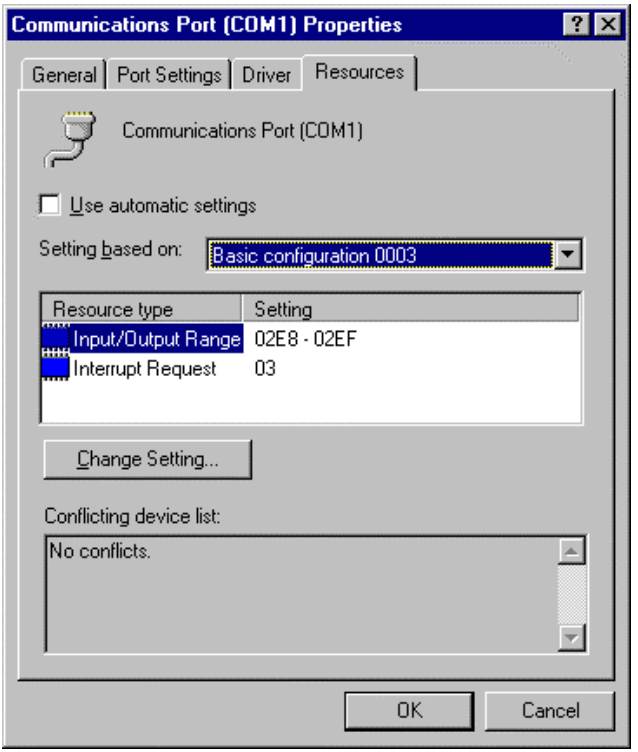


Click Resources.

Click off (check mark out of box) Use Automatic Settings.



Select Basic Configuration 0007 (or last one).

Select Input / Output Range.

Click Change Setting.

Change Address to match the free address settings you found earlier.

Click OK.

Select Interrupt Request.

Click Change Settings.

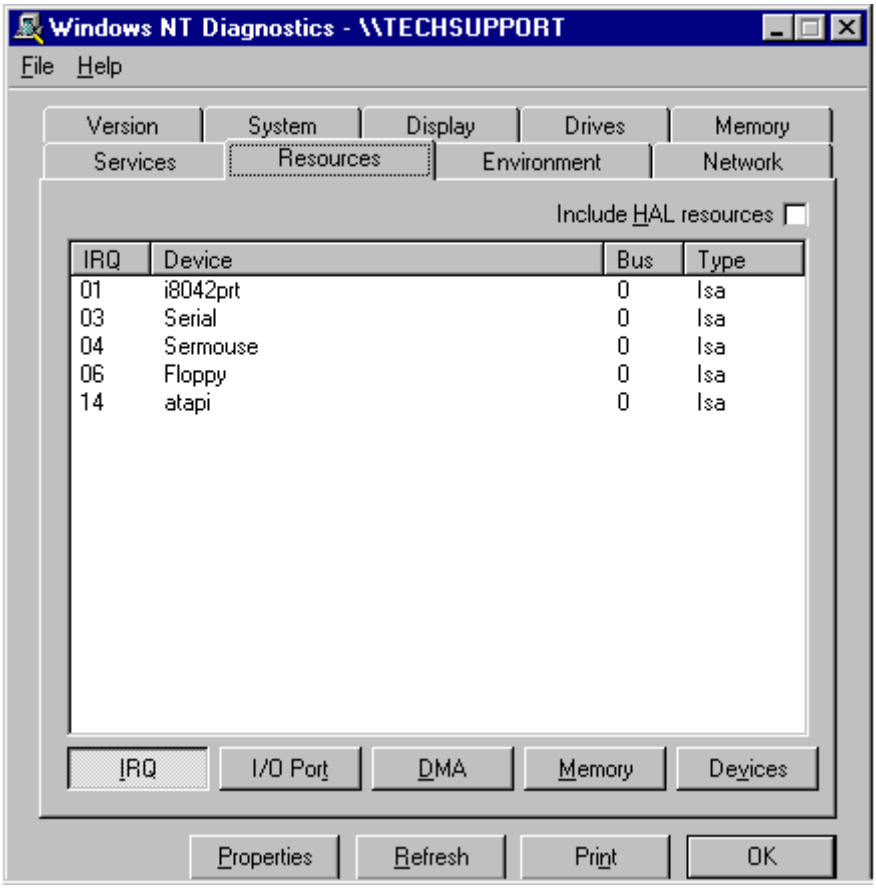
Change IRQ to match the free IRQ settings you found earlier.

At this point you can shut down the system and physically install your B&B Electronics Serial Card into an available ISA slot. Double check to make sure the addresses and IRQ's on the Serial Card are set to the correct settings.

Checking Windows NT Diagnostics for Available Address/IRQ's (Windows NT 4.0)

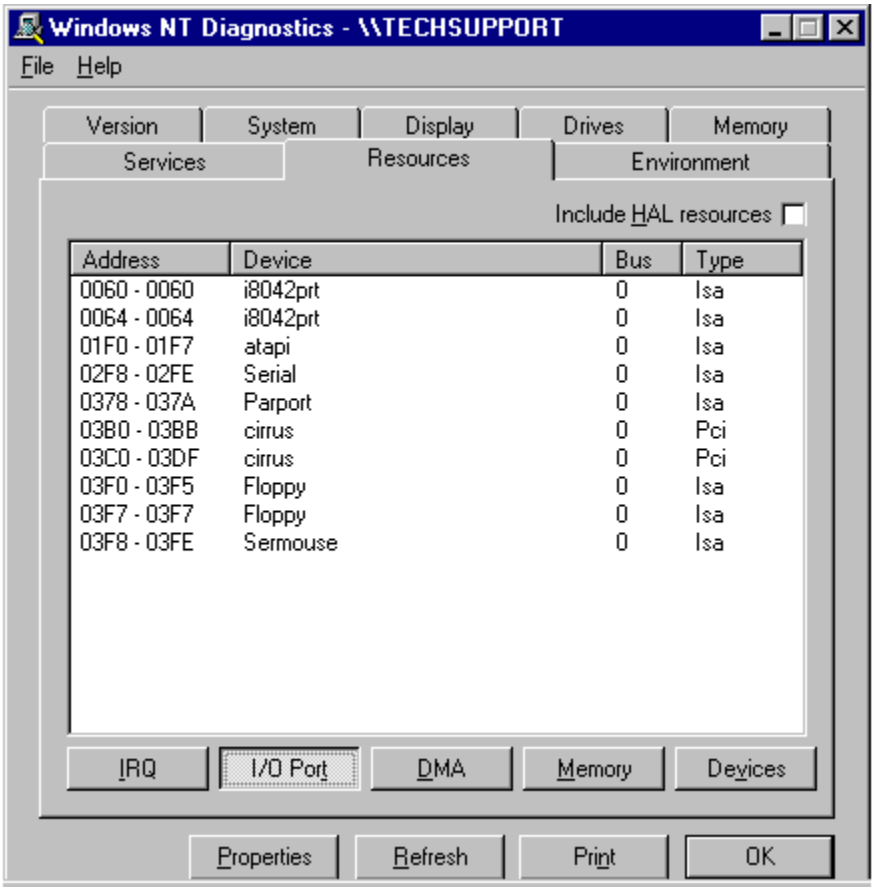
Click on Start / Programs / Administrative Tools / Windows NT Diagnostics.

Left-click on Resources.



Find a free IRQ in the following list. Any number that is seen on the left hand side of this screen is an IRQ that is currently being used. The object is to find a number of IRQ(s) **not** listed and set your port(s) using those IRQ's.

Left-click on I/O Port in Resources. Tab to view currently used addresses.



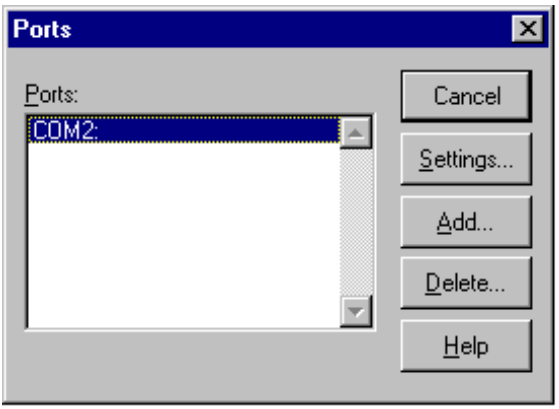
Scroll through the list, check 03F8H, 02F8H, 03E8H, 02E8H. If one of these is available, use it. If not, check alternates.

Find a free address in the list. Keep in mind that COM1 – COM4 only can be used with this card. Other COM ports may have to be disabled or reassigned to open up a COM1 – COM4 slot. Most desktop PC's have a COM1 and possibly a COM2 already on their system which will be seen in the list. You might have to start at COM3 or COM4 to begin addressing the ISA card. Write these open addresses and IRQ's down for later reference.

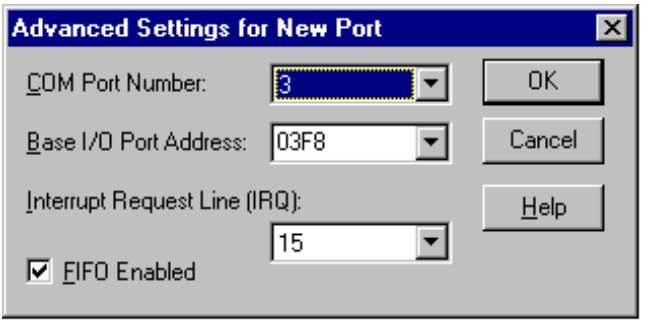
Adding Serial Port(s) in Windows NT 4.0

Go to Start Menu / Settings / Control Panel.

Double-click on Ports.



Click Add.



Choose COM Port Number, Base I/O Address, and IRQ that you want to use for the new Serial Port(s) being added.

After clicking OK, you will see a screen – System Setting Change. Click the button Restart Now to restart Windows NT 4.0.

At this point you can shut down the system and physically install your B&B Electronics Serial Card into an available ISA slot. Double check to make sure the addresses and IRQ's on the Serial Card are set to the correct settings.

Checking Windows 2000 for Available Address/IRQ's

Click on Start / Settings / Control Panel.

Double-click on System.

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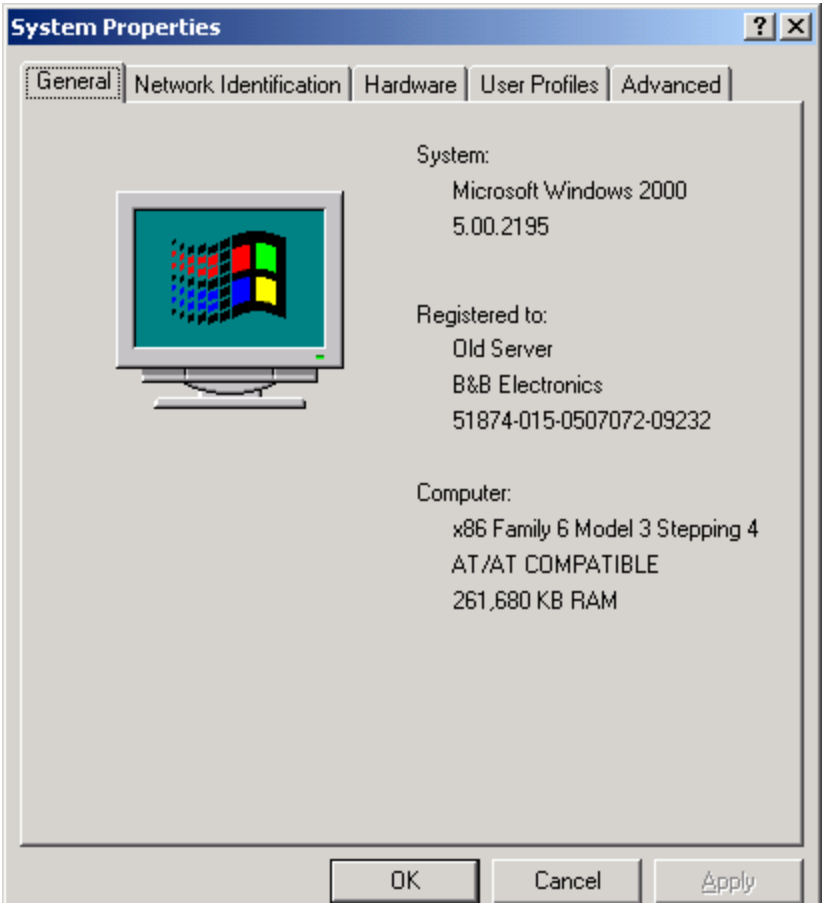
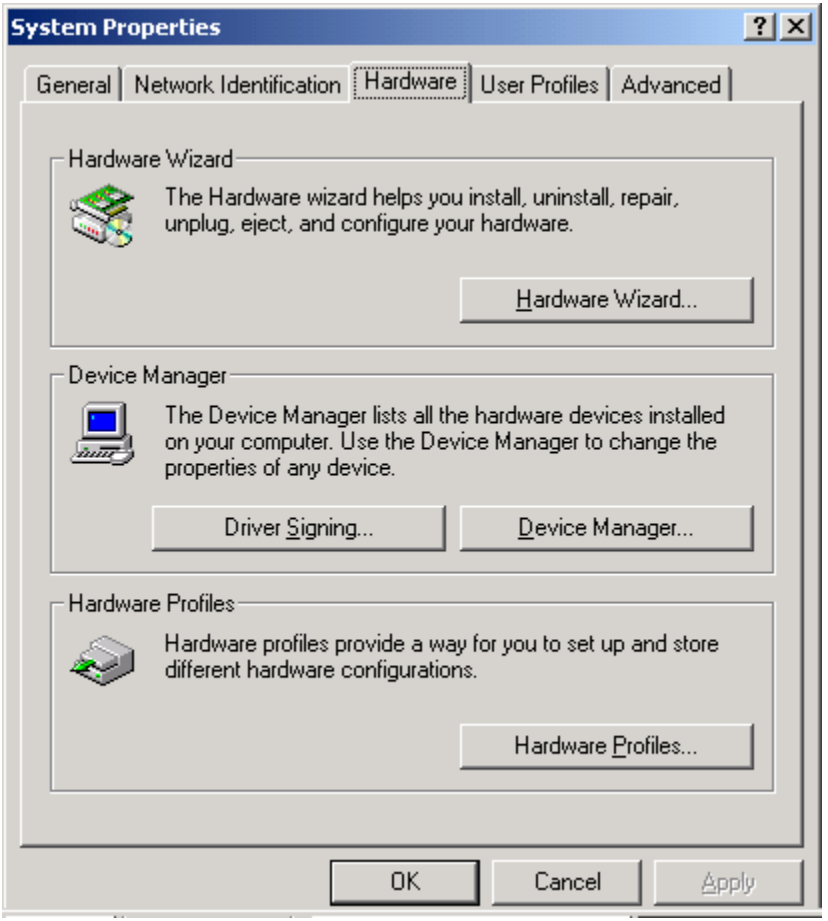


Click on Hardware.



Click on Device Manager.

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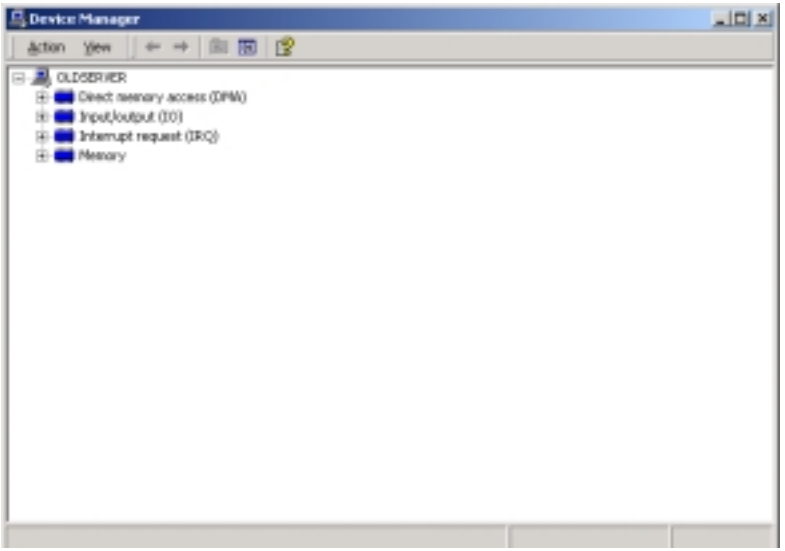


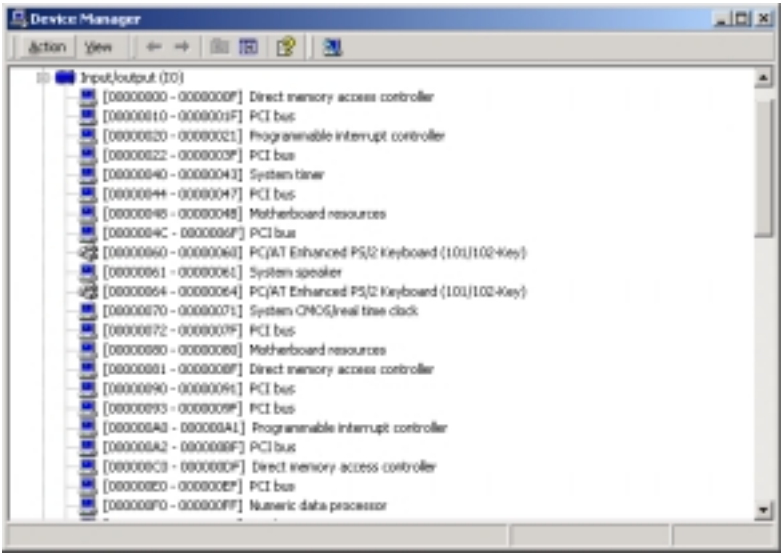
Click on View (top of screen).

Click on Resources by type.

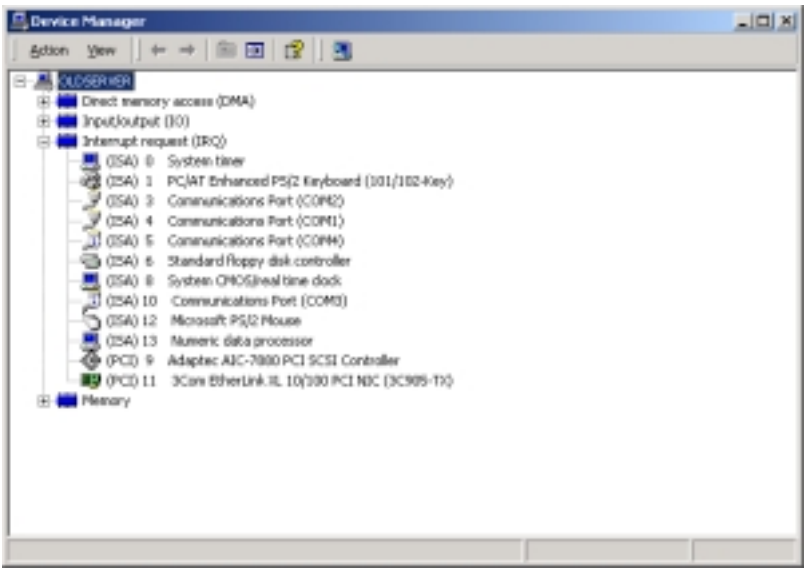
Double-click on Input/Output. Find an unused address to set your B&B Electronics serial card to.

Scroll through the list, check 03F8H, 02F8H, 03E8H, 02E8H. If one of these is available, use it. If not, check alternates.

Find a free address in the list. Keep in mind that COM1 – COM4 only can be used with this card. Other COM ports may have to be disabled or reassigned to open up a COM1 – COM4 slot. Most desktop PC's have a COM1 and possibly a COM2 already on their system which will be seen in the list. You might have to start at COM3 or COM4 to begin addressing the ISA card. Write these open addresses and IRQ's down for later reference.



Double-click on Interrupt Request (IRQ). Here you will need to find an unused IRQ to set your B&B Electronics serial card to.



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Adding Serial Port(s) in Windows 2000

Go to Start Menu / Settings / Control Panel.

Double-click on Add/Remove Hardware.

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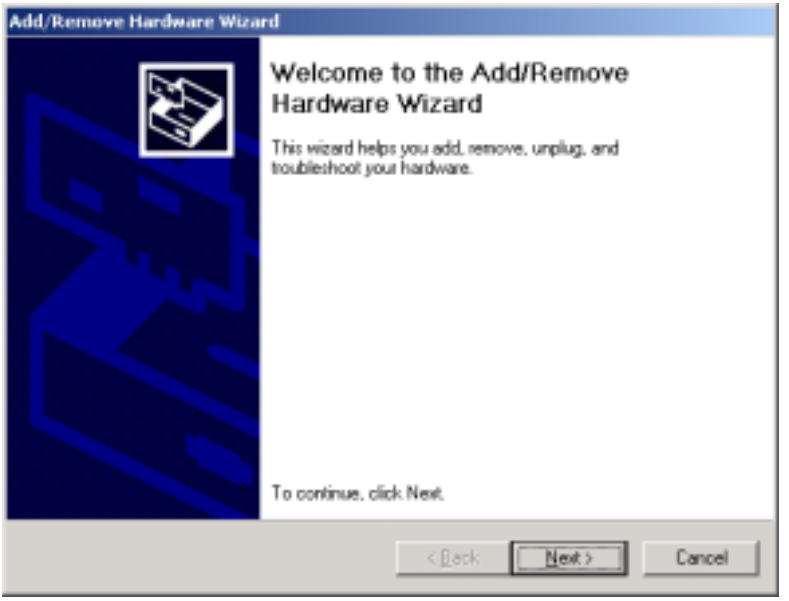
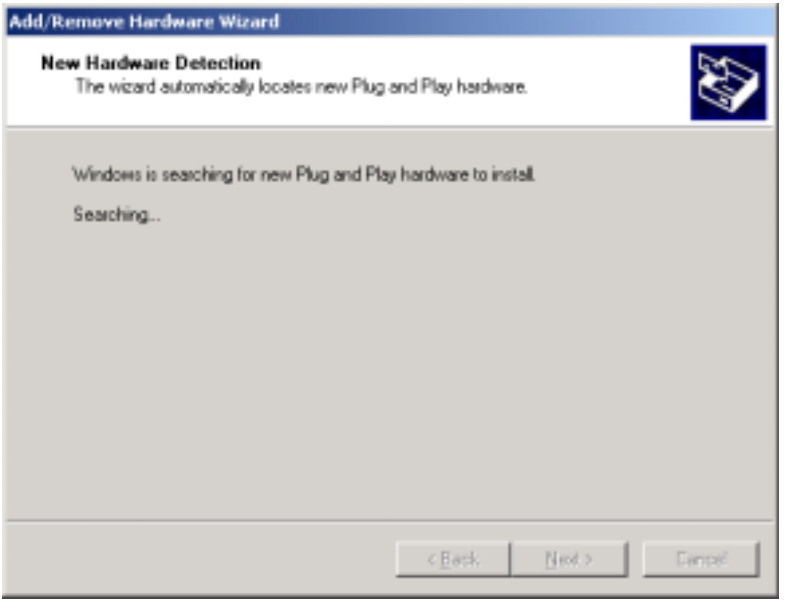


Click Next.

Click on Add/Troubleshoot a device.



Click Next.

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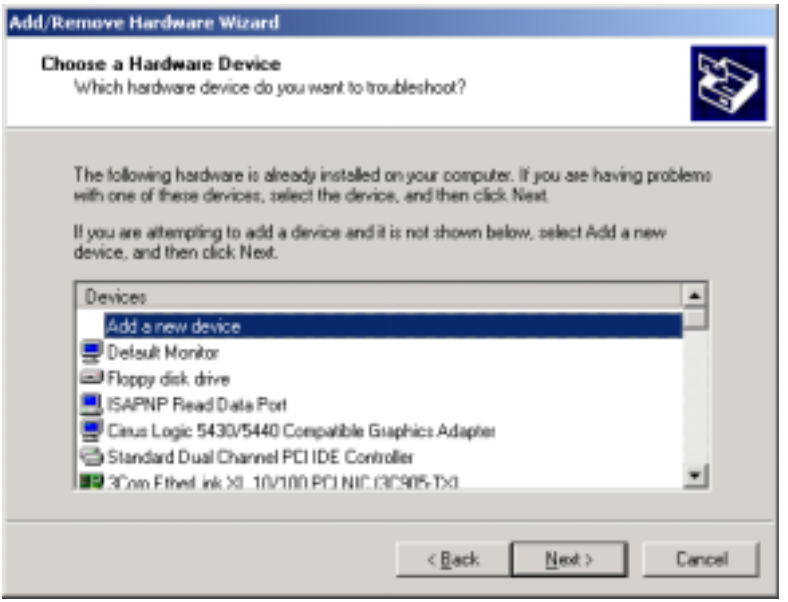
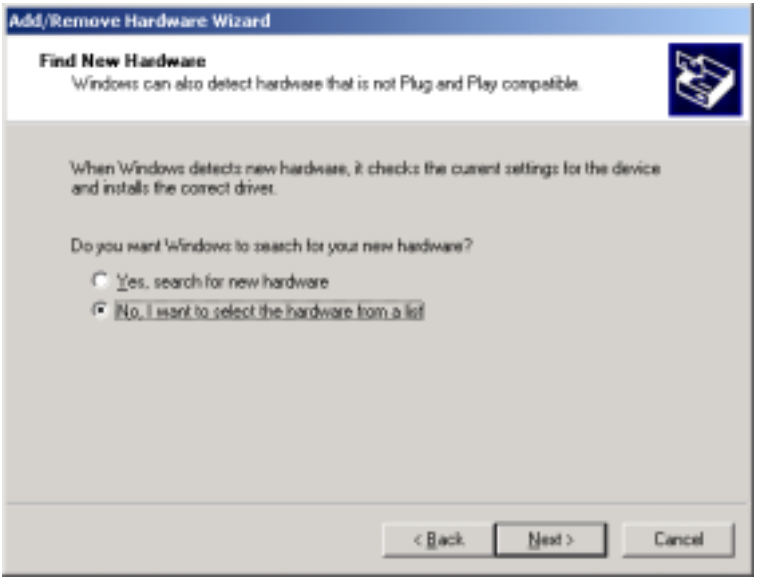
The following screen will appear after a few seconds.

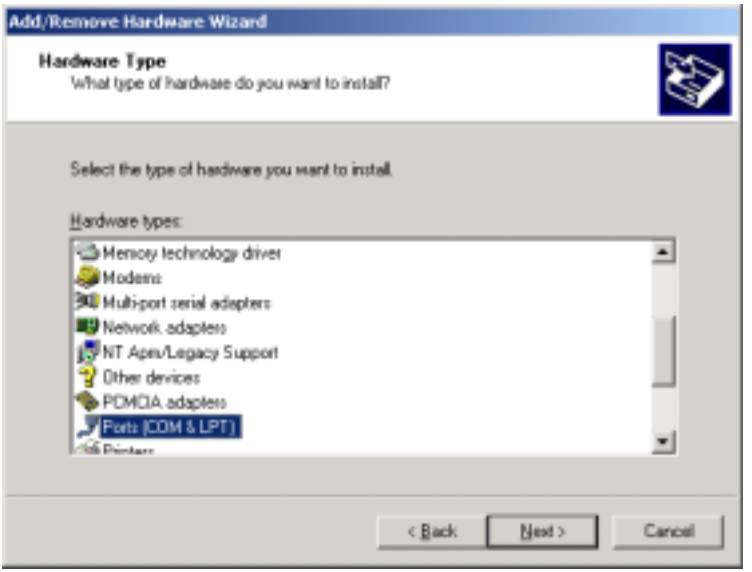


Click Add a new device.

Click Next.

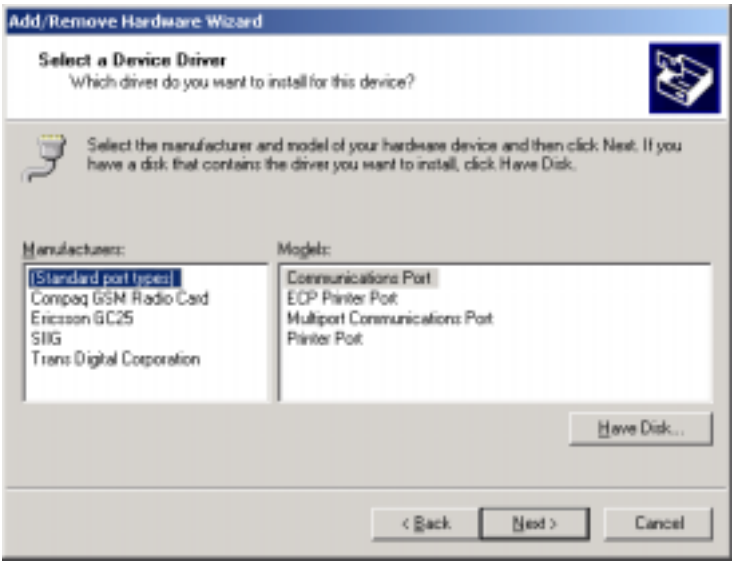


Click No, I want to select the hardware from a list.



Click Ports (COM & LPT).

Click Next.



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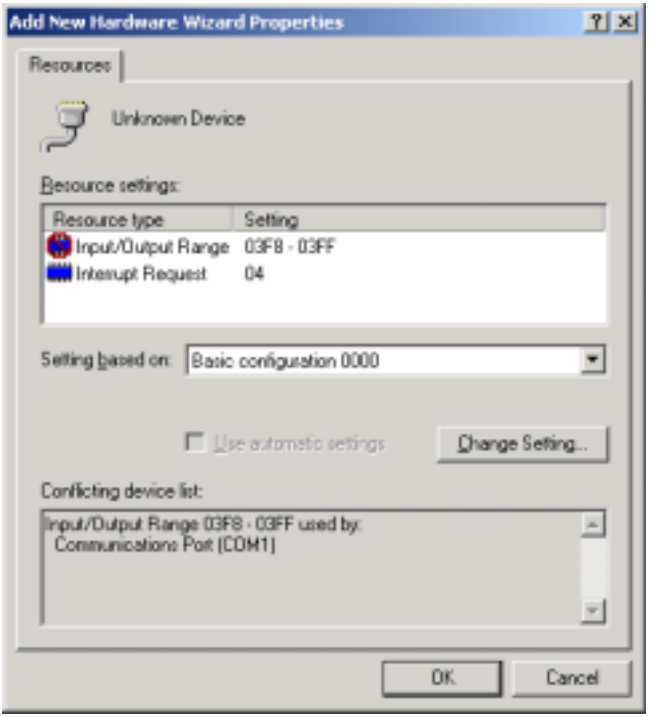
Select Standard port types and Communication Ports and Click Next. You will see the following screen, go ahead and Click OK.

The Resources area will allow you to set the IRQ and Address of your new ports.

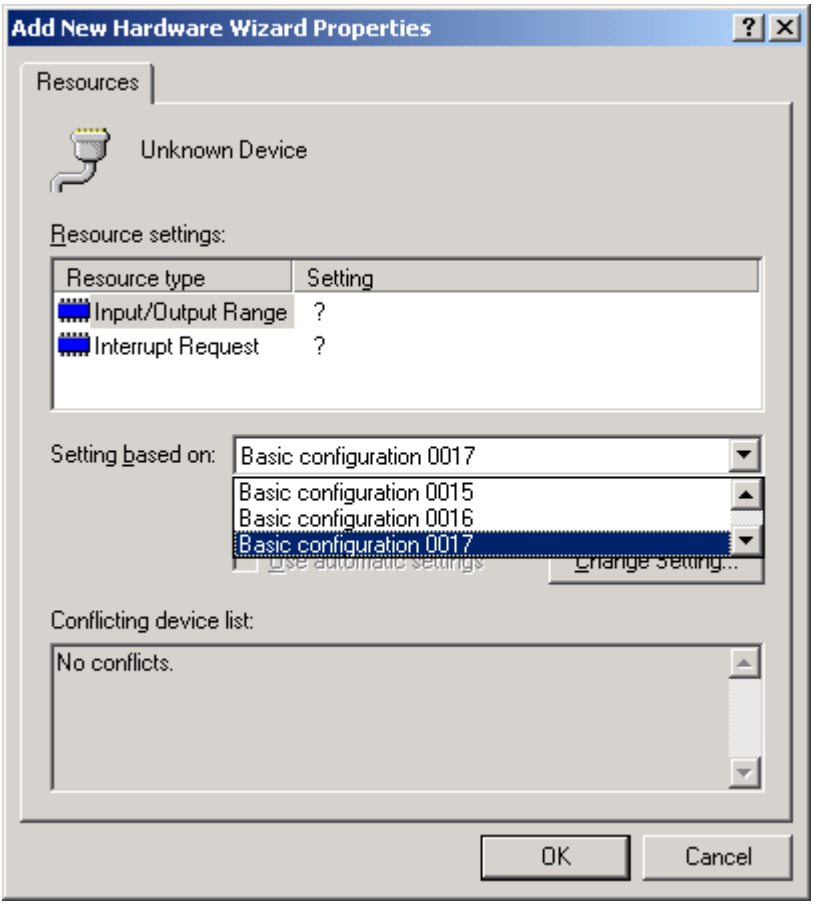
Click on the down arrow to the middle right of the screen after "Setting based on":



Click on the highest Basic configuration number in the list on the "Setting based on" category.

Double-click on the Input/Output Range to set the Address.

Double-click on the Interrupt Request to set the IRQ.



Select IRQ and Address that you want your port(s) (COM1 – COM4 only) configured at.

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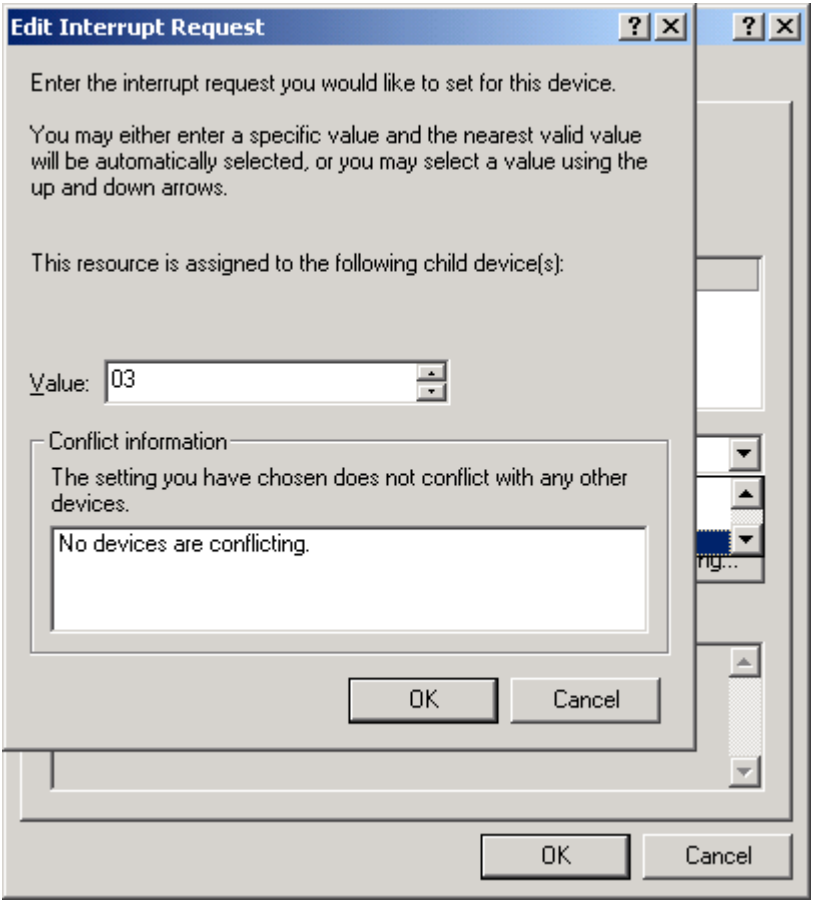

At this point you can shut down the system and physically install your B&B Electronics Serial Card into an available ISA slot. Double check to make sure the addresses and IRQ's on the Serial Card are set to the correct settings.

Chapter 4: Address and IRQ Setting

Address Switch Setup

If your computer already has a serial port, change the setting of jumpers JP2 (COM Port) on the 422ICC card so the address of the new port will be unique. Determine whether the original port in your system is named COM1, COM2, COM3, or COM4, and refer to Figure 1 for the COM port you want to use. You must also configure your software to match the jumper settings. Make sure that your software supports COM1 - COM4.

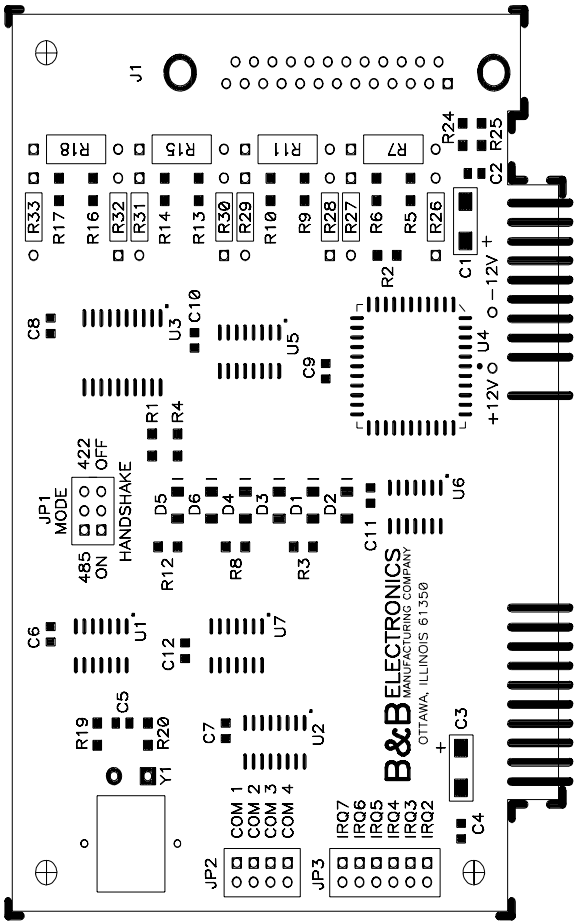

Figure 1

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Interrupt Jumper Setup

Use JP3 to change the IRQ (or Interrupt Request) setting corresponding to the COM port that you have chosen (see Figure 1). Normally, COM1 and COM3 use IRQ4, and COM2 and COM4 use IRQ 3 (see Table 1).

Table 1. Standard IRQ Settings

COM1	IRQ4
COM2	IRQ3
COM3	IRQ4
COM4	IRQ3

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Chapter 5: Communication Jumper Settings

This chapter will cover all of the jumper settings to set your B&B Serial Card for the proper communications that you desire.

CAUTION: Electrostatic Sensitive Device.
Use ESD precautions for safe handling.

RS-422/RS-485 Mode

JP1 selects RS-422 or RS-485 operation. In the RS-422 mode the card will be configured for RS-422 communications supporting TD, RD, RTS, CTS, DTR, DSR, and CD. In the RS-485 mode, Request To Send controls the Transmit Data output. When the RTS bit in the UART is set, TD will be enabled. When the RTS bit is not set, TD will be disabled and the TD driver will be in the high impedance mode. This allows you to connect to 2-wire, half-duplex systems (see Figure 3). Keep in mind that the receiver is always enabled so data is always “echoed” back in RS-485 two-wire mode. In RS-422 mode, the Transmit Data output is always enabled. This setting is typically used in 4-wire systems (see Figure 2).

Disabling All Handshake Lines

The jumper JP1 marked "handshake" disables all the handshake lines when it is in the off position. This forces all handshake lines to be TRUE or ON.

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RS-485 Operation

RS-485 mode requires that the driver be enabled and disabled as needed, allowing two or four-wire communications. To set up the 422ICC Serial Card up for two wire mode you can simply jumper TD(A) to RD(A) (for your Data "-") and TD(B) to RD(B) (for your Data "+"). Use the Signal Ground for your return path as the thrid wire in this configuration. For four wire mode you simply use all four data lines and your signal ground for a return path. The 422ICC card uses the RTS control line to put the driver in high-impedance or tri-state mode. With RTS control, software must set the RTS bit to a logic 1 to enable the driver and logic 0 to disable the driver. The receiver is always enabled on the 422ICCA card (whether it is in RS-422 mode or RS-485 mode. Make sure that the software that is used can accomidate constant echoing of the data that is transmitted. More information on RS-485 communications can be found in B&B Electronics' free RS-422/RS-485 Application Note.

RS-422 and RS-485 Termination

A 120Ω termination resistor has been provided for the RS-422/485 receivers. Termination resistors (if used) should be placed in R7 position on the 422ICCA serial card. If you do not need to use termination, do not place the termination resistor in the R7 location. Termination should only be used with very long cable runs and high baud rates. For example, cable runs of 4000 feet or shorter and baud rates 19.2K baud or lower, termination is not required. Anything over these distances/baud rates would require termination. Note that if a termination resistor is used, the biasing of the RS-485 network is altered and the value of the bias resistors will likely need to be changed somewhere on the network. More information on termination and biasing can be found in B&B Electronics' free RS-422/RS-485 Application Note.

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 B&B Electronics' free RS-422/RS-485 Application Note.

Chapter 6: Physical Hook-up and Troubleshooting

This chapter will cover 422ICC pinout, communication cable data, and troubleshooting information.

Pinouts

RS-422/RS-485 Pinouts

The pinouts of the male DB-25P connector for the RS-422/RS-485 port are shown in Table 2.

TABLE 2
Connector Pinouts for RS-422/485 Port

Pin 1	Frame GND
Pin 2	TD (A)
Pin 3	RD (A)
Pin 4	RTS (A)
Pin 5	CTS (A)
Pin 6	DSR (A)
Pin 7	Signal GND
Pin 8	CD (A)
Pin 10	CD (B)
Pin 13	CTS (B)
Pin 14	TD (B)
Pin 16	RD (B)
Pin 19	RTS (B)
Pin 20	DTR (A)
Pin 22	DSR (B)
Pin 23	DTR (B)

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Figure 2. RS-422/RS-485 (Four Wire) Pinout Description

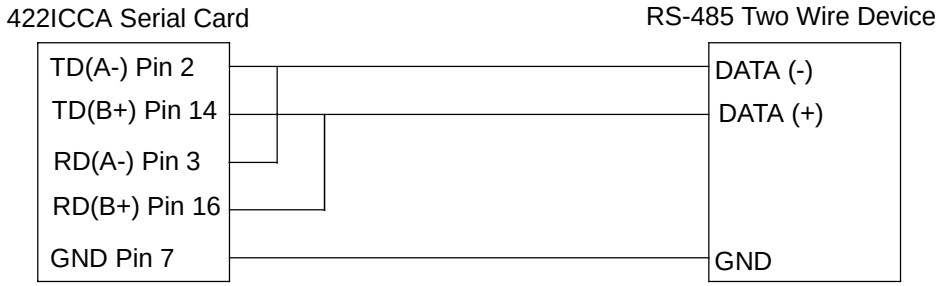

Figure 3. RS-485 (Two Wire) Pinout Description

Communication Cable Data

The 422ICC Serial Card communicates using RS-422, and RS-485 communications. The communication cable specifications are 24AWG (wire gauge) and 30pF/ft. (capacitance rating). Twisted pairs are ideal for the RS-422/RS-485 Cable in order to suppress noise on the data line. B&B Electronics can provide this communication cable for RS-422/RS-485 Applications. The Model ETC8506 (3 twisted pair) can be used for RS-422/RS-485 Applications. Keep in mind that if you are using the 422ICCA to pass all of the data and handshake lines (RS-422 mode), an 8 twisted pair (16 conductor) cable will need to be used.

Troubleshooting

If you are unable to communicate with the card from your software:

1. Consult your software manual to make sure it supports the address and interrupt that you have configured.
2. Double check that the address and interrupt are properly set.
3. Try another software package for troubleshooting. Download SIMPTERM (DOS Terminal Emulator) or Comtest (Windows Terminal Emulator) from B&B Electronics' web site. SIMPTERM and Comtest are shareware Simple Terminal Emulators that can be used to vary the setup of any serial card. Both can be downloaded from the following site location.

http://www.bb-elec.com/support.asp

4. Troubleshooting with a Loopback Test

Load SIMPTERM or Comtest on the test PC. When loading SIMPTERM you must set up the port address and IRQ you have set on the B&B Electronics serial card.

Jumper TD to RD on the DB9 male connector located on the serial card. You may have to make a "loopback connector" in order to do this. This is done by jumping pin 2 and pin 3 of a DB9 female connector and plugging it into the DB9 male port on the serial card.

To test the RS-232 handshake lines you can also jumper RTS to CTS and DTR to DSR. When you raise the RTS line you should see CTS also go high. When you raise the DTR line you should see DSR also go high.

Send data from the Serial Port (B&B Electronics serial card) and see if the data is echoed back to the port. When a character is typed on the keyboard you must see a duplicate character after the first character to verify that the same character was received. Perform this test on all ports of your serial card to verify the ports can (or cannot) transmit and receive data.

5. Call B&B Electronics' Technical Support. Technicians are available at (815) 433-5100 to answer your questions from 8:00 a.m. - 5:00 p.m. weekdays (Central Time).

Appendix A: Hardware I/O Map

I/O Map of XT Class Machines

Hex Address	Address Function in XT Class Machines
000-00F	DMA controller (8237A)
020-021	interrupt controller (8259A)
040-043	timer (8253)
060-063	PPI(8255A)
080-083	DMA page register (74LS612)
0A0-0AF	NMI - non maskable interrupt
200-20F	game port joystick controller
210-217	expansion unit
2E8-2EF	COM4 serial port
2F8-2FF	COM2 serial port
300-31F	prototype card
320-32F	hard disk
378-37F	parallel print
380-38F	SDLC
3B0-3BF	MDA - monochrome adapter and printer
3D0-3D7	CGA - color graphics adapter
3E8-3EF	COM3 serial port
3F0-3F7	floppy diskette controller
3F8-3FF	COM1 serial port

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I/O Map of AT Class Machines

Hex Address	Address Function in AT Class Machines
000-01F	DMA controller #1 (8237A-5)
020-03F	interrupt controller #1 (8259A)
040-05F	timer (8254)
060-06F	keyboard (8042)
070-07F	NMI - non maskable interrupt & CMOS RAM
080-09F	DMA page register (74LS612)
0A0-0BF	interrupt controller #2 (8259A)
0C0-0DF	DMA controller #2 (8237A)
0F0-0FF	80287 math coprocessor
1F0-1F8	hard disk
200-20F	game port joystick controller
258-25F	Intel Above Board
278-27F	parallel printer port 2
2E8-2EF	COM4 serial port
2F8-2FF	COM2 serial port
300-31F	prototype card
378-37F	parallel printer 1
380-38F	SDLC or bisync com 2
3A0-3AF	bisync com 1
3B0-3BF	MDA - monochrome adapter
3BC-3BE	parallel printer on monochrome adapter
3C0-3CF	EGA - reserved
3D0-3D7	CGA - color graphics adapter
3E8-3EF	COM 3 serial port
3F0-3F7	floppy diskette controller
3F8-3FF	COM1 serial port

The 422ICCA can be set up for COM1 – COM4 only via jumpers on the card.

Appendix B: 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:	422ICC1A, 422ICC1B, 422ICC2A, 422ICC2B
Description:	RS-232 Serial Card
Type:	Light industrial ITE equipment
Application of Council Directive:	89/336/EEC
Standards:	EN 50082-1:1992 IEC 801 (-2, -3, -4) EN 61000 (-4-2, -4-3, -4-4, -4-6) EN 50082-1:1998

CE

Michael J. Fahrion, Director of Engineering