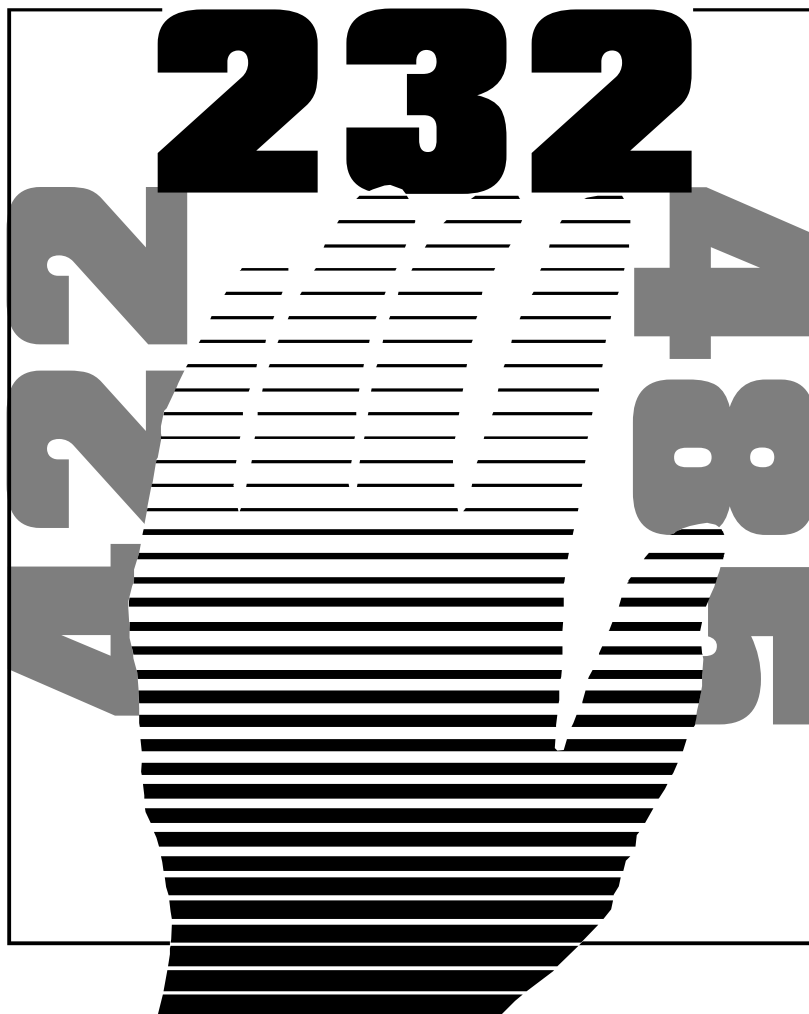


Hardware Manual



AT DUAL RS232/422/485

1.0 EDITION MARCH 1998

Guarantee.

FULL 36 MONTHS GUARANTEE.

We guarantee your Serial Port Card for a full 36 months from purchase, parts and labour, provided it has been used in the specified manner. In the unlikely event of failure return your interface to your Dealer, with proof of purchase, who will determine whether to repair or replace this product with an equivalent unit.

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Due to the manufacturers commitment to quality, software is subject to continuous improvements: information regarding upgrades can be obtained from your dealer.

Serial Solutions is supplied to you by



ACKNOWLEDGEMENTS.

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AT DUAL RS232/422/485

This product conforms to the following standards:

CE Standard: EN55022:1987 (Class B)

IEC 801-2: 1991 Level 2

IEC 801-3: 1984 Level 2

IEC 801-4: 1998 Level 2

TIA / EIA: 232 - E

TIA / EIA: 422 B (1996)

EIA: 485 A (1995)

AT DUAL RS232/422/485 MANUAL

Outline Contents.

Chapter 1 Optional Serial Solution Software.

Chapter 2 AT Dual RS232/422/485 Hardware Configuration.

Chapter 3 AT Dual RS232/422/485 Software Configuration.

Chapter 4 RS232 Pinouts And Port Cabling.

Chapter 5 Additional RS422/RS485 Information.

THE LAYOUT OF THIS MANUAL.

Chapter 1 - Serial Solution Software, is an overview of the optional companion software package that is the ideal companion for our range of serial port cards. Buy it from your dealer now!

Chapter 2 - AT Dual RS232/422/485 Hardware Configuration, shows you how to configure the AT Dual RS232/422/485 ports and (optional) printer, as well as detailing RS422/485 port configuration options and how to install the AT Dual RS232/422/485 into a PC.

Chapter 3 - AT Dual RS232/422/485 Software Configuration Guide, shows you how to configure your operating system to successfully allow trouble free operation of your AT Dual RS232/422/485. Installation procedures are for DOS, Windows 3.x, Windows 95 / 98, Windows NT and OS/2 version 2.x and OS/2 Warp.

Chapter 4 - RS232 Pinouts and Port Cabling - gives details of the 9 and 25 pin RS232 pin outs, cabling and connections.

Chapter 5 - Additional RS422/RS485 Information, gives details on the RS422 and R485 standard, and cabling; as well as examining half and full duplex RS485 systems and information on Rs422/485 port grounding systems.

The Index - covers the complete contents of this manual.

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Chapter 1

SERIAL SOLUTIONS SOFTWARE.

Introduction.

This chapter is a brief description of the Serial Solutions software package available from YOUR DEALER.

Introducing Serial Solution Software.

The perfect partner for any Serial Port is Serial Solutions Software! Serial Solutions is a fully featured suite of programs designed to squeeze the most from PC serial communications.

Serial Solutions is made up of the following components: -

Serial Solutions for DOS
Serial Solutions for Windows 3.x
Serial Solutions for Windows 95
Serial Solutions for Windows NT

All the Serial Solutions drivers have the following features: -

- Drivers for PC FIFO UARTs e.g. 16550 as well as the new improved 32 byte 16650 and 64 byte 16750 UARTs.
- Support for any mix of RS232, and RS485 handshake schemes.
- Support for wider range of Baud rates and for more than 4 serial ports.

Serial Solutions For DOS.

Serial Solutions for DOS consists of the following programs: -

NewCOM.sys	A device driver, it supports COM1 to COM16, allowing 16 serial ports to be used under DOS. It also includes an interrupt handler for enhanced performance with user definable buffer sizes. Accessible from all DOS languages, it is the heart of the Serial Solution. It has extensive handshaking support, implementing both hardware handshaking using any combination of the DTR, DSR, CTS, RTS, and DCD lines, and a software handshake using the XON/XOFF protocol.
NewCOM24.sys	A device driver providing support for 24 ports.
NewCOM32.sys	A device driver providing support for 32 ports.
NewMode.exe	A replacement for the DOS 'mode com...' command. NewMode is used to set the serial parameters, including the port address, IRQ line used, the baud rate, parity and data and stop bit options. Baud rates supported are from 110 baud to 115,200 baud! Included is a very handy query mode that reports the settings of the various serial ports. Flexible and fast!
EASY programs.	The EASY disk contains short, simple to understand and use EASYBAS, EASYC and EASYPAS programs, providing straight forward, file type I/O to serial ports with debug information. Use these FIRST, base your sample applications on them. Source code, make files and compiled ready to run programs supplied.
TERM programs	A suite of larger terminal emulation programs written in C (Cterm), Assembly language (Aterm), Pascal (Pasterm), BASIC (BASterm) and FORTRAN (FORterm) show how to access the NEWBIOS routines as well as the simple file I/O to ports. They contain many lines of

code and are thus harder to grasp. They demonstrate in depth serial port programming in a variety of languages but they are also useful tools for using serial devices.

Comtest.exe Comtest is a short but invaluable program that is used to check that the serial port at a particular I/O address is functioning correctly and is connected to the particular IRQ line. The program correctly identifies the UART type by employing the built in loop back capability of the PC serial port chip, a full test of the baud rate generator, transmitting and receiving buffer, parity enable and start stop bit is performed. There is no need for a second serial port or a cable when using this utility.

Serial Solutions For Windows 3.x

Serial Solutions for Windows 3.x works with Windows 3.0, 3.1 and 3.11 as well as Windows For Workgroups 3.11.

Serial Solutions for Windows 3.x consists of the following programs: -

Setup.exe	The install routine for the package.
Port.DLL	Enhanced Control Panel applet. Allows configuration of extra serial ports from the Windows Control Panel. Supports single as well as multiport cards using shared interrupts.
BbLynx.drv	Replacement for COMM.DRV.
LynxAPI.dll	Enhancement to the Windows Comms API's allowing support for more than 9 ports.
Term.exe	Terminal program.
EasyCWIN	C source code, project files and ready to run.exe program for an easy to understand Windows terminal program. Learn how to write Windows comms apps correctly the easy way.

Serial Solutions For Windows 95.

Windows 95 has an improved communication API and directly supports up to 255 ports. Our Windows 95 driver supports the shared interrupt mechanism used on our multiport cards. Serial Solutions for Windows 95 consists of the following programs: -

SSCards.inf	The information file to aid the installation process "Have Disk...."
Ssmodem.inf	Setup file for Serial Solutions modems.
sscardui.dll	
ssportui.dll	The device manager configuration DLLs and...
ssenum.vxd	
ssv485.vxd	...the virtual device drivers providing the shared
ssvel.vxd	interrupt handlers and dispatch routines etc for the
ssmult.vxd	various Serial Solutions serial cards.
ssm485.vxd	

Serial Solutions For Windows NT.

Windows NT has an improved communication API and directly supports up to 255 ports. Serial Solutions for Windows NT consists of the following programs: -

Setup.exe	Expands into the Control Panel applet and associated files which allows the configuration of all ports on Serial Solutions serial cards.
Ssmodem.inf	Setup file for Serial Solutions modems.

Complete Documentation And Technical Backup.

We believe in supplying complete documentation with every package we sell. The Serial Solution Software Package is no exception, it has an attractive manual in an A5 binder, containing over 150 pages of in-depth technical detail with comprehensive

indexes and table of contents. We guarantee your Serial Solution Software package or a full 12 months from purchase. A complete technical backup service is available to ensure that you get the maximum performance out of your investment.

Chapter 2

AT DUAL RS232/422/485 HARDWARE CONFIGURATION GUIDE

Introduction.

This chapter explains how to hardware configure and install the AT Dual RS232/422/485 card in a PC compatible, giving details for address and IRQ jumper selection.

AT Dual RS232/422/485 Card General Features.

- One RS232 Serial port.
- One RS422/485 Serial port.
- 16550 FIFO provides 16-byte input and output buffer on each port.
- Jumper selectable serial port address, COM1- COM8.
- Jumper selectable interrupts of IRQ 2-7, 10-12, 14 & 15.
- Fully double buffered for reliable asynchronous operation.
- High speed integrated circuitry ensures operation with fast PC's eg 333MHz Pentium II WITHOUT extra wait states.
- One Centronics Parallel printer port, 100% PC compatible, requires ribbon cable LPT-ADAPTER.
- Jumper selectable printer port address, LPT1-LPT3. IRQ5 or IRQ7 and bidirectional capability.

General Port Features.

Baud Rate: 50 Baud to 115200 Baud.

Word Length: 5, 6, 7 or 8 bits.

Parity: Even, Odd, None, Mark or Space.

Start Bit: 1 start bit always sent.

Stop Bits: 1, (1.5 for 5-bit data word length) or 2.

Clock Input: 1.8432 MHz.

RS232 Port Features.

- 9 Pin D connector.
- Full modem control TXD, RXD, DSR, DCD, DTR, RTS, CTS and RI signals.

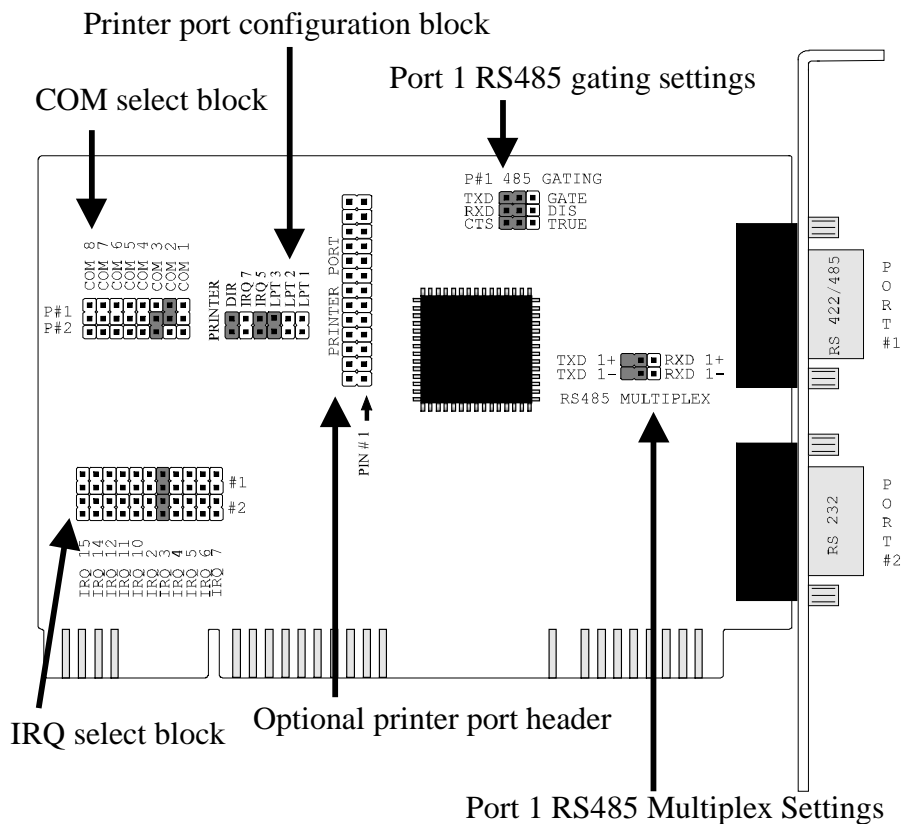
For additional information upon RS232, its standard, connectors etc refer to “**Chapter 4 – RS232 Pinouts and Port Cabling**”

RS422/485 Port Features.

- 9 Pin D connector.
- TXD, RXD, RTS and CTS signals.
- Two or four wire operation.
- RS485 Gating jumper options:
TXD driver Gating: Always On or RTS enable.
RXD receiver Gating: Always On or RTS disable.
- RS485 TXD/RXD multiplex selectable by jumpers: - either FULL DUPLEX or HALF-DUPLEX.
- On board 120 Ohm terminating resistors.
- On board Fail Safe open circuit and short circuit detection.

Driver: SN75174
High Level Voltage: 3.7V typical at 33mA source
Low Level Voltage: 1.1V typical at 33mA source
High Level Current: -60mA max
Low Level Current: 60mA max
Receivers: SN75175
Diffital I/P threshold: 200mV max.
Hysteresis: 50mV typical
Input Impedance: >12K Ohm without terminators.

For additional information upon RS422/485, its standard, connector pinouts etc refer to Chapter 5 “**Additional RS422/RS485 Information.**”

Figure 2-1. AT Dual RS232/422/485 Card Layout.**I/O Connections:**

Port 1 : 9 Pin D connector

Port 2 : 9 Pin D connector

Port 3 : 25 Pin LPT port via optional flylead

Dimensions:

10.7 x 12.5cm;

4.2 x 5in.

Power:

300mA @ 5V

50mA @ $\pm 12V$.**Weight:**

0.12kg; 0.26lb.

Configuring The AT Dual RS232/422/485

In the state it leaves the factory, the AT Dual RS232/422/485 card is ready to plug straight into a PC compatible computer. Unless there is GOOD REASON, do not alter its default setting. However, due to the presence of other serial ports in the PC, your card may need configuring to suit your setup.

If your card needs to be reconfigured it is important to know the settings (particularly IRQ allocations) of any other add on cards / motherboard resources that exist in your PC, in order to ensure its trouble free operation. Various means of determining these settings exist, for example, the Device Manager in Windows 95 or the MSD program in MS-DOS, but these do not always give the complete picture and should be used for indication only. Settings for legacy devices such as ISA cards, are determined most accurately by examining the appropriate hardware, or contacting the supplier. PCI device settings can change, but are often reported by the BIOS at boot time.

Serial Port Connectors.

The AT Dual RS232/422/485 card possesses two 9 pin serial ports: Port 1 is RS422/485 and Port 2 is RS232. See chapters 4 and 5 for additional RS232 and RS422/485 information.

Serial Port Address Selection.

The position of the movable jumper on the address jumper block whose position is indicated on figure 2-1 (pictured below with default values) determines the I/O address of the serial ports, each port may be configured at COM values of either 1 – 8.

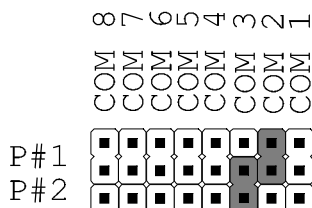
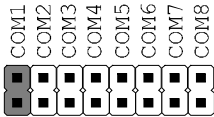
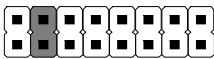
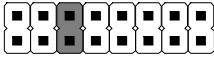



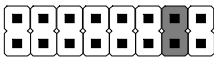



Figure 2-2. Serial Port Address Jumper Block.

JUMPER	PORT	ADDRESS	NORMAL IRQ ALLOCATION
	COM1	03F8hex	IRQ 4.
	COM2	02F8hex	IRQ 3. <u>DEFAULT SERIAL 1</u>
	COM3	0E38hex	IRQ 3. <u>DEFAULT SERIAL 2</u>
	COM4	02E8hex	IRQ 3.
	COM5	01A0hex	IRQ 3.
	COM6	01A8hex	IRQ 3.
	COM7	01B0hex	IRQ 3.
	COM8	01B8hex	IRQ 3.

Serial Port IRQ Interrupt Jumper Selection.

The position of the movable jumper on the interrupt jumper block whose position is indicated on figure 2-1 (pictured below with default values), determines the IRQ vector of the serial ports, configuring the card as IRQ2 etc.

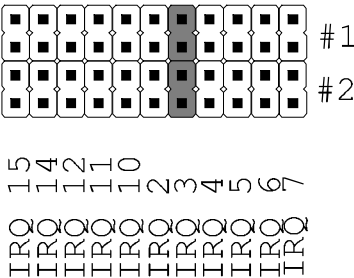





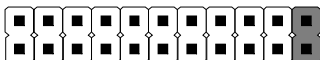

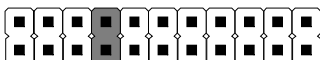

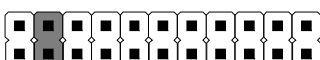



Figure 2-3. Serial Port IRQ Jumper Block.

<u>NORMAL USE OF INTERRUPT</u>											
15	14	12	11	10	2	3	4	5	6	7	
IRQ	IRQ	IRQ	IRQ	IRQ	IRQ	IRQ	IRQ	IRQ	IRQ	IRQ	
											
IRQ 2 EGA/VGA GRAPHIC CARD. Usually free. Only Used by very few graphics cards.											
											
<u>IRQ 3 COM 2.</u>											
											
<u>IRQ 4 COM 1.</u>											
											
IRQ 5 PRINTER PORT #2 OK for DOS & Windows. Avoid for OS/2 and Novell											
											
IRQ 6 DISK DRIVE STATUS, AVOID!											
											
IRQ 7 PRINTER PORT #2 OK for DOS & Windows. Avoid for OS/2 and Novell											
											
IRQ 10 Usually free Good for COM 3											
											
IRQ 11 Usually free Good for COM 4											
											
IRQ 12 POINTING DEVICE, Usually Free. Free when mouse is on a COM port.											
											
IRQ 14 Usually IDE hard drive. Free if SCSI used											
											
IRQ 15 Usually free											

NOTE:

- IRQ 0 & 8 - Timer & Clock Interrupts, not on expansion bus
- IRQ 1 - Keyboard interrupt, not on expansion bus
- IRQ 9 - Best left Unexplained, not on expansion bus
- IRQ 13 - Maths coprocessor interrupt, not on expansion bus

RS422/485 Port (Port 1) Configuration.




As well as the configuration of COM and IRQ addresses the RS422/485 port of the AT Dual RS232/RS422/485 has two other configurable options, these are:

1. RS485 Gating
2. RS485 Multiplex

...and are discussed in more detail below.

RS485 Gating

The RS485 gating block (position indicated on figure 2-1) is pictured below with default settings.

TXD	1		GATE
RXD	1		DISABLE
FORCE CTS	1		TRUE

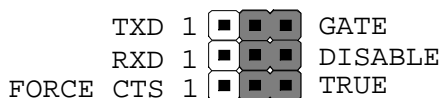
The 3 movable jumpers are:-

1. **TXD1 / GATE** - For RS485 Use. For use in RS485 Half Duplex systems only, where only one twisted pair connects both receive and transmit lines of all serial devices together. The RTS line is used as a control to allow the outgoing TXD data to reach the 9 pin connector. When RTS is false, the TXD lines are tristated, the PC cannot send data but other devices may send data, which the PC receives. When the RTS line is true, the PC can send data down the TXD line to be received by other devices. Note the PC will hear its own transmitted data echoed back on the RXD lines unless the RXD DISABLE jumper, below, is set.
2. **RXD1 / DISABLE** - For RS485 Use. This jumper is the compliment of the above RXD GATE jumper. For use in RS485 Half Duplex systems only, where only one twisted pair

connects both receive and transmit lines of all serial devices together. This jumper is used to stop the PC hearing its own transmitted data. When the RTS line is true no incoming data, RXD, can be received. When the RTS line is false all data sent by the other serial devices is heard.

3. **CTS1 FORCE TRUE** - Usually For RS485 Use. This jumper forces determines whether the CTS handshake signal is INPUT from the external serial device or is permanently forced true on the card. The serial ports own RTS OUTPUT handshake signals is always taken out to the serial port connector.

Figure 2-4 – Alternative RS485 Gating Settings.



RS485 Multiplex.

The RS485 Multiplex jumper block (position indicated on figure 2-1) is shown below with default settings.



When the Multiplex jumpers are set to the right (figure 2-5) then the RXD- & TXD- signals and the RXD+ & TXD+ signals are shorted together at the 9 pin connector. The multiplex jumpers should only be set for RS485 Half Duplex operation, when one twisted pair is used to interconnect both transmit and receive lines.

Figure 2-5 Alternative RS485 Multiplex Settings



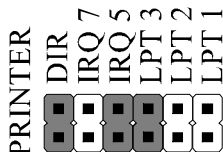
RS232 Port (Port 2) Configuration.

Other than the configuration of COM and IRQ addresses the RS232 port of the AT Dual RS232/RS422/485 requires no other configuration.

Optional Parallel Printer Port Configuration.

The optional parallel printer port is available from the 25 pin header (position indicated on figure 2-1) and with a printer lead is connected to the outside world via a fly lead to an available back plane aperture. These leads are available from your dealer for a nominal charge.

The printer port can be configured via the printer configuration block, which is pictured below with default settings (position indicated on figure 2-1).



The printer port can be configured with one of the three standard port addresses, as shown in figure 2-7 below, with interrupts 7 or 5.

Figure 2-6 Printer Port Pinouts.

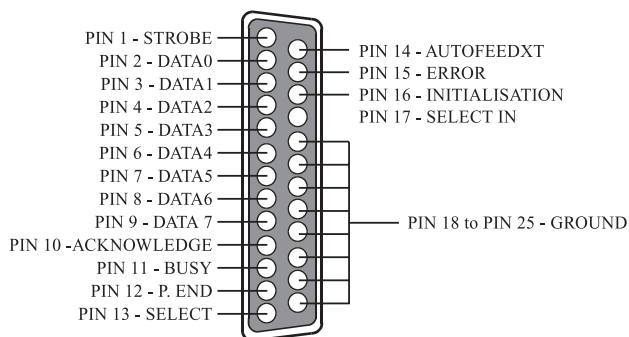
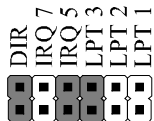




Figure 2-7 Printer Port Configuration Block.

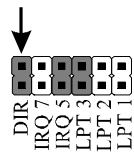
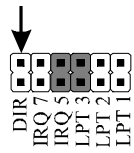
	<u>PORT</u>	<u>ADDRESS</u>	<u>IRQ</u>
	LPT 3	0278hex	IRQ 5 <u>FACTORY DEFAULT</u>
	LPT 2	0378hex	IRQ 7
	LPT 1	03BChex	IRQ 7

NOTE: The printer port on the PC motherboard may be at EITHER 03BC hex OR 0378 Hex and still be known as LPT1. To add a second printer port as LPT2: it may be necessary to set the card to 0278 hex. Check the address of printer ports already installed with ADDRDLPT1.EXE (see Chapter 3) on the utility disk.

Bidirectional Printer Port Selection.

The parallel printer port can be set for output only or for bi-directional use. Scanners connected to the parallel port and some file transfer utilities require the bi-directional setting.

Figure 2-8. Bidirectional Printer Port Selection.

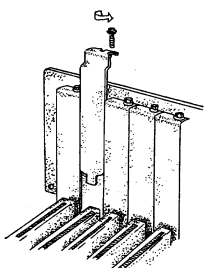
<u>LPT BLOCK</u>	<u>SETTING</u>
	Bidirectional Jumper (DIR) shorted: PRINTER PORT OUTPUT ONLY. <u>FACTORY DEFAULT.</u>
	Bidirectional Jumper (DIR) open: PRINTER PORT BIDIRECTIONAL. Two way transfer on printer data lines, pins 2 -9

Hardware Installation.

STEP 1: Before the PC card can be installed the power to the PC **MUST** be switched **OFF**, and the lead removed from the PC.

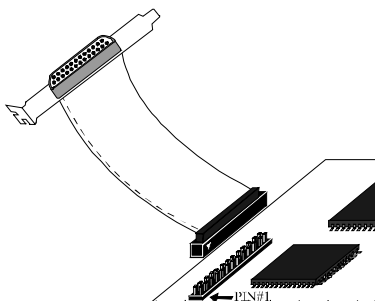
STEP 2: Remove the PC case.

Figure 2-9. Removing Blanking Cover

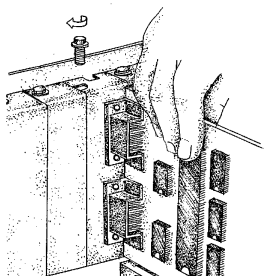


STEP 3: Choose an empty expansion slot. Remove the blanking cover protecting the slot on the PC back panel (Figure 2-9). **KEEP** the blanking cover screw safely for later.

Figure 2-10. Installing The Printer Port Cable.



Step 4: (**OPTIONAL**): Place the AT Dual RS232/422/485 on a flat, even surface. Making sure that the inverted triangle on the plug on the LPT lead aligns with the Pin#1 marking on the printer header, press the plug down evenly and firmly, until resistance is felt and it can be pushed no further - the port has been plugged in (Figure 2-10). The LPT port is mounted on a bracket allowing it to be placed in a spare PC aperture, next to the AT Dual RS232/422/485.

Figure 2-11. Inserting The PC Serial Card.

STEP 6: Now insert the AT Dual RS232/422/485 in the slot. Be careful to ensure that the gold plated PCB fingers fit neatly into the expansion connector. Press down firmly but evenly on the top of the card (Figure 2-11).

STEP 7: The connectors should fit neatly through the slot's aperture to the outside world.

STEP 8: Now replace the system unit's cover by carefully sliding it down and back over the system unit. Replace the cover mounting screws.

STEP 9: After attaching all the monitor and keyboard cables, power up the PC. Do not forget the mains power cable! The PC should then power on in the normal way.

Problems!

If the system fails to power up normally check the following:

- i.) Ensure that the AT Dual RS232/422/485 has no conflicting IRQ and COM addresses.
- ii.) Ensure that other cards in the PC have not been upset.
- iii.) Ensure that the power is connected and the PC is switched ON!

If all these have been checked and the PC still does not power up then inspect the area surrounding the card to ensure that any potentially harmful bits of metal etc. are not present, if the problem persists ask your dealer to check the card or contact the HELP line as given on Intro. page 2.

Chapter 3

SOFTWARE CONFIGURATION OF THE AT DUAL RS232/422/485

Introduction.

This section contains the installation procedures of the AT Dual RS232/422/485, for the operating systems DOS, Windows 3.x, Windows 95 & 98, Windows NT, OS/2 version 2.x and OS/2 Warp.

The setup procedures in this chapter also assume that your PC has only one serial port present. Also, if you have changed the default settings of the cards in any way, then substitute the appropriate values in the relevant sections.

Informing The PC Of The Port Address.

The BIOS of most PC's automatically detects whether serial ports at COM1 and COM2 addresses are present in a machine. The problem comes with serial ports COM3 and COM4. PC's have a table of information that stores the setup of the PC, this is the BIOS data area. It has space for 4 serial port addresses. The trick is to get the right addresses into the third and fourth port areas.

On the utility disk included with your card there are several programs for setting the COM3 and COM4 addresses. To set COM3 address from the DOS command line enter:-

```
ADDRCOM3 03E8 <return>
```

To set COM4 address from the DOS command line enter:-

```
ADDRCOM4 02E8 <return>
```

To set the COM port address from within the AUTOEXEC.BAT file use a text editor to add the following lines

to the file.

```
ADDRCOM3 03E8
ADDRCOM4 02E8
```

DOS 4, 5 and DOS 6 have features allowing access to COM3 and COM4. DOS 2 and DOS 3 only allowed access to COM1 and COM2, though some manufacturers their own DOS versions, e.g. COMPAQ, had enhanced MODE commands etc. to set up and use the extra ports. Please see Chapter 4, Serial Utility Disk for more details.

If you are uncertain how many serial and parallel ports are in the machine, it is wise to run the ADDRCOM3 program BEFORE installing an AT Dual RS232 series card type :-

```
ADDRCOM3 <return>.
```

The PC responds with something like:-

```
COM1: 03F8
COM2: 02F8
COM3: <not set>
COM4: <not set>
LPT1: 03BC
LPT2: <not set>
LPT3: <not set>
```

Provided that the RS232 installation is attacked in this orderly manner, every thing should work first time. If it does not then check the software selectable communications parameters, Baud rate, Parity, stop bits first, and that the communications program is attempting to access the serial port installed. If this fails to solve the problem check the cable connections. Finally check that the card is indeed configured as you believed.

Settings for DOS Software.

Most users will require that the IRQ is set to correspond to the interrupt used by their serial communications software.

Note, that a serial port that is USING interrupts must not share the same IRQ line as another serial port that is USING interrupts AT THE SAME TIME, otherwise some interrupts will be missed. IE no two ports may use the same IRQ line simultaneously.

Some serial communications software, especially older versions, assume that COM1 and COM3 both use IRQ4 and that COM2 and COM4 both use IRQ3. Other older packages assume that COM1 is on IRQ4 and that COM2, COM3 and COM4 all use IRQ3. Both kinds of older packages will therefore not allow simultaneous interrupt driven I/O on all four ports. It may be necessary to upgrade your serial communications software.

Newer, more up to date, serial communications programs are configurable. They allow the user to specify the I/O address and the interrupt used by the serial port. Procomm and many other packages are configurable in this way.

Installation Of Ports in Windows 3.x.

The Windows environment now supports up to four serial ports, RS232, and RS485 etc.

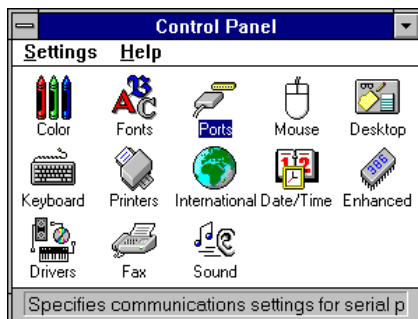
Windows assumes that both COM1 and COM3 are on IRQ4 and that both COM2 and COM4 are on IRQ3. Since the PC bus does not allow interrupt sharing, these pairs of ports cannot be used simultaneously, seriously limiting the flexibility of Windows 3.1.

To obtain trouble free mix and match of the COM ports, assuming that your PC has only 1 serial port:

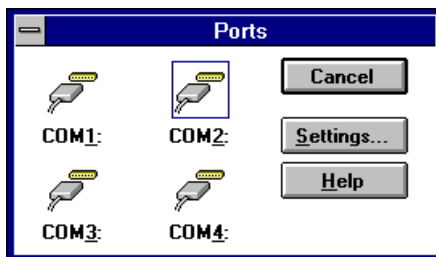
- Set COM2 and COM3 interrupts to ones not used by other devices on your system, say IRQ3 and IRQ10.
- From the Windows Program Manager select **Main**. Then double click the **Control Panel** icon.



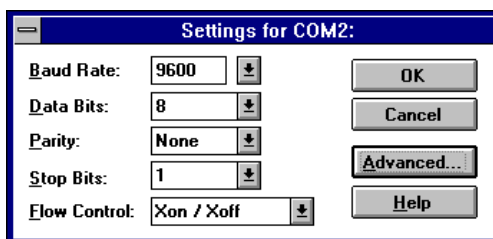
- From the Control Panel window select **Ports**.



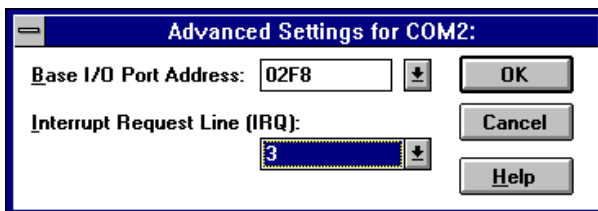
- From the Ports window select **COM2**. Then click the **Settings** button.



- From the COM2 window click the **Advanced** box.

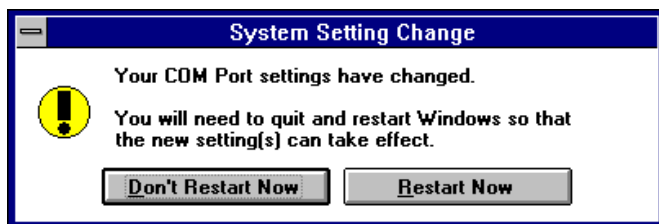


- From the Advanced Settings for COM2: window select **Interrupt Request Line(IRQ)**:
 - Scroll through the list of interrupts and select IRQ3 by clicking on 3.
 - Return from the Advanced Settings for COM2: window by clicking on **OK**



- Repeat the above procedure to install the second port, substituting the appropriate values.

- Windows displays a Systems Setting Change, saying "You will need to quit and restart Windows so that the new setting(s) can take effect."

**Either:**

Click on Restart Now and let windows restart itself able to run with the new configuration.

Or:

Click on Don't Restart Now and step back through the various windows to configure other ports or run other applications. The new settings for the COM ports will only take effect the next time you boot up Windows from cold.

Please Note:

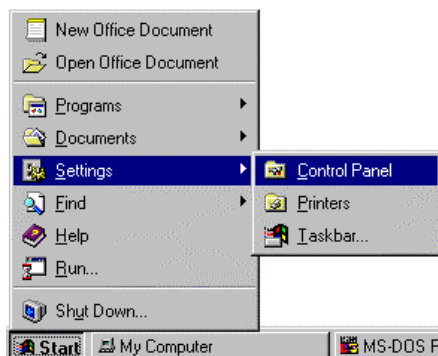
Microsoft documentation for Windows STRONGLY recommends the use of 16550 FIFO chips on serial ports. The AT Dual RS232/422/485 card provides this as standard.

Installation Of Ports In Windows 95 & 98.

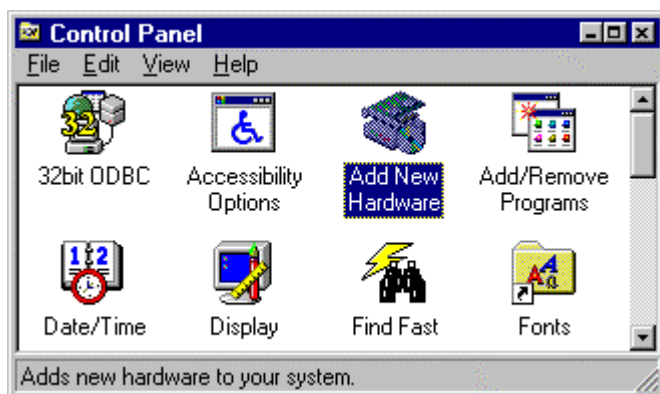
The procedure below covers installation of the AT Dual RS232/422/485 in both Windows 95 and Windows 98.

The following steps describe the installation of the Serial Solutions driver for Windows 95, which is supplied, on one 3.5" floppy disc. The listed installation procedure assumes that only 1 COM port (COM1) is present.

- Open the **Control Panel**.



- Double click the **Add New Hardware** icon in the control panel.



- Click **next** on the applet dialogue.

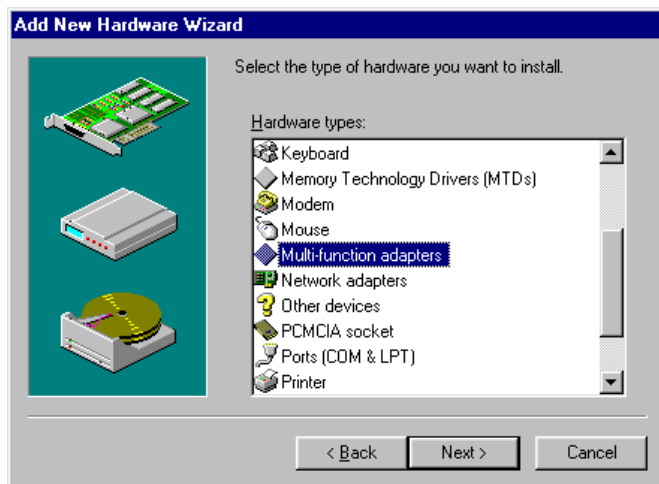


The **Add New Hardware** wizard will ask you if you wish Windows to search for your hardware.

- Click the **No** radiobutton and then click **next**.



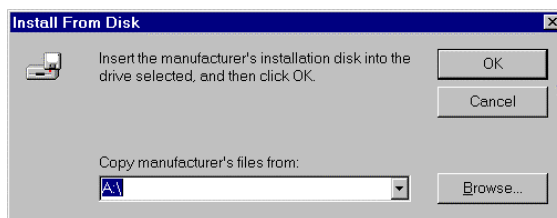
- From the hardware types list select **Multi Function-Adapter**. Click **next**.



- Click **Have Disk**.



- Windows will then ask you for the location of the Serial Solutions files, you will see something similar to:



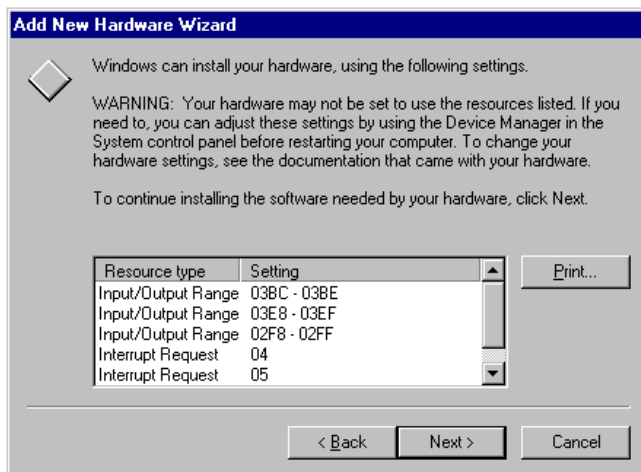
After the installation procedure, the a list of Serial Solutions cards will be displayed:



- Select the **ISA Dual RS232+ RS422 card**. Click **Next**.

You will then be informed of the settings that have been allocated to the AT Dual RS232/422/485 ports, and depending upon the PC's resource availability these values may be different from the cards default settings. If this is the case, make a note of the new settings. Click **Next**.

- Click **finish**. Windows will install the card with the listed settings.

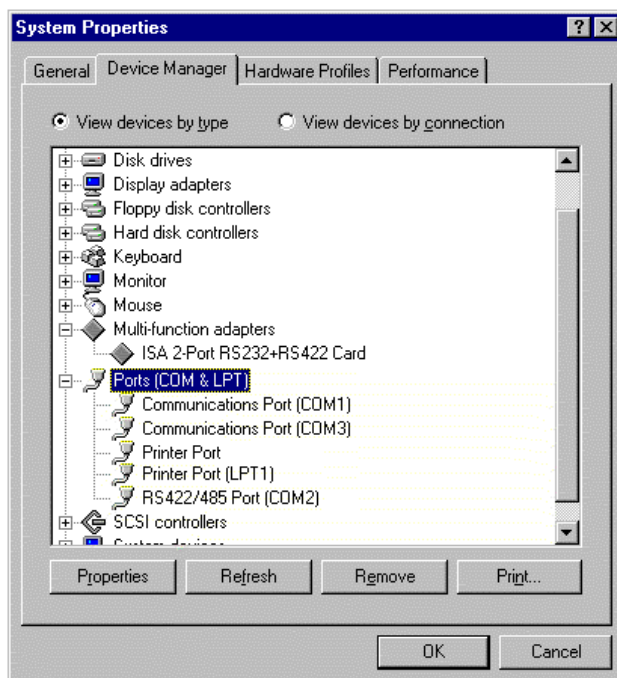


You will then be asked if you wish to re-boot the system. Since the **Dual RS232/422/485 card** will now need to be installed, select yes. Turn the PC off and insert the card as described in the previous chapter, making changes to settings on the card as necessary. Restart the computer and allow Windows 95 to load normally. Upon loading it will then "detect" the ports on the **Dual RS232/422/485 card** individually and install them, in a similar manner to that of a Plug and Play card.

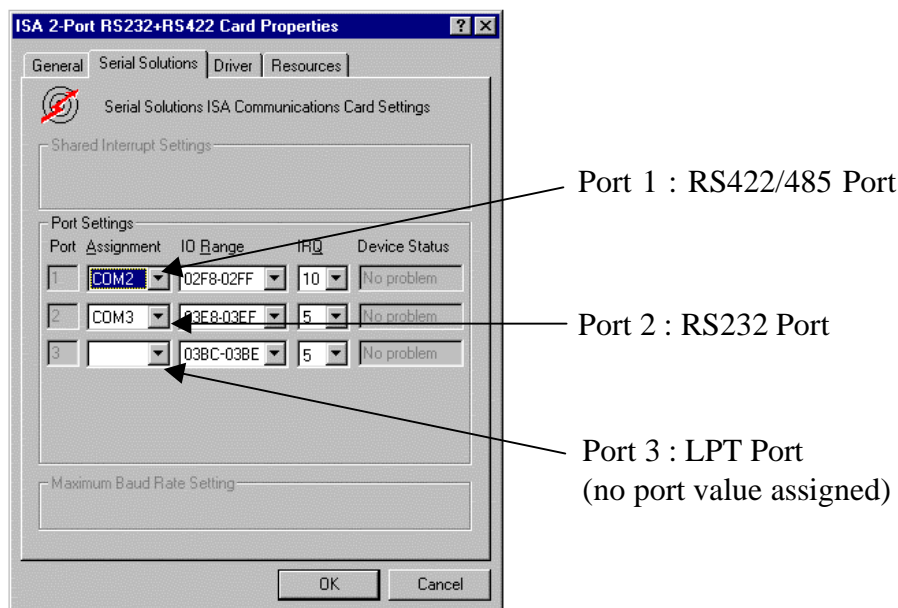
However, if you choose not to restart your PC Windows 95 will still "detect" each of the ports on the **Dual RS232/422/485 card** as described above, despite the card not being installed - this is due to the nature of the driver software.

Dual RS232/422/485 Card Settings in Windows 95 & 98.

Upon installation of the **Dual RS232/422/485 card** and Windows being restarted, the **Device Manager** will appear similar to the following:



To change settings of the parent device (**Dual RS232/422/485 card**), double click the **Dual RS232/422/485 card** entry under the **Multi-Function adapter** branch, and select the Serial Solutions Tab:



Settings available in these windows are:

1. **COM Port Assignment** - see the section below “**Changing port numbers**”
2. **LPT port assignment** – When installed the LPT port has no port number assigned to it, one may be assigned from the pulldown menu; also see the section below “**Changing port numbers**”
3. **IO range** – change this value to match any changes made to the addresses of the AT Dual RS232/422/485 card.
4. **IRQ Range** – change this value to match any changes made to the IRQ of the AT Dual RS232/422/485 card.

Changing Port Numbers.

In the Serial Solutions tab of the parent device properties window the COM and LPT port assignment may be changed, simply by selecting a new port value from the pull down menu relevant to the port. However, COM and LPT port usage other than

those for the installed multifunction card itself are not checked, so it is advisable to first check which ports are in use - port availability can be checked by viewing the Device Manager:

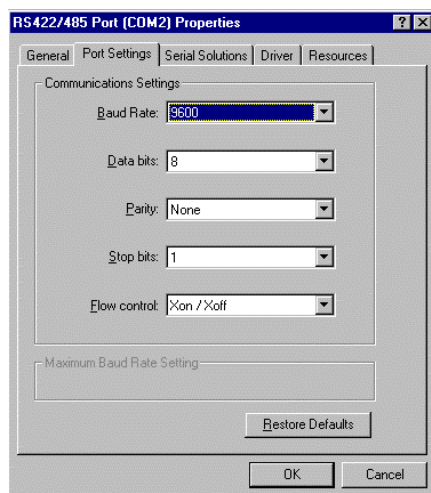


All ports present will be listed under the entry "**Ports (COM & LPT).**" The above screenshot indicates that COM4 and above are not installed, and therefore may be used and LPT1 is installed, therefore LPT2 and above may be used.

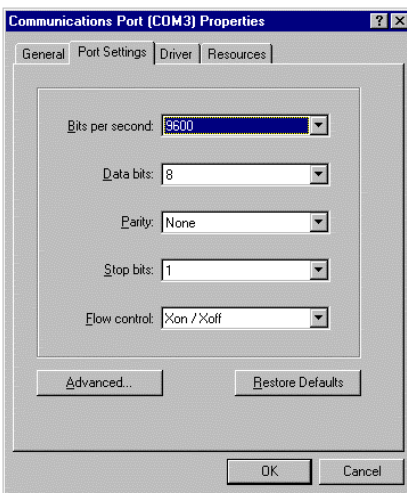
Multiport Card Port Settings In Windows 95 & 98.

Two separate port types exist for the AT Dual RS232/422/485 card: a standard COM (communications) port and an RS422/485 port. Double clicking upon an individual port entry in the **Device Manager**, and selecting the **Port Settings** tab will display:

RS422/485 Port:



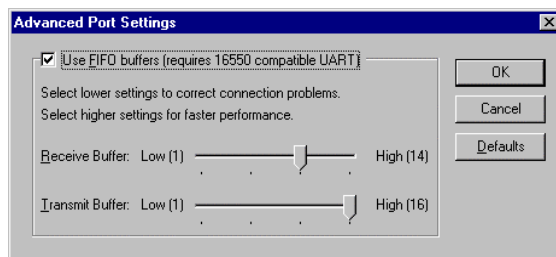
RS232 Port:



Settings available in these windows are:

1. **Baud Rate (RS422/485 port).**
 2. **Bits Per Second (RS232 port)**
 3. **Data Bits.**
 4. **Parity.**
 5. **Stop Bits.**
 6. **Flow Control.**
- } Change to suit remote device.
6. **Restore Defaults** - When clicked, this will reset the selected port to the default values of:

Baud Rate:	9600
Data Bits:	8
Parity:	None
Stop Bits:	1
Flow Control:	Xon / Xoff
 7. **Advanced (Communications port only)**- Clicking on this button will display:



Settings available in this window are:

- **Use FIFO Buffers** - turns the selected ports FIFO buffer on or off. It is strongly recommended that the FIFO for both ports is left enabled.
- **Receive Buffer** - These settings allow the selection of a receiver FIFO trigger setting. Selecting a low value will allow the interrupt to be serviced quicker, which is good for slow machines. If you have a fast

machine, setting a high value will give you more time for multi-tasking operations.

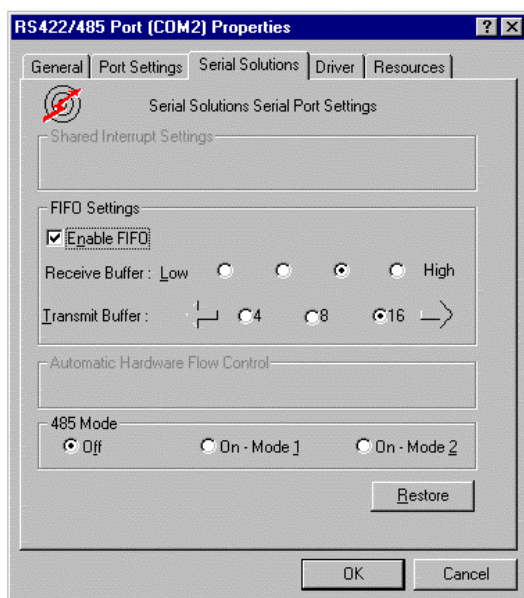
- **Transmit Buffer** - These settings allow the selection of a transmitter FIFO trigger setting. Selecting a low value will send fewer data-bytes per interrupt, and this is recommended if you are communicating to a slower machine. Selecting a high value will send more data-bytes per interrupt, and will give more time for multi-tasking operations.
- **Defaults:** when clicked this button restores the advanced settings for the selected port to:

Use FIFO Buffers: On (Checked)

Receive Buffer: High (14)

Transmit Buffer: High (6)

- Selecting the **Serial Solutions** tab of the RS422/485 port properties Window will display:



Settings available in this window are:

1. **FIFO Settings.**

- **Enable FIFO** - turns the selected ports FIFO buffer on or off. It is strongly recommended that the FIFO for both ports is left enabled.
- **Receive Buffer** - These settings allow the selection of a receiver FIFO trigger setting. Selecting a low value will allow the interrupt to be serviced quicker, which is good for slow machines. If you have a fast machine, setting a high value will give you more time for multi-tasking operations.
- **Transmit Buffer** - These settings allow the selection of a transmitter FIFO trigger setting. Selecting a low value will send fewer data-bytes per interrupt, and this is recommended if you are communicating to a slower machine. Selecting a high value will send more data-bytes per interrupt, and will give more time for multi-tasking operations.

2. **485 Mode** offers the options:

- **Off** – 485 mode is not implemented.
- **On - Mode 1** - Mode-1. Half-duplex operation, selecting this option turns off RTS immediately after the last character is transmitted, but sits watching the data leave the serial port.
- **On – mode 2** - Half duplex operation . Selecting this option causes the hardware to “notice” when the last data byte is written to the serial port. Then it watches at 'idle' moments of the system for the transmission to finish, when it disables RTS.

NOTE: The software settings for **485 Mode 1** and **485 Mode 2** must match the RS485 Multiplex Jumper configuration, as described in the section “**RS485 Multiplex**” in Chapter 2, to ensure accurate and error free data transmission.

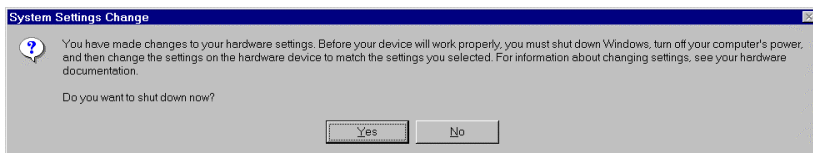
3. **Restore** - when this button is clicked the settings in the current window will be reset to the default values of:

Enable FIFO:	On (Checked)
Receive Buffer:	3 rd from left.
Transmit Buffer:	16
485 Mode:	Off

Restarting Windows

Whenever certain values have been entered or changed in the hardware settings window, a message prompting to restart Windows will appear. Only after having made ALL the necessary changes restart Windows so that the new settings come into effect.

Windows 95 issues a warning to ask you to confirm your changes and asks you if you wish to shut down the computer. If you have more ports to configure select No, otherwise select Yes.



After the computer has been re-booted the new ports will be available for use.

Installation Of Ports in Microsoft Windows NT.

Microsoft Windows NT Provides built in support for 255 standard serial ports. The installation procedure is very similar to that of Windows 3.x. Successful operation of the ports is again dependent on using separate interrupts for each of the ports which you are installing.

Windows NT versions 3.51 and 4.0 may look much different, but the installation procedure for Serial Ports remains the same.

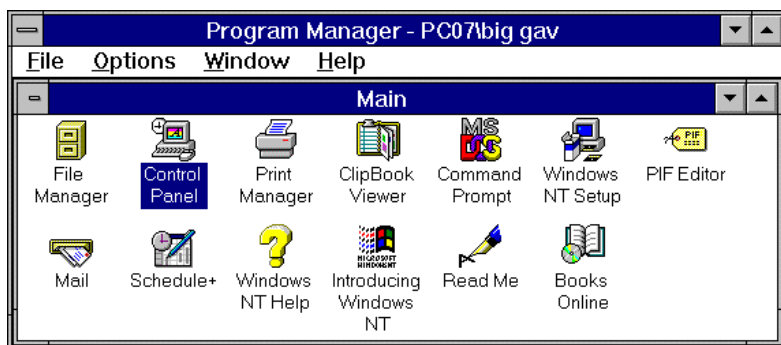
To obtain trouble free mix and match of the COM ports, assuming that only 1 Serial Port already exists on your PC,

Version 3.51:

- From Windows NT's **Program Manager**, select the **main** program group, and double click the **control panel** icon.

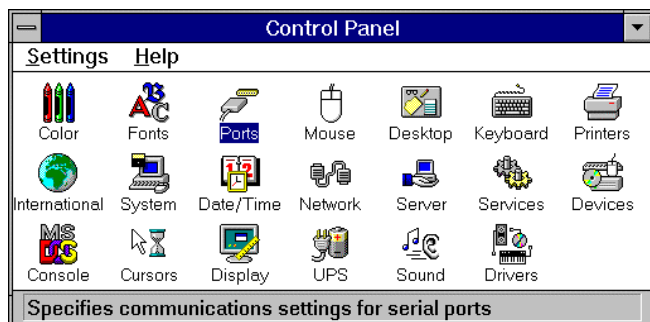
Version 4.0:

- Open 'My Computer' and double click the **Control Panel** icon or click the start button, select **Settings** and then **Control Panel**

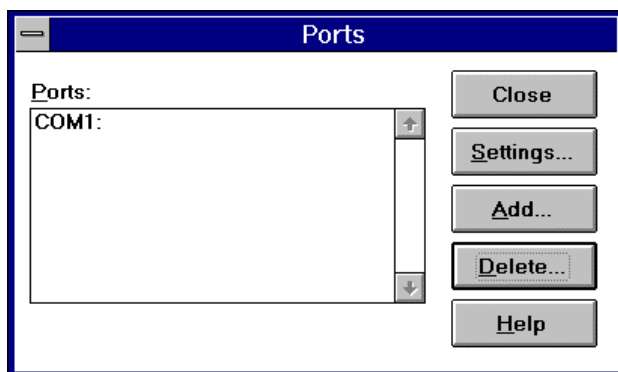


From Control Panel:

- Double Click the **Ports** icon.



If you only have one existing port in your PC then your ports applet will look something like the following figure.



Your new ports will need to be added one at a time. Each ports installation procedure is equivalent to the other from this point.

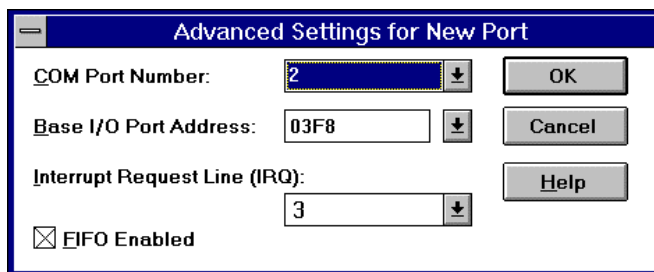
- Click the **Add** button.

Change any of the settings in the box as appropriate to match your hardware, as Windows NT may not correctly

determine the hardware settings. For our example COM2 should be set to IRQ3. The FIFO enabled check box should be checked if you wish to enable the hardware buffer. This option is only available on cards which have a 16C550 or better UART chip on board. It is recommended that this option be set.

When you are happy with your settings:

- Click **OK**.



Windows will now tell you that for your settings to take effect, you will need to restart your machine. If you have more ports to install:

- Click **Don't Restart Now**, and continue with the installation of your other ports,

Else

- Click **Restart Now** to complete the installation.

Installation Of Ports In OS/2.

This section details the port installation procedure in OS/2 Version 2.x and OS/2 Warp.

OS/2 provides built in support for up to four serial ports. OS/2 assumes that COM1 is on IRQ4 and that COM2 is on IRQ3. To use COM3 and COM4 ports on AT bus machines it is necessary to include parameters on the DEVICE=COM.SYS statement in the CONFIG.SYS file. That is:-

DEVICE=COM.SYS (N,XXX,I)

where N is the COM port number (3 or 4)

XXX is the I/O port address (3E8, 2E8, etc.)

I is the IRQ (interrupt) level (from 1 to 15)

For COM2 using IRQ3 the CONFIG.SYS file entry should be:-

DEVICE=COM.SYS (2,2F8,3)

For COM3 using IRQ10 the CONFIG.SYS file entry should be:-

DEVICE=COM.SYS (3,3E8,10)

For COM4 using IRQ11 the CONFIG.SYS file entry should be:-

DEVICE=COM.SYS (4,2E8,11)

For COM2 using IRQ 3, COM3 using IRQ10 and COM4 using IRQ11 the CONFIG.SYS file entry should be:-

DEVICE=COM.SYS (2,2F8,3) (3,3E8,10) (4,2E8,11)

Ensure that a 1 space character is between each of the bracket enclosed variables

When using OS/2 note that these settings DO NOT get passed on to the WINOS/2 control panel and therefore have to be set separately for Windows 3.1 in order to use them - refer to the above section “**Installing Ports In Windows 3.x**”.

If the standard COM3 or COM4 addresses are not used,

and a mouse is on COM1/2, in DOS VDMs the ADDRCOM3/4 programs may report COM port addresses in a different order to that expected. However the MODE command etc. correctly accesses the right port in both DOS VDM and OS/2 sessions.

Please Note:

As with Windows 3.1, OS/2 STRONGLY recommends, and automatically detects, the use of 16550 FIFO chips on serial ports.

Chapter 4

RS232 PINOUTS AND PORT CABLING.

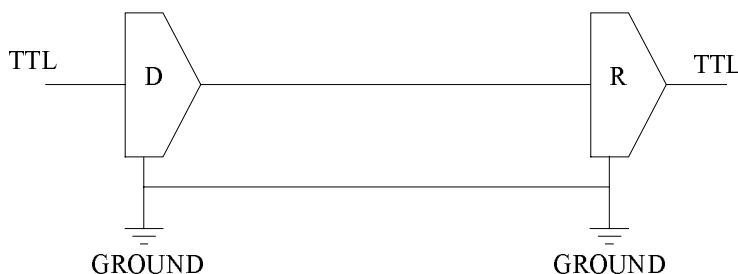
Introduction.

This chapter gives details of the 9 and 25 pin RS232 pin outs, cabling and connections, with information on how to connect the serial ports of two PCs and how to make a selftest loop back connector.

The RS232 Standard.

The RS232 standard is ancient in computer industry terms. Introduced in 1962, it is now widely established. RS232 is a slow speed, short distance, single ended transmission system (i.e. only one wire per signal). Typical RS232 maximum cable length is 50 feet with a maximum data rate of 20K bits per second.

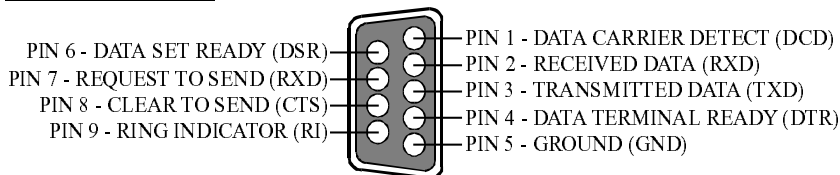
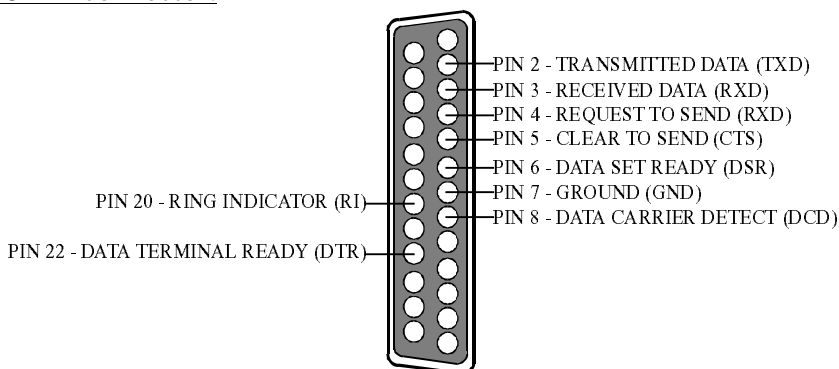
Figure 4-1. RS232 Point To Point Connection.



RS232C Standard 1 Driver 1 Receiver	
Line Length	Max Data Rate
50 Feet = 15m	20 Kbits/sec

RS232 Serial Port Pin Outs.

The pinouts of the 9 and 25 pin Male D connectors are given below.

Figure 4-2. RS232 Serial Port Pin Outs.**9 Pin connector:****25 Pin connector:****9 Pin D Serial Port RS232 Cables.**

To connect to the AT style RS232 Serial Port you will need a cable terminating in a 9 way female D connector. It is sound practice to use cables with screws fitted that will allow you to fasten the cable securely to the PC card.

In general, you will need to make up a "cross over" cable to correctly interface the PC to the RS232 port of another computer or device. Traditionally, making up the cross over cable has been considered a black art. However, provided you have the pin outs and handshake requirements of both sides of your RS232

connection, the cross over cable becomes a matter of common sense. The cross over cable is simply to ensure that the right signals going out of one RS232 port go into the appropriate lines of the other RS232 port.

9 Pin D Serial Port Connection To Another PC.

Suppose we want to connect the AT style 9 pin D Serial Port to the serial port of another IBM PC. See Figure 4-3.

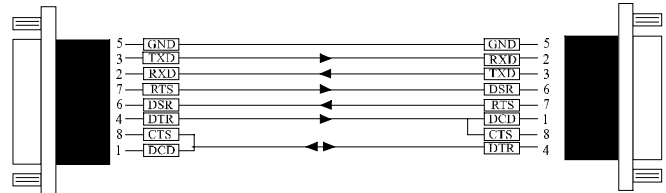
- 1) Connect the earth lines.
Line 5 of Serial Port 2 to lines 1 & 7 of the other PC.
This gives the two devices a common earth level.
- 2) Connect the Transmit and Receive lines together.
Line 3, TXD, Port 2 goes to line 3, RXD, of the other PC.
Line 2, RXD, Port 2 goes to line 2, TXD, of the other PC.
This allows each to receive the data transmitted by the other.
- 3) Connect the Port 2 DTR line, pin 4 to the other PC DCD, pin 8 and CTS, pin 5, lines.
Also, connect up the other PC DTR line, pin 20 to the Port 2 DCD, pin 1 and CTS, pin 8, lines.
This allows the receiving device to signal when it can no longer accept data. The receiving device sets DTR false when it is unable to receive any more data. The sending device reads DTR on its CTS and DCD pins. It should stop sending when CTS goes false.
- 4) Connect the Port 2 RTS line, pin 7, to the other PC DSR line, pin 6. Also, connect the other PC RTS line, pin 4, to the Port 2 DSR line, pin 6. This RTS line is used to let the other device know that it is ready for data exchange.

Figure 4-3. 9 Pin D Serial Port To Other PC Cable.

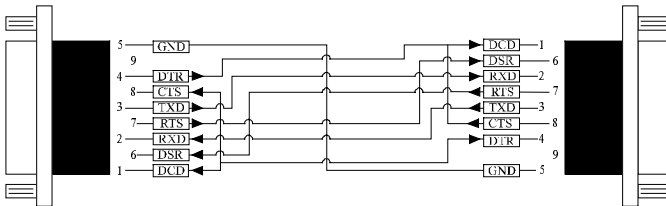
AT SERIAL PORT Side
9 PIN D CONNECTOR

Other PC SERIAL PORT Side.
9 PIN D CONNECTOR

SCHEMATIC REPRESENTATION:



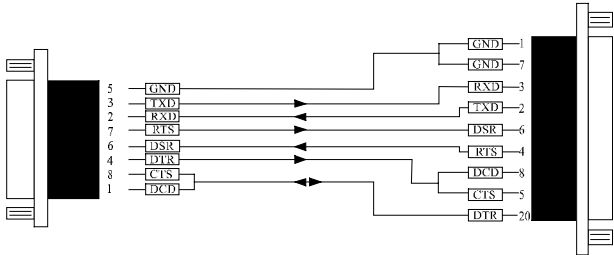
ACTUAL REPRESENTATION:



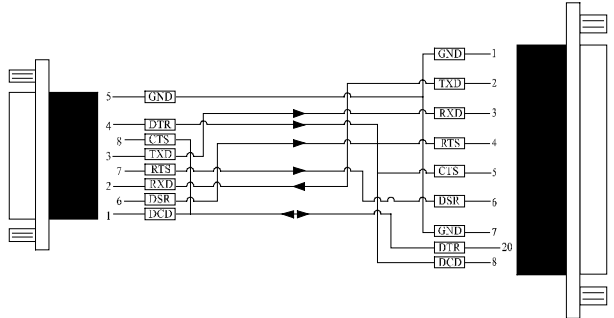
9 PIN D CONNECTOR

25 PIN D CONNECTOR

SCHEMATIC REPRESENTATION



ACTUAL REPRESENTATION



9 Pin D Serial Port To A Modem.

If you are connecting a MODEM to a 9 pin D Serial Port then you will NOT need a cross over cable and a straight through cable connected as the 9 to 25 pin adapter given in Figure 4-5.

9 Pin D Serial Port Loop Back Connector.

A loop back connector can be used to echo RS232 data transmitted by a serial port back into its own RS232 receiver. In this way, the function of the serial port can be tested.

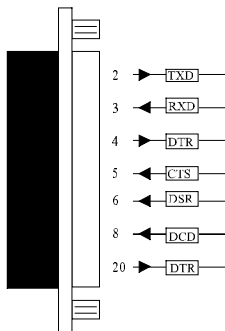
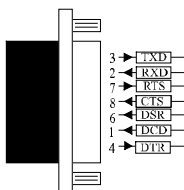
For an AT style Serial Port use the a female 9 way connector wired as in Figure 4-4.

Figure 4-4. 9 Pin D Serial Loop Back Connector.

9 PIN D CONNECTOR

25 PIN D CONNECTOR

SCHEMATIC REPRESENTATION:



ACTUAL REPRESENTATION:

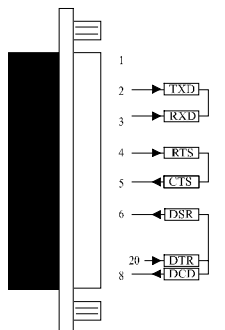
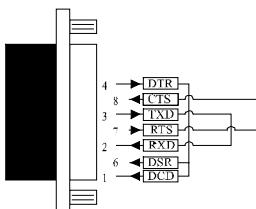


Figure 4-5. 9 To 25 Way Adapter.

This adapter cable makes the AT style 9-pin serial port, look like the standard PC 25 pin serial port. It is NOT a cross over cable!

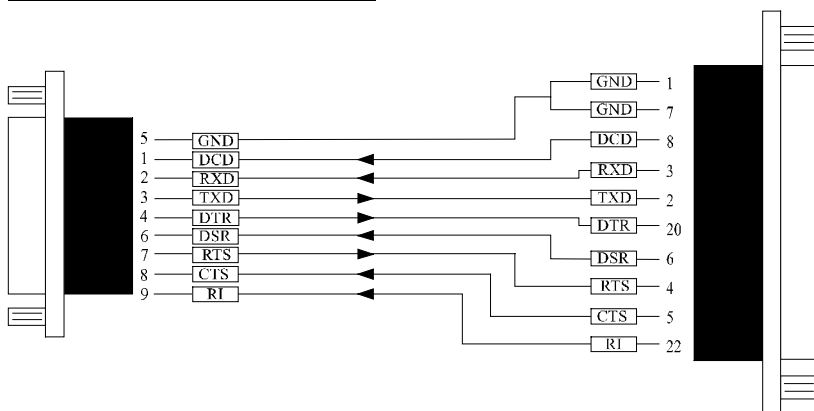
9 Pin AT SERIAL PORT

9 Pin Female D Connector

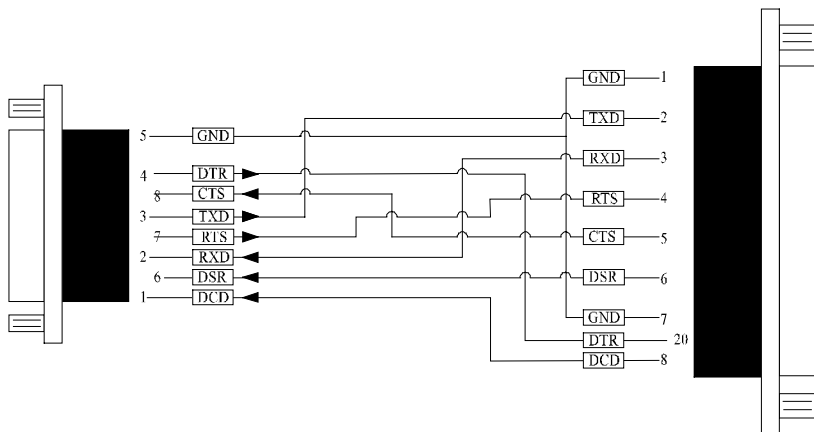
25 Pin PC SERIAL PORT

25 Pin Male D Connector

SCHEMATIC REPRESENTATION:



ACTUAL REPRESENTATION:



Chapter 5

ADDITIONAL RS422/485 OPERATION

The RS422 Standard.

The RS422 standard defines a serial communications standard. RS422 is a high speed and/or long distance data transmission. Each signal is carried by a pair of wires and is thus a differential data transmission system. Over distances up to 40 feet the maximum data rate is 10 Megabits per second, and for distances up to 4000 feet the maximum data rate is 100 Kilobytes per second. A 120-Ohm resistor should be used to terminate the receiving end of the line. It is generally used between one transmitter receiver pair to ONLY one other transmitter receiver pair, but each output can drive up to 10 receivers.

RS422 Standard	
1 Driver up to 10 Receivers	
Line Length	Max Data Rate
40 Feet = 12m	10 Mbits/sec
400 Feet = 122m	1 Mbits/sec
4000 Feet = 1219m	100 Kbits/sec

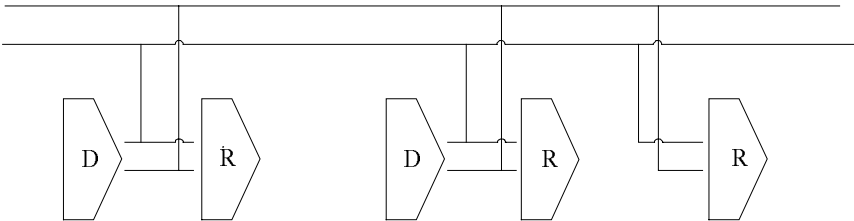


The RS485 Standard.

The RS485 standard is similar to the RS422 standard upon which it is based. The main difference is that up to 32 transmitter receiver pairs may be present on the line at one time. A 120-Ohm

resistor should be used to terminate either end of the main line. If more than one device may transmit data, the RTS line is used as transmit enable signal, so preventing contention between talkers.

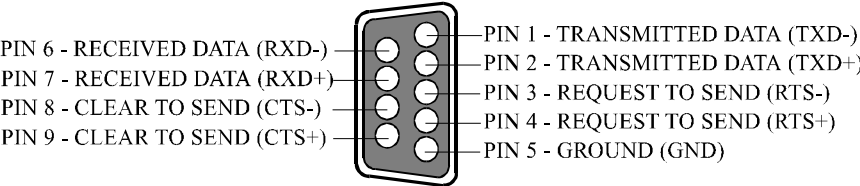
RS485 Standard	
Up to 32 Driver/Receiver Pairs	
Line Length	Max Data Rate
40 Feet = 12m	10 Mbits/sec
400 Feet = 122m	1 Mbits/sec
4000 Feet = 1219m	100 Kbits/sec



RS422 Serial Port Pinouts.

The pinouts of the 9 pin male connector are given below.

Figure 5-1. RS422 Serial Port Pin Outs.



Terminating Impedance's.

RS422 and RS485 lines should be terminated at the end of the main branch of the RECEIVER, in the cables characteristic impedance. These terminating impedance's stop echoes caused by the serial data being reflected back at the cable ends. It is not

necessary to terminate the transmitter end of the twisted pair.

There is no need to add any more at the PC end.

The terminating impedance's shown later in the wiring diagrams of Figure 5-2, Figure 5-3, Figure 5-5 & Figure 5-7 are automatically provided by the on board resistors and do not have to be added by the user.

Fail Safe Open Circuit Detection.

Open circuit is when there are no drivers on the circuit. This occurs by design in party line multi driver/receiver systems and unintentionally when the twisted pair line is accidentally cut or disconnected or the transmitting device fails. In RS485 party line systems there are extended periods of time when none of the many possible talkers are gated onto the bus. This is known as the line idle state and occurs when all the driver outputs are in the high impedance state. The lines float, perhaps being pulled to the high or low state by noise or other voltages on the line.

Without fail safe open circuit detection false start bits are detected by the receivers, either corrupting good communications or causing noise to masquerade as good data.

The on board fail safe open circuit detection causes the receiver to go to a known, pre-determined state and prevents false start bits and bad data being detected during open circuits.

Fail Safe Short Circuit Protection.

Short circuits are when the two lines of a twisted pair are connected together. This occurs due to either accidental damage to the cable or due to failure of one or more transmitter/receivers on the line. The short circuit condition is dangerous since damage to the receiver may occur and communication may be corrupted or prevented.

The on board fail safe short circuit detection prevents the line impedance from going to zero and thus protects the inputs of receivers and the outputs of drivers.

RS422 Operation.

Generally, in RS422 systems all 8 signal lines from the 9 pin D connector participate in the data transfer sequence, thus 4 twisted pair cables are used. One twisted pair carries the TXD data outwards, one pair brings the RXD data inward, another pair carries the RTS handshake outwards and the fourth pair brings the CTS handshake inwards. There is no need to carry the ground from one device to another.

This RS422 arrangement allows data to be transmitted and received simultaneously since each signal has its own data cable pair. In addition, the receiver can set RTS true so telling the transmitter on its CTS input that the receiver is ready to accept data. In this way, no data will ever be transmitted when the receiver is unable to accept it, due to a full input buffer etc. And so no data will be lost.

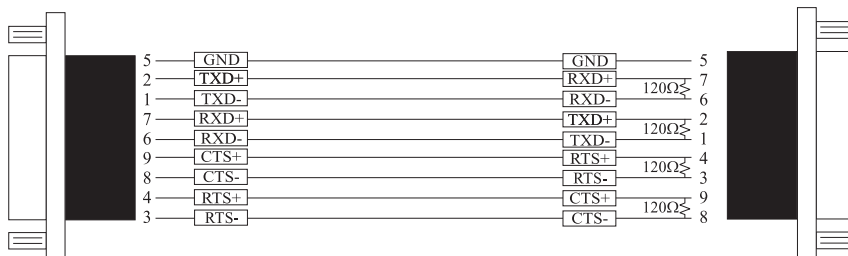
RS422 Serial Port Cables.

Use screened twisted pair Belden cable 9729 and 9829, L type 2493 and 2919 or IBM Part No 4716748 cable to make the RS422 connection. Unscreened Belden type 8795 may also be used in less noisy environments.

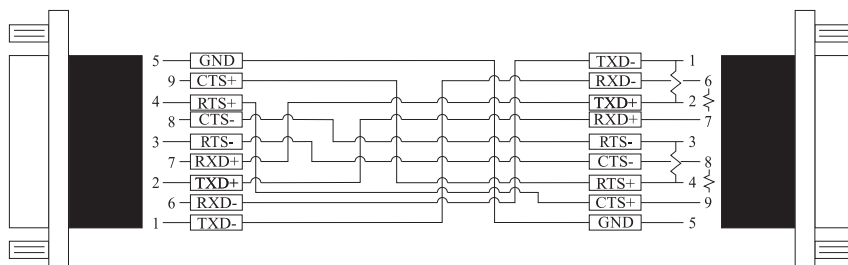
The on board resistor networks terminate the receiving end of the twisted pair cable in its characteristic impedance.

Figure 5-2. Serial Port 1 To Other PC Cable.SERIAL PORT 1 Side9 Pin Female D ConnectorOther PC SERIAL PORT Side9 Pin Female D Connector

SCHEMATIC REPRESENTATION:



ACTUAL REPRESENTATION:

**Note:**

- i.) Receiver ends terminated in characteristic impedance ONBOARD resistor networks.
- ii.) USE BELDEN TYPE 9729 etc. see above.
- iii.) RS485 Gating & Multiplex Jumpers as Factory Set.

RS485 Operation.

The RS485 standard is intended for up to 32 driver receiver pairs on the bus. The line drivers used in the Serial Solutions RS422/485 card are designed to work correctly in both RS422 and RS485 systems. The main difference therefore is in how the system is implemented. Though the card uses a 9 pin D connector, in general, not all the lines are used for RS485 systems. The RTS+/- and CTS+/- lines, though driven by the card, are usually not connected. In two wire, Half-Duplex configurations the TXD+ line is connected to the RXD+ whilst the TXD- line is connected to the RXD-, only one pair of twisted wire cable is used in RS485 Half Duplex communications.

The hardware handshaking performed by the CTS+/- and RTS+/- lines in RS422 systems are handled by a software protocol in RS485 systems. In situations where more than one device may transmit data on the shared data line, each cards RTS line is used as a gating signal to enable the TXD driver only when that card needs to transmit data, i.e. set TXD GATE or AUTO jumper. This mechanism prevents bus contention caused by multiple transmitters holding the line in opposing states. The three wiring schemes given described below are: -

- i.) RS485 One Talker Many Listeners (HALF DUPLEX)
- ii.) RS485 Many Talkers Many Listeners (HALF DUPLEX.)
- iii.) RS485 Many Talkers Many Listeners (FULL DUPLEX.)

RS485 Cable.

For best noise immunity use twisted pair cables to make the RS485 connection. In Half Duplex wiring only 1 twisted cable pair is needed. Two twisted pair cables are needed for Full Duplex communications.

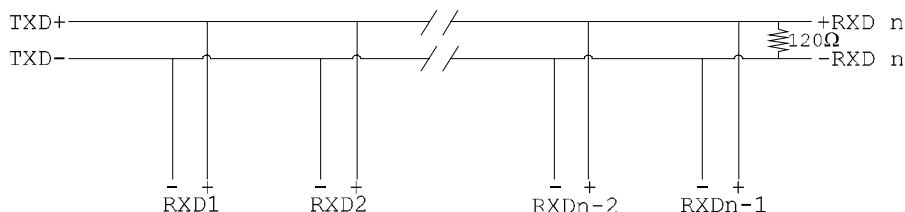
Use screened twisted pair Belden cable 9729 and 9829, UL type 2493 and 2919 or IBM Part No 4716748 cable to make the RS485 connection. Terminate the twisted pair cable at either end in its characteristic impedance, which for the Belden 9729 cable is

120 Ohms. Unscreened Belden type 8795 may also be used in less noisy environments.

RS485 One Talker - Many Listeners, Half Duplex.

There are several schemes for connecting RS485 devices depending on the characteristics of the system. In many cases there will be only one device, which can transmit, data and all the others simply listen to it. This scheme is used for theatrical lighting intensity control in the DMX512 standard. This is shown in Figure 5-3, below. For the talker the RS485 TXD GATE jumper should remain in the factory set position, i.e. transmitter is always enabled. There is NO multiplexing of the TXD and RXD lines. Data is only flowing one way, from PC outwards, and is thus a Half-Duplex configuration, only one twisted pair cable is needed.

Figure 5-3. RS485 1 Talker Many Listeners.



Note: The Receiver end of MAIN line terminated in characteristic impedance by ONBOARD resistor networks, stubs off the main not terminated.

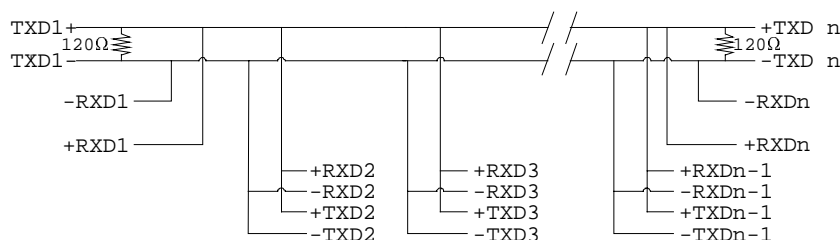
In the above scheme, one RS485 device is talk only, it transmits data, but it does not receive any. The other RS485 devices are receive only, they do not transmit any data at all. Figure 5-4, below, gives the RS485 Gating jumper settings.

Figure 5-4 Half Duplex Settings of RS485 Multiplex.

- Both jumpers shorted, causing the RXD- & TXD- and the RXD+ & TXD+ signals to short together at the 9-pin connector.

RS485 Many Talkers- Many Listeners, Half Duplex.

Another popular RS485 layout is for multiple talkers and multiple listeners. This is shown in Figure 5-5, below. This is also known as "party line" transmission. It is imperative to have some method of preventing two devices trying to drive the data lines at the same time. The normal method is to use the RTS line as a talk enable. The RTS line should go true immediately prior to the data transmission and go false immediately after the last byte in the stream is sent. See Figure 5-4 for jumper settings.

Figure 5-5. RS485 Many Talkers & Listeners. Half Duplex

Note: BOTH ends of MAIN line terminated in characteristic impedance, stubs off main line not impedance, since both ends receive. The twisted pair ends are wired to both RXD+ & TXD+ and RXD- & TXD- at each RS485 device!

RS485 Many Talkers- Many Listeners, Full Duplex.

The RS485 many talkers, many listeners, Full Duplex system can be used when all the RS485 devices have separate Transmit and Receive channels. There is NO multiplexing of the TXD and RXD signals on the same device. This system is especially useful when there is no flow control available on the PC, usually due to the use of a third party communications program that prevents the use of the RTS signal as a "transmit enable" control, via the TXD GATE jumper. It can be used in the following situations:-

- a) The PC is connected to only ONE RS485 device.
- b) The PC is communicating with several RS485 devices that are each able to recognize and respond to their own unique address. The RS485 devices only drive their TXD lines when they are responding to requests from the PC to send data. In effect, the RS485 device's address and the command it receives is used to control access to the devices TXD channel.

This is a Full Duplex system. Two twisted pair cables are required. One twisted pair, is the PC's TXD channel, it carries the data sent from the PC's TXD outputs to the RXD inputs of each of the RS485 devices. The second twisted pair, is the Devices TXD channel, it carries the data sent from each of the devices' TXD outputs to the RXD inputs of the PC.

The advantages of this system are great, since no new communications, software is needed, and the PC can talk and listen at the same time. In effect, the handshaking is performed by the intelligence of the RS485 devices attached to the PC.

When wired as in Figure 5-7 below, the PC can transmit data at any time and all the RS485 devices #1 to #n simultaneously receives it.

Only one of the RS485 devices may talk, i.e. transmit data, at any one time. Each RS485 device recognizes commands and data addressed to it, it only talks when the PC commands it to do so. When the RS485 device receives the command to talk from the

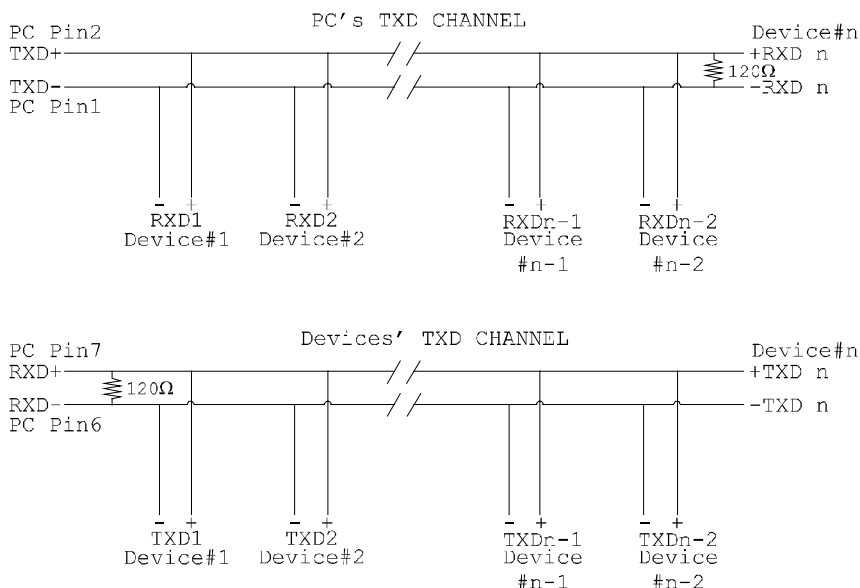
PC, it gates its TXD drivers on, sends the data down the device TXD channel, and disables its TXD drivers. The other RS485 devices remain in the receive only mode when they are not being addressed, they do not transmit any data at all. Figure 5-6 gives the jumper settings for the serial card in the RS485 Full Duplex mode.

Figure 5-6. RS485 Jumpers, Full Duplex.



- Both jumpers left unconnected (not shorted).

Figure 5-7. RS485 Full Duplex.



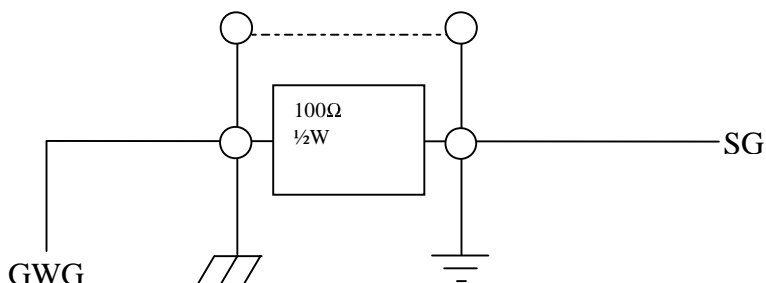
Note: The receiver end of MAIN line terminated in characteristic impedance, stubs off the main not terminated.

Optional Grounding Arrangements.

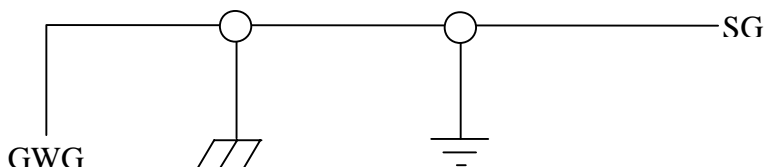
Proper operation of the cable circuit, according to TIA EIA: 485 A (1995) requires that the cable ground shield is not connected directly to the equipment ground shield. A current limiting resistor should be used in series with the shield to avoid possible large current flow due to differences in ground potential. Any one of the methods shown in Figure 5-8, below can do this.

Figure 5-8 - Optional Grounding Arrangements For The RS422/485 Port.



Configuration A)



Configuration B)



KEY:

SG	=	Signal Ground Interchange Circuit.
GWG	=	Green Wire Ground Of Power System.
	=	Protective ground of frame ground.
	=	Circuit ground or circuit common.

Configuration A) The circuit common of the equipment is connected to protective ground, at one point only by a $100\ \Omega$, $\pm 20\%$ resistor with a power dissipation rating of $1/2W$. An additional provision may be made for the resistor to be bypassed with a strap to connect signal common and protective ground directly together when specific installation conditions necessitate.

Configuration B) The circuit common shall be connected directly to protective ground. The same configuration need not be used at both ends of an interconnection; however, care should be exercised to prevent establishment of ground loops carrying high currents. (Note: Under certain ground conditions in configuration A, above, high ground currents may cause the resistor to fail; therefore, a provision should be made for inspection and replacement of the resistor.)

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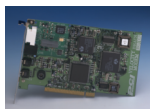
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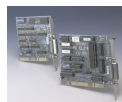
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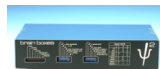
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