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Solflower Serial Port Adapter

for PCI bus

User's Manual

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CHAPTER 1: GENERAL INFORMATION

INTRODUCTION

The Solflower Serial Port Adapter is a 16 serial port PCI add-in board. The 16 serial ports can operate simultaneously with each port's error-free data rate up to 115000 bps for all 16 ports.

This document describes the hardware specification and installation of the board.

PARTS INCLUDED IN THE PACKAGE

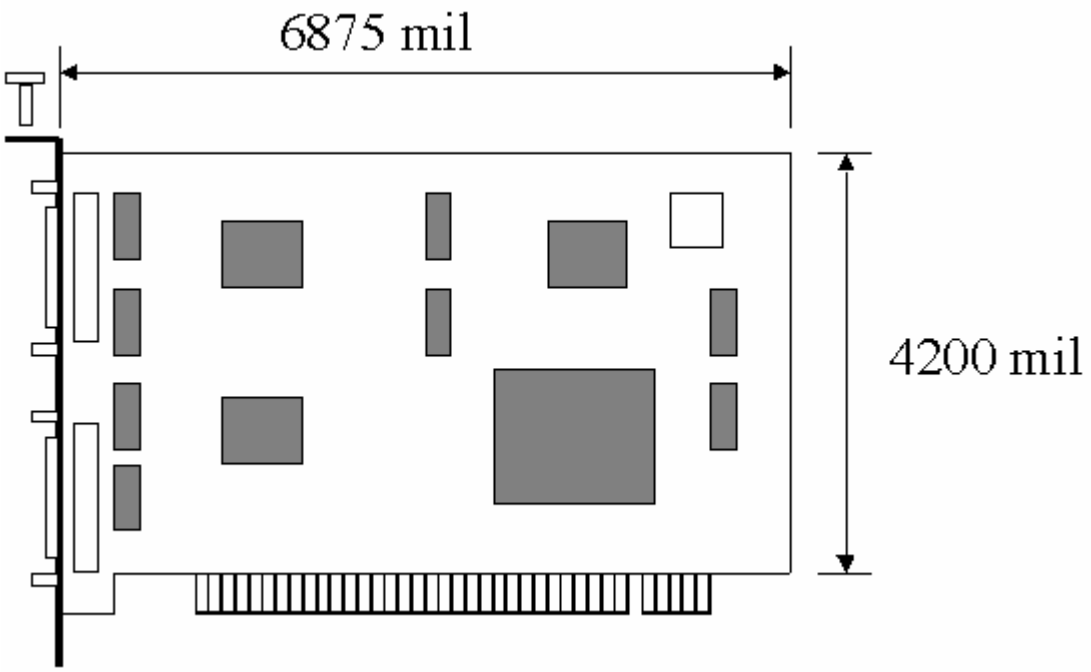
1 Solflower Serial Port Adapter board.
2 1-to-8 serial cables.
1 CDROM that contents device drivers and user's manuals.

SAFETY RULES

To prevent damage to the board, do not handle the board without ESD precaution. Solflower Computer Inc. recommends user to ware an anti-static strap. Do not plug or unplug the board when your system is powered on. This board uses power supplies of 5V and +/-12V. This board is designed for in-door use only.

BOARD SPECIFICATIONS

Dimension:



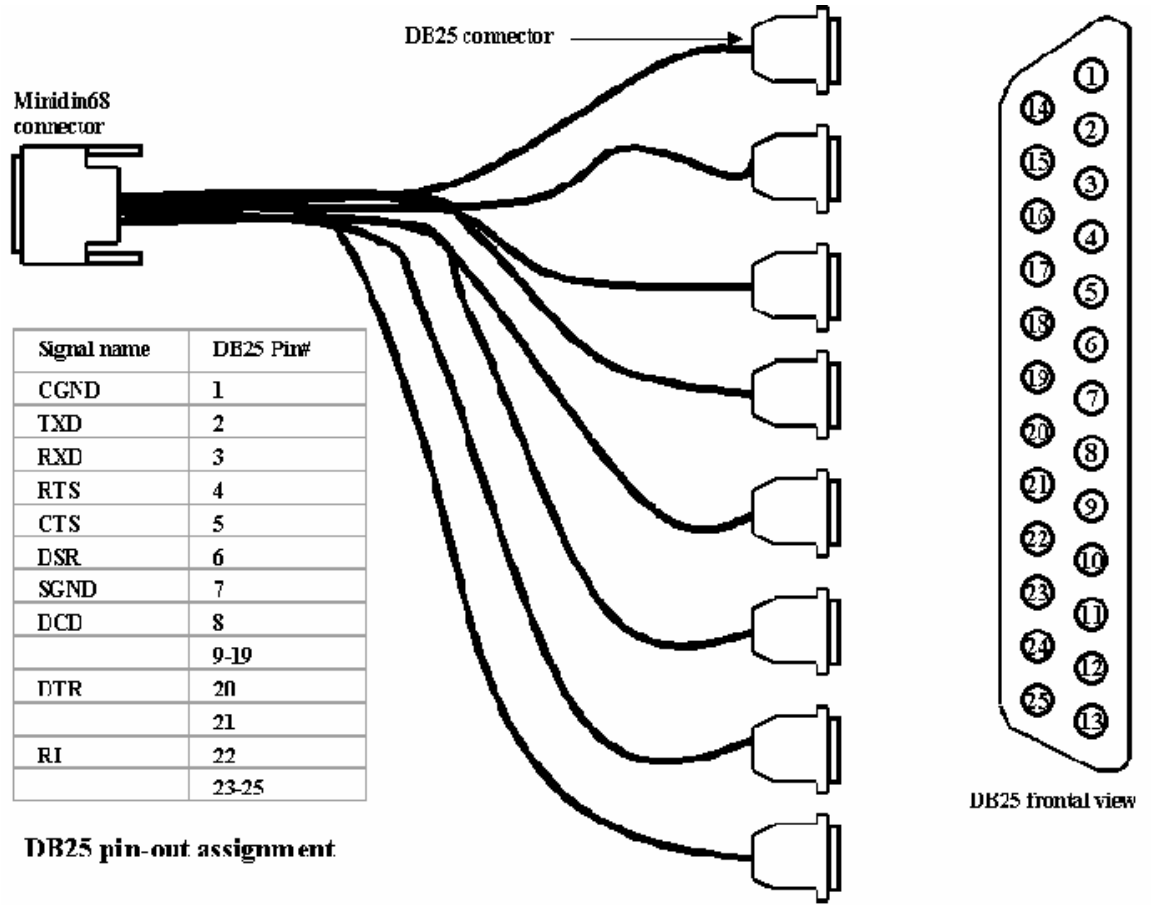
Power Consumption: Maximum power rating is approximately 5 watts.

Electrical Characteristic (power supply and signal voltage):

Input power:	-/+5V and +/-12V.
Maximum input current:	50 mA.
Logic input level:	2.5-5.5V.
Logic output level:	5V
Serial input level:	-12 to +12 V.
Serial output level:	-5 to +5 V.
Maximum data rate:	115200 kbps each serial port.

Cable Connector Pinouts:

There are two minidin68 female connectors (U55, U56) on board which house 16 serial channels, eight serial channels for each minidin68 connector. Eight serial ports (COM5 to COM12) are accommodated in connector U55 and another eight (COM13 to COM20) are in connector U56. Each serial port utilizes one DB25 connector. Two special 1-to-8 serial cables are included. (Figure 1)



Signal name	DB25 Pin#
CGND	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SGND	7
DCD	8
	9-19
DTR	20
	21
RI	22
	23-25

DB25 pin-out assignment

Figure 1

CHAPTER 2: HARDWARE INSTALLATION

Before you begin, please make sure you are electrically grounded, wearing an anti-static strap is strongly recommended, and your system is power off.

Insert the Solflower Serial Adapter board into a PCI slot. Avoid touching the on-board IC's. Make sure the board is firmly seated and the PCI connector makes fully contact with the PCI slot.

Secure the board with a screw.

Connect the two male Minidin86 connectors to the on board female connectors. Lock the connector with screws.

CHAPTER 3: WINDOWS INSTALLATION

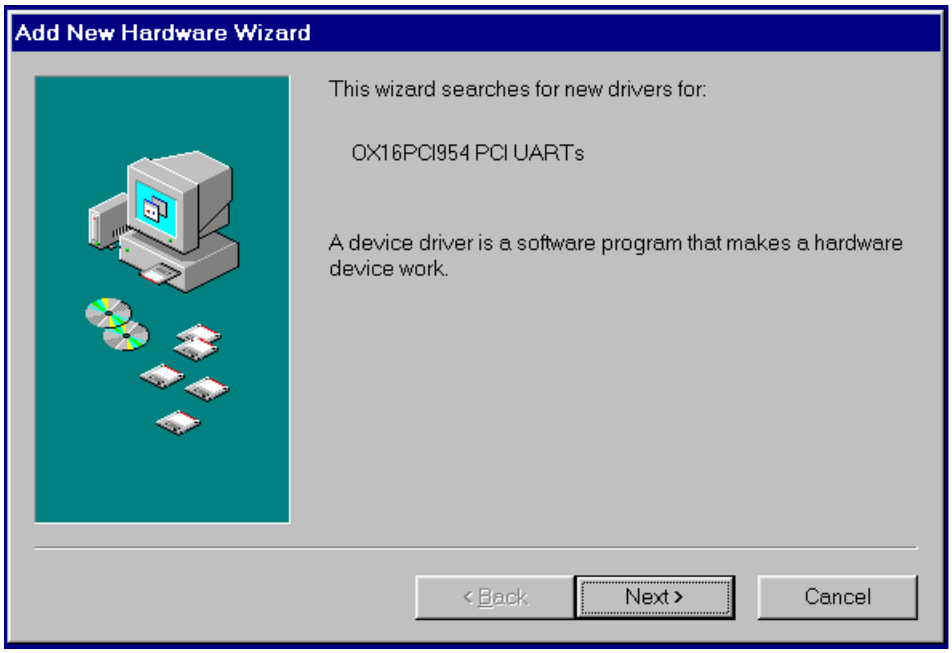
WINDOWS 98 INSTALLATION

Any previous release of the OX16PCI954 drivers on the system must be removed before installing the new drivers. Refer to the **Removal of Card and Drivers** section. All the files for Windows can be found on the CD in *\SOLFOXT\RELOC\OPT\SOLFOXT\WINDOWS*.

1. Extract the file *v4_04.zip* to a temporary directory, *C:\Temp\OX16PCI954*, for example.

2. Install the card as described in chapter 2. Power up the system.
   Windows will detect the PCI card, start the Add New Hardware Wizard, and begin driver installation. The driver installation proceeds in three parts: the first part installs the driver for the PCI UARTs, the second part installs the driver for the PCI bridge, and the third part installs the driver for the PCI communications ports.

3. After new hardware is detected, the following window will appear.
   Click **Next** to start the driver installation for the PCI UARTs.



4. The following window will appear. Click **Next** to start searching for a driver.



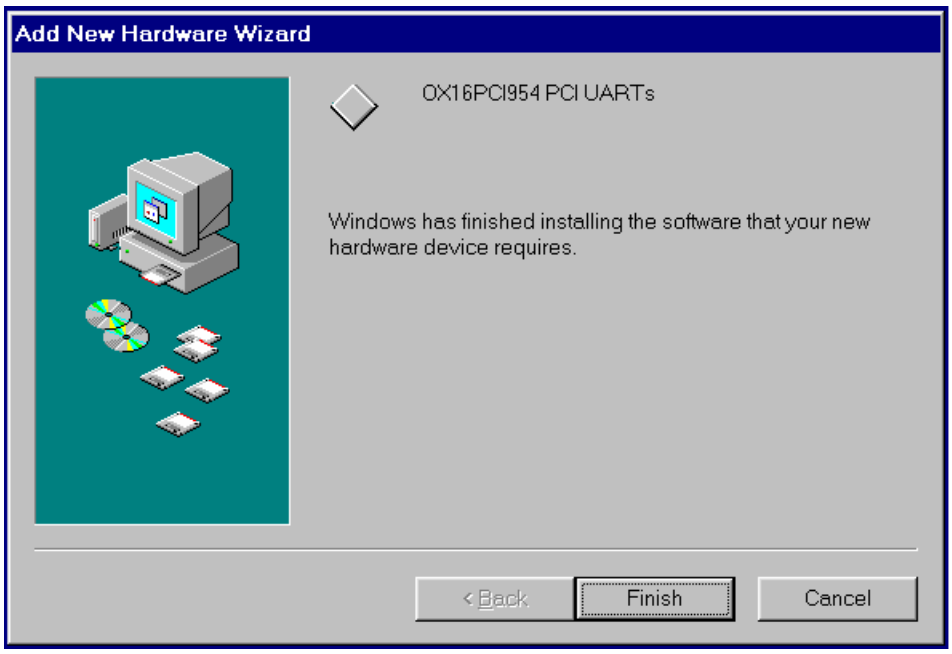
5. In the next window, check the option **Specify a location**.
   In the textbox, enter the path where the file *v4_04.exe* was unzipped, then click **Next**.



6. The following window will appear. Click **Next** to continue.



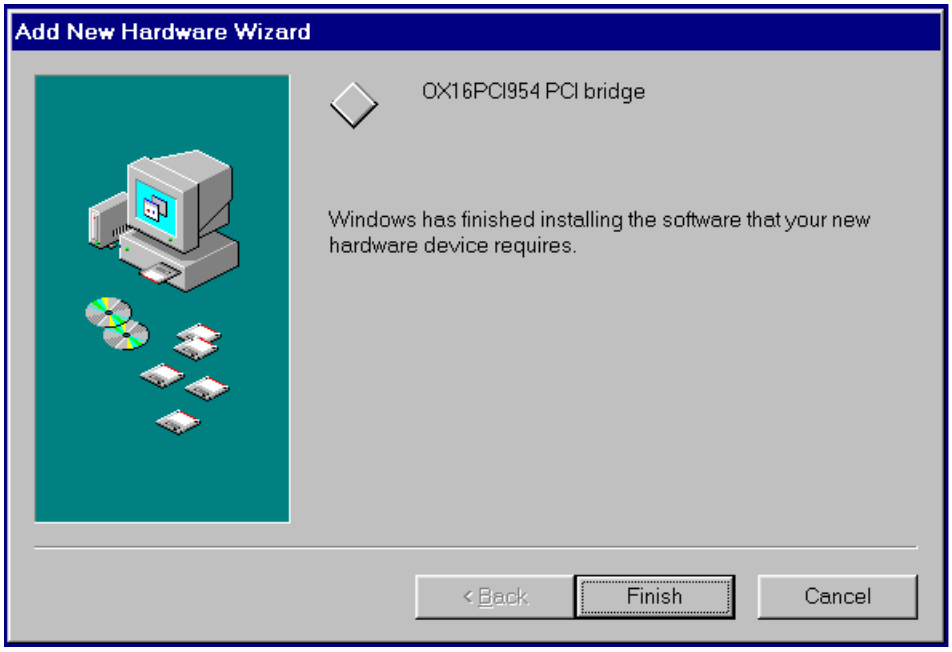
7. When the driver installation is done, the next window will appear. Click **Finish**.



8. The following window will appear. Repeat step 3 through 6 to install driver for the PCI bridge.



9. When the driver installation is done, the next window will appear. Click **Finish**.



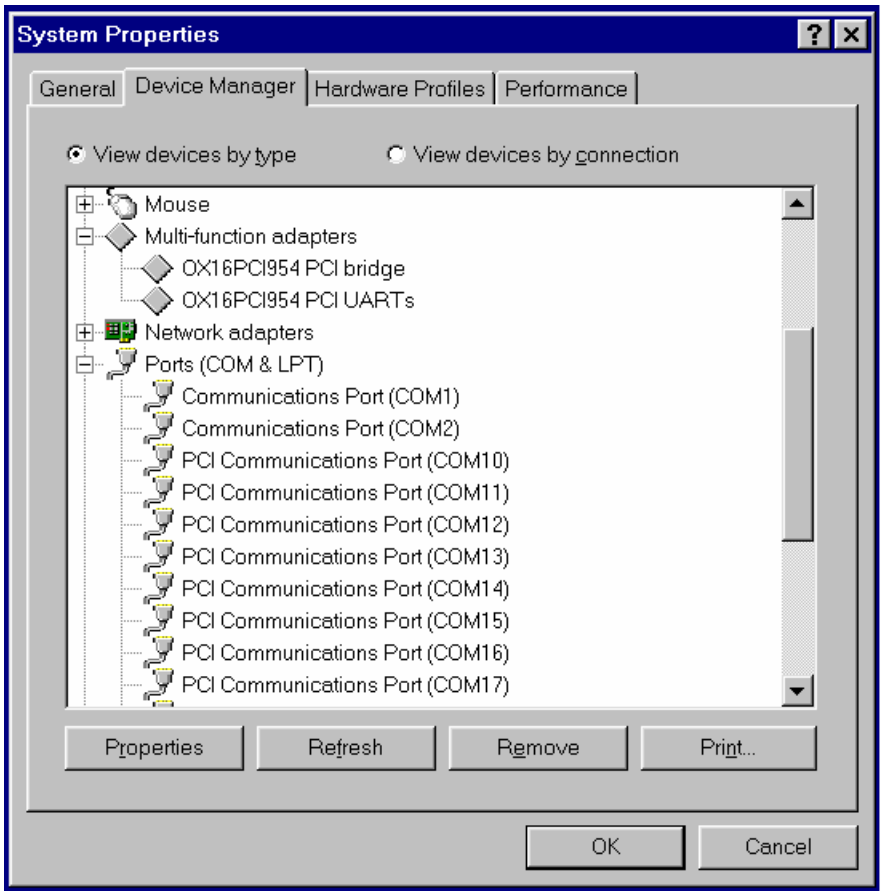
10. Windows will then search, find, and install driver for the 16 PCI communications ports automatically. Wait for the process to complete.

VERIFY THE INSTALLATION

To verify the software installation, open **My Computer**, **Control Panel**, **System** (or Start, Setting, Control Panel, System). Select the **Device Manager** Tab.

Click **Multi-function adapters**, the OX16PCI954 PCI bridge and UARTs should appear.

Then click **Ports (COM & LPT)**, the 16 PCI communications ports (COM5 through COM20) should appear as shown in the following window.



REMOVAL OF CARD AND DRIVERS

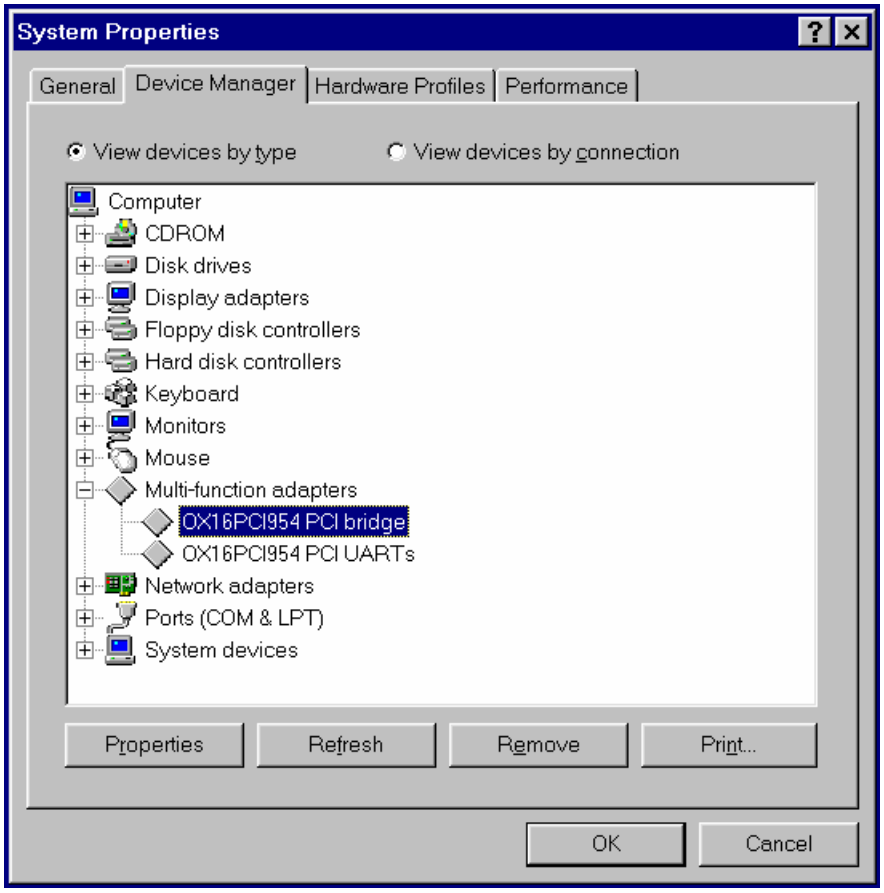
To remove the card from your system and remove its current driver:

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

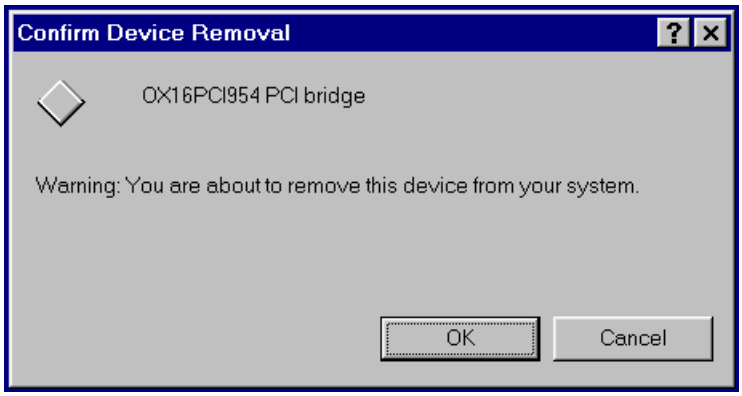
2. In the **System Properties** window, select the **Device Manager** Tab.

3. Click **Multi-function adapters,** then select **OX16PCI954 PCI bridge**.

4. Click the **Remove** button.



5. In the **Confirm Device Removal** window, click the **OK** button.



6. Wait for the removal to finish then go back to the **System Properties** window, click **Multi-function adapters**, and select **OX16PCI954 PCI UARTs**.

7. Repeat step 4 and 5 to remove the OX16PCI954 PCI UARTs driver.

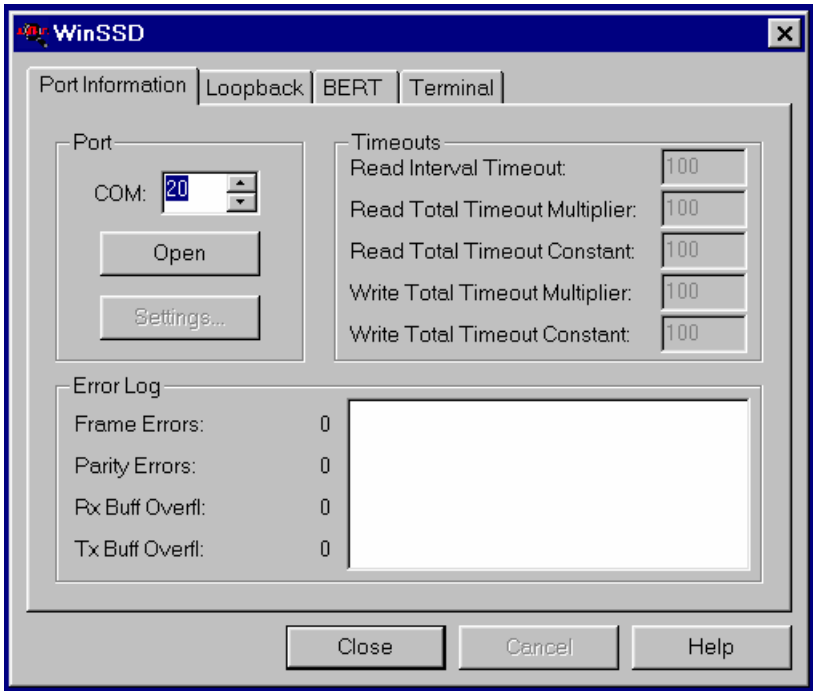
8. Shut down the computer, then remove the card by following the **Hardware Installation Guide**.

CHAPTER 4: SERIAL PORT TESTS IN WINDOWS

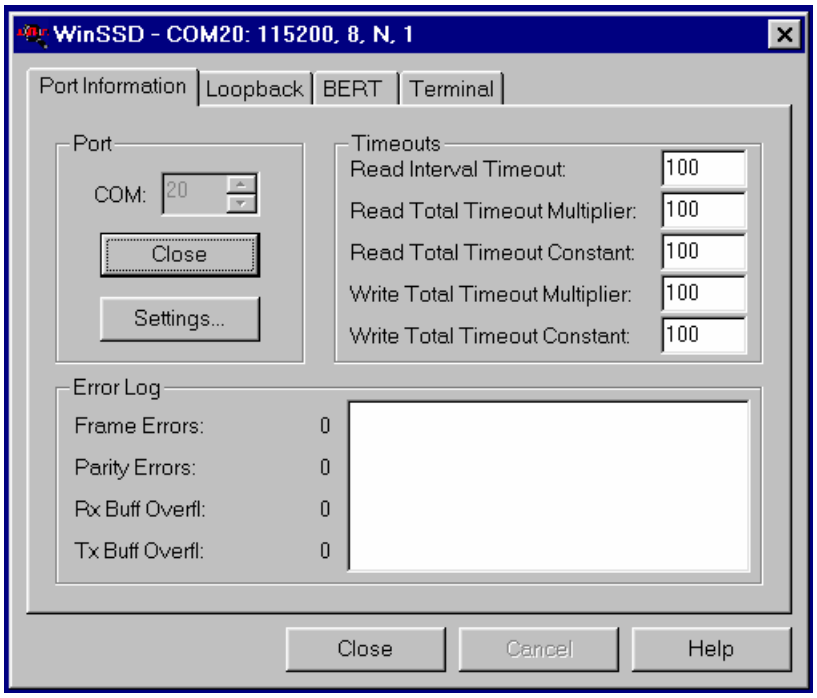
WINSSD SERIAL DIAGNOSTICS

WinSSD can be downloaded at: http://www.sealevel.com/catalog/asyncsw.htm.
It can also be found on the CD in *\SOLFOXT\RELOC\OPT\SOLFOXT\WINDOWS.*

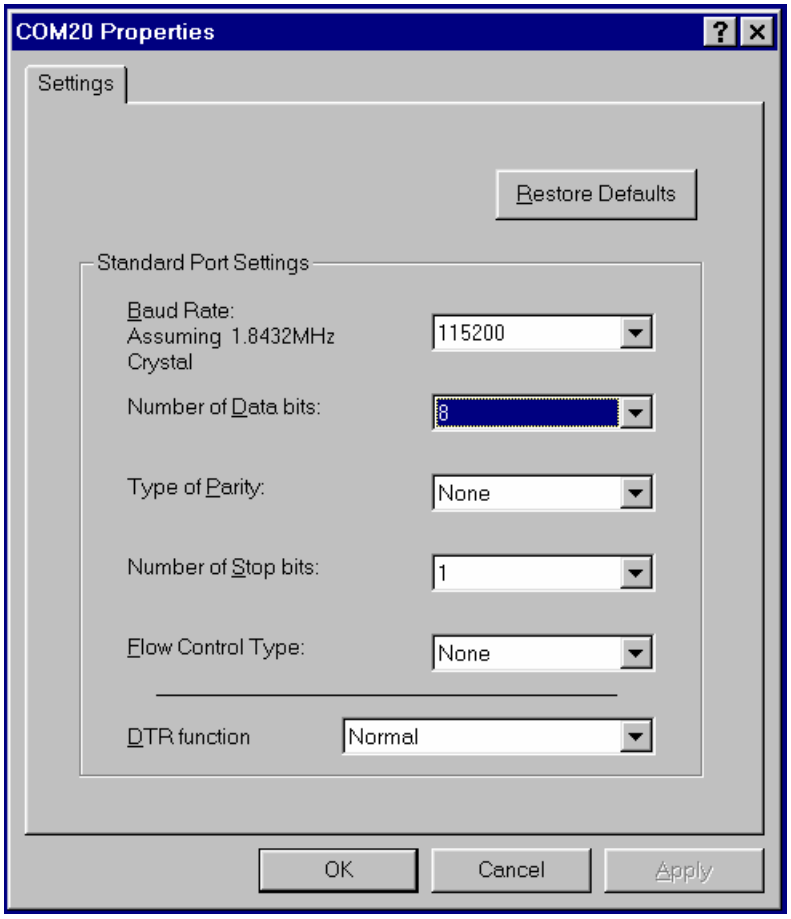
1. Start **WinSSD**. Select a COM port to test, then click **Open**.



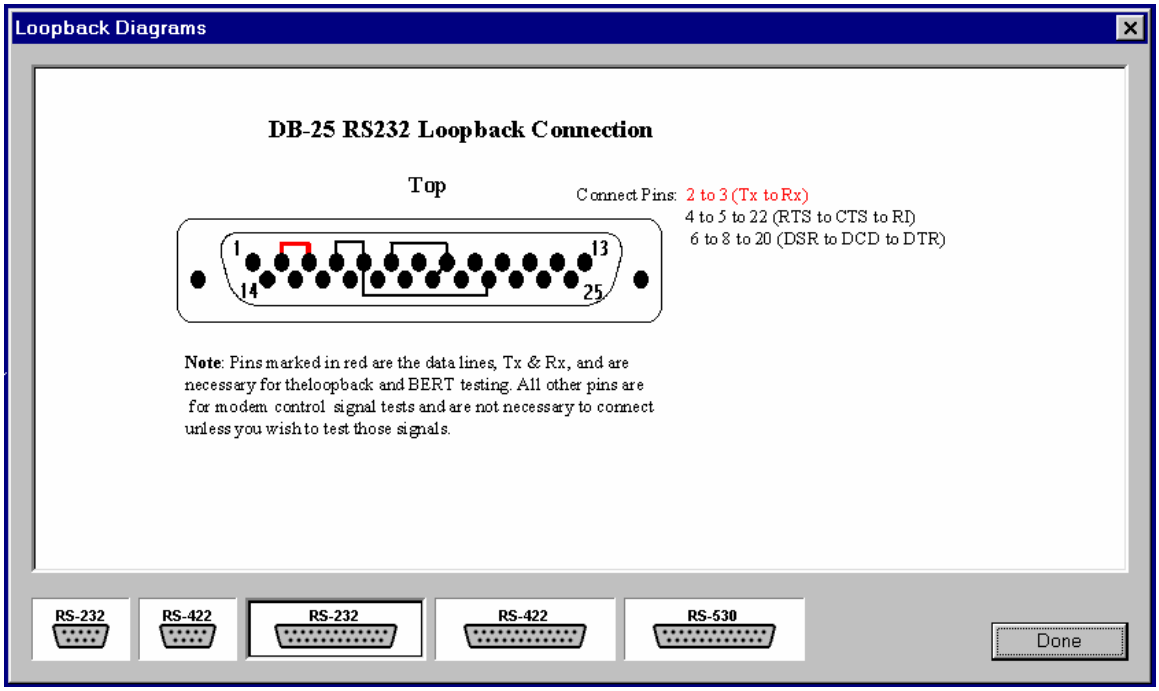
2. The following window will appear. Click **Settings** to view or change the port's properties.



3. The **COM Properties** window will appear. Make any necessary changes. Then Click **OK** to save the settings.



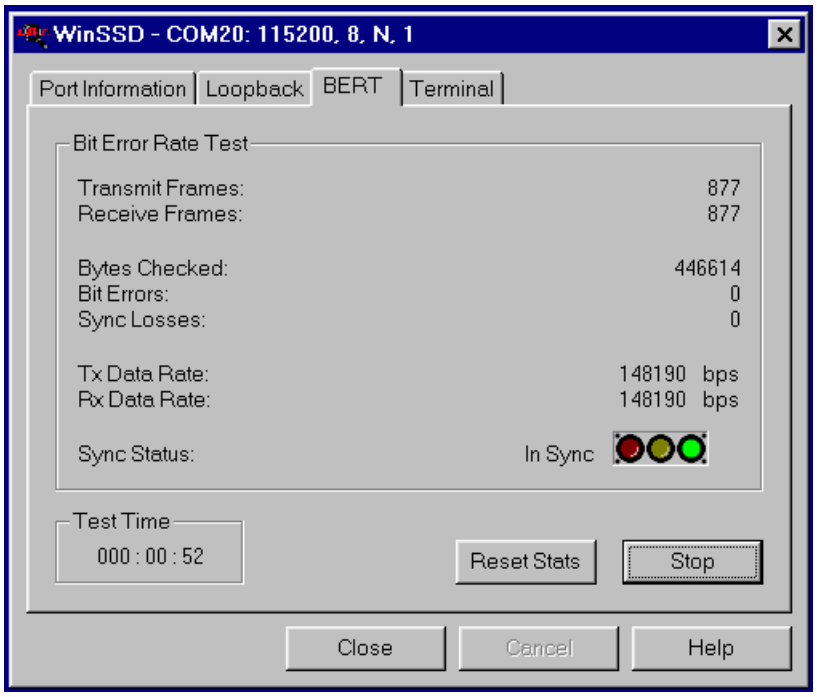
4. In the **WinSSD** window, click **Loopback**. Click **Diagrams** to check the loopback connection needed for each particular connector as shown. Click **Done** to go back to the **WinSSD** window.



5. If there is only a Tx and Rx loopback connection, leave the **Modem Control Test** unchecked. Otherwise, check the **Modem Control Test**, then click **Start**.
The window below shows all three loopback tests completed successfully.



6. Click **BERT** (Bit Error Rate Test). Click **Start**.
   The following window shows a running BERT on COM20.
   If there is an error, it will be shown in the **Port Information** window.

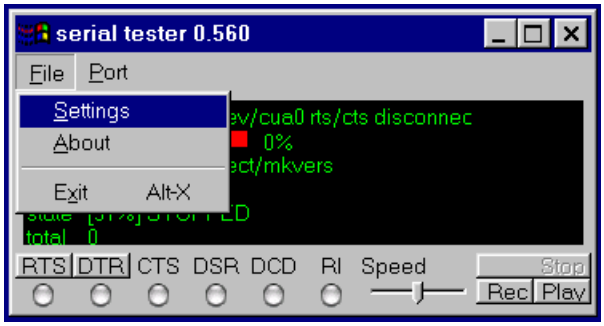


SERIAL COMMUNICATION PROBE - SERTEST

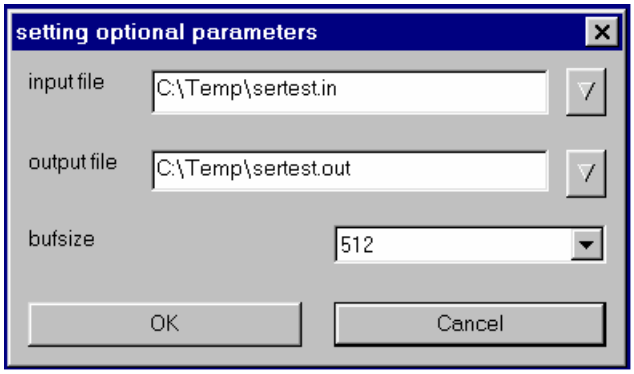
sertest can be downloaded at: http://www.iftools.com/samples.html.
It can also be found on the CD in *\SOLFOXT\RELOC\OPT\SOLFOXT\WINDOWS.*

sertest can be used to transfer data between two COM ports on a computer
or even between two COM ports on two different computers.

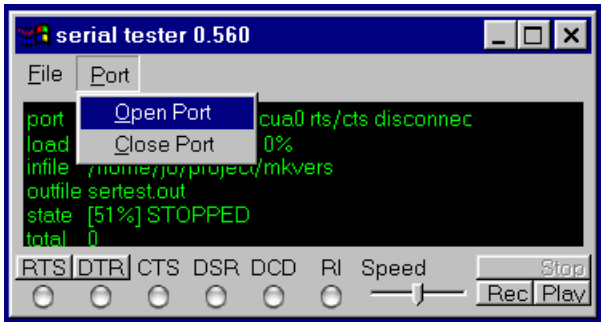
1. Connect the two COM ports being tested.
   Start **sertest**. Click **File**, then select **Settings** as shown below.



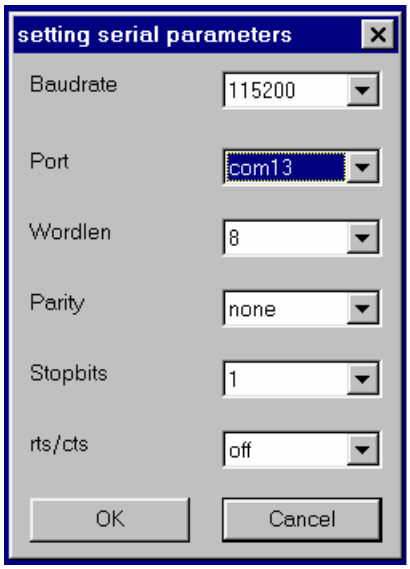
2. Enter the paths for the input and output files, then click **OK**.



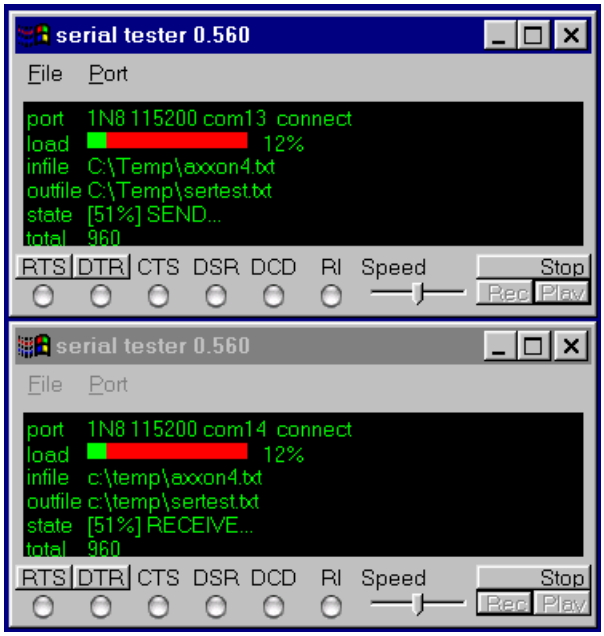
3. Click **Port**, then select **Open Port** as shown below.



4. Select the port being tested to open. Change other settings if needed, then click **OK**.



5. Start another **sertest**. Repeat step 1 through 4 to open the other COM port.
   In one window click **Rec**, and in the other window, click **Play**.
   The following screen shows the file transfer between COM13 and COM14.



CHAPTER 5: LINUX INSTALLATION (KERNEL 2.4.18)

1. Install the card as described in chapter 2. Power up the system.

2. Linux will detect the PCI card and start the Hardware Discovery Utility. Click **Configure**.



3. To verify the installation, use **dmesg(8)**, and the following text should appear.
   The 16 ports are ttyS4 through ttyS19.

Serial driver version 5.05c (2001-07-08) with MANY_PORTS MULTIPORT SHARE_IRQ SERIAL_PCI ISAPNP enabled
ttyS00 at 0x03f8 (irq = 4) is a 16550A
ttyS01 at 0x02f8 (irq = 3) is a 16550A
ttyS04 at port 0xff20 (irq = 11) is a 16C950/954
ttyS05 at port 0xff28 (irq = 11) is a 16C950/954
ttyS06 at port 0xff30 (irq = 11) is a 16C950/954
ttyS07 at port 0xff38 (irq = 11) is a 16C950/954
ttyS08 at port 0xf880 (irq = 5) is a 16C950/954
ttyS09 at port 0xf888 (irq = 5) is a 16C950/954
ttyS10 at port 0xf890 (irq = 5) is a 16C950/954
ttyS11 at port 0xf898 (irq = 5) is a 16C950/954
ttyS12 at port 0xf8a0 (irq = 5) is a 16C950/954
ttyS13 at port 0xf8a8 (irq = 5) is a 16C950/954
ttyS14 at port 0xf8b0 (irq = 5) is a 16C950/954
ttyS15 at port 0xf8b8 (irq = 5) is a 16C950/954
ttyS16 at port 0xf8c0 (irq = 5) is a 16C950/954
ttyS17 at port 0xf8c8 (irq = 5) is a 16C950/954
ttyS18 at port 0xf8d0 (irq = 5) is a 16C950/954
ttyS19 at port 0xf8d8 (irq = 5) is a 16C950/954
ttyS20 at port 0xf8e0 (irq = 5) is a 16450
ttyS21 at port 0xf8e8 (irq = 5) is a 16450
ttyS22 at port 0xf8f0 (irq = 5) is a 16450
ttyS23 at port 0xf8f8 (irq = 5) is a 16450

4. To test these ports, use **dt** which can be downloaded at:
   http://www.bit-net.com/~rmiller/dt.html.
   It can also be found on the CD in /*SOLFOXT/RELOC/OPT/SOLFOXT/LINUX.*
   Here is a result of **dt** run on ttyS18 and ttyS19:

 # dt if=/dev/ttyS18 of=/dev/ttyS19 bs=8 limit=1k

Total Statistics (1655):
Input device/file name: /dev/ttyS18 (device type=terminal)
Type of I/O's performed: sequential (forward)
Terminal characteristics: flow=xon_xoff, parity=none, speed=9600
Data pattern read: 0x39c39c39
Total records processed: 128 @ 8 bytes/record (0.008 Kbytes)
Total bytes transferred: 1024 (1.000 Kbytes, 0.001 Mbytes)
Average transfer rates: 492 bytes/sec, 0.481 Kbytes/sec
Number I/O's per second: 61.538
Total passes completed: 1/1
Total errors detected: 0/1
Total elapsed time: 00m02.08s
Total system time: 00m00.00s
Total user time: 00m00.00s
Starting time: Wed Oct 9 14:04:17 2002
Ending time: Wed Oct 9 14:04:19 2002

Total Statistics (1654):
Output device/file name: /dev/ttyS19 (device type=terminal)
Type of I/O's performed: sequential (forward)
Terminal characteristics: flow=xon_xoff, parity=none, speed=9600
Data pattern written: 0x39c39c39 (read verify disabled)
Total records processed: 128 @ 8 bytes/record (0.008 Kbytes)
Total bytes transferred: 1024 (1.000 Kbytes, 0.001 Mbytes)
Average transfer rates: 948 bytes/sec, 0.926 Kbytes/sec
Number I/O's per second: 118.519
Total passes completed: 1/1
Total errors detected: 0/1
Total elapsed time: 00m01.08s
Total system time: 00m00.00s
Total user time: 00m00.00s
Starting time: Wed Oct 9 14:04:17 2002
Ending time: Wed Oct 9 14:04:19 2002

5. A version of **sertest** for Linux is also available on the CD. Please refer to chapter 4 for more information about this test program.

CHAPTER 6: SOLARIS 8 INSTALLATION

SOFTWARE INSTALLATION

1. Install the card as described in chapter 2. Power up the system.

2. Insert the CD that came with the card. The CD should be mounted automatically.
   If not, in a shell, use **volcheck(1)** to mount the CD.

3. Use **df(1)** to see where the CD is mounted. It can be mounted on */cdrom/cdrom* as below:

 # df –k

```
Filesystem            kbytes    used   avail capacity      Mounted on
/vol/dev/dsk/c0t6d0/cdrom    1612    1612       0   100%   /cdrom/cdrom
```

4. Go to the directory where the CD is mounted. Use **pkgadd(1)** to install software for the card.

```
# cd /cdrom/cdrom
# pkgadd -d `pwd`
```

The following packages are available:
1 SOLFoxt OX16PCI954 UART Test and Doc Package for Solaris 8 UltraSPARC
(sparc.sun4u) 1.0 REV 0.0
2 SOLFoxu OX16PCI954 UART Driver Package for Solaris 8 UltraSPARC
(sparc.sun4u) 1.0 REV 1.0

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]: all

Processing package instance <SOLFoxt> from </cdrom/cdrom>

5. Press the Return key to install both packages. Type *y* to answer any questions that ask if you want to continue with the installation. At the end of the installation, you should see the following message. Type *q* to end the installation process.

Installation of <SOLFoxt> was successful.

Installation of <SOLFoxu> was successful.

The following packages are available:
1 SOLFoxt OX16PCI954 UART Test and Doc Package for Solaris 8 UltraSPARC
(sparc.sun4u) 1.0 REV 0.0
2 SOLFoxu OX16PCI954 UART Driver Package for Solaris 8 UltraSPARC
(sparc.sun4u) 1.0 REV 1.0

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]: q

6. Reboot the system with option *–r*.

VERIFY THE INSTALLATION

1. Use **dmesg(1)** to see if the 16 serial ports are installed.

ox: [ID 766547 kern.notice] OX16PCI954 UART Driver, Version 1.1
ox: [ID 600729 kern.notice] Copyright (c) 2002 by Solflower Computer, Inc.
ox: [ID 588111 kern.notice] Built: Thu Dec 19 16:21:46 PST 2002
ox: [ID 749261 kern.notice] Solflower Driver Kit, Module: DRV-util, Version 1.1
ox: [ID 600729 kern.notice] Copyright (c) 2002 by Solflower Computer, Inc.
ox: [ID 588111 kern.notice] Built: Thu Dec 19 16:20:57 PST 2002
ox: [ID 697747 kern.notice] ox0 uart0 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox0 uart1 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox0 uart2 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox0 uart3 16550 compatible: 128 Byte FIFO
ox: [ID 819724 kern.notice] PCI interrupt level 1 vec 7d8
simba: [ID 370704 kern.info] PCI-device: serial@4, ox0
genunix: [ID 936769 kern.info] ox0 is /pci@1f,0/pci@1,1/serial@4
ox: [ID 697747 kern.notice] ox1 uart0 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart1 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart2 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart3 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart4 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart5 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart6 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart7 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart8 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart9 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart10 16550 compatible: 128 Byte FIFO
ox: [ID 697747 kern.notice] ox1 uart11 16550 compatible: 128 Byte FIFO
ox: [ID 819724 kern.notice] PCI interrupt level 11 vec 7d9
simba: [ID 370704 kern.info] PCI-device: pci1415,1@4,1, ox1
genunix: [ID 936769 kern.info] ox1 is /pci@1f,0/pci@1,1/pci1415,1@4,1

2. Use **prtconf(1)** to verify if the drivers for the card are attached.
   There should be the following two lines in the output of **prtconf(1)**:

```
serial, instance #0
pci1415,1, instance #1
```

3. If these two lines are:

```
serial, instance #0 (driver not attached)
pci1415,1, instance #1 (driver not attached)
```

   Then go to */opt/SOLFoxu/bin* and run *r_ox* to remove the drivers and *a_ox* to attach them again. Use **prtconf(1)** to verify if the drivers are attached this time.

SERIALDEMO IN JAVA COMMUNICATIONS API

The Java Communications API can be downloaded at: http://java.sun.com/products/javacomm/.
It can also be found in */opt/SOLFoxt/solaris* after the package *SOLFoxt* is installed on the system.

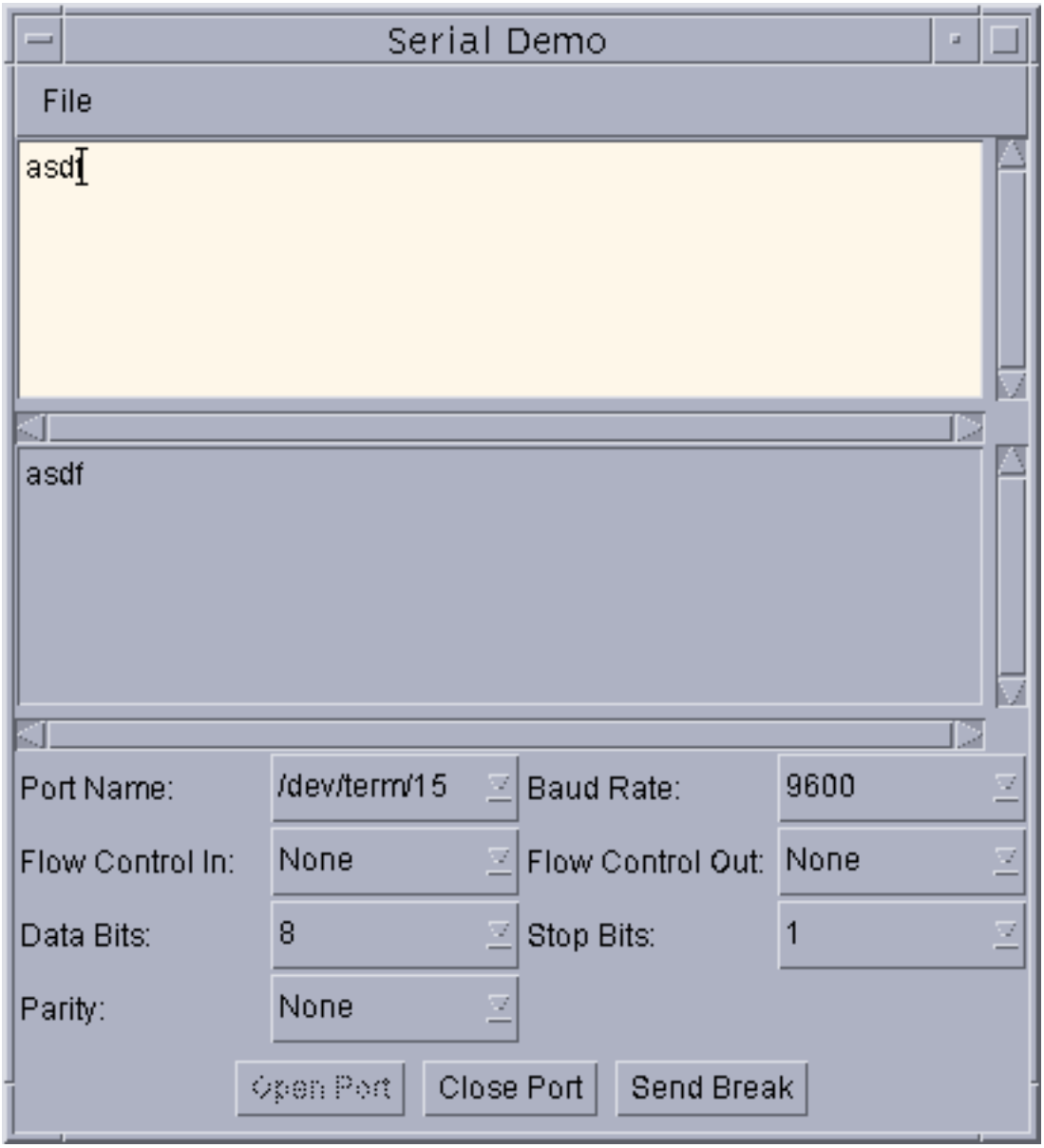
1. Download and uncompress the software.

 # zcat javax_comm.-2_0_2-solsparc.tar.Z | tar xvf -

2. Install the software by following the instructions in *PlatformSpecific_Solaris.html*

3. Go to the directory commapi/samples/SerialDemo and compile the **SerialDemo** program.

4. Run the **SerialDemo** program. The 16 serial ports are */dev/term/0* through */dev/term/15*. The following picture shows a loopback test running on */dev/term/15*.



5. **SerialDemo** can also be run on two different ports, for example, */dev/term/7* and /*dev/term/15*. Connect these two ports and open two Serial Demo windows. Open these two ports, then type some text in one window. The text should be displayed in the other window.

DATA TEST PROGRAM (dt)

dt can be downloaded at: http://www.bit-net.com/~rmiller/dt.html.
It can also be found in */opt/SOLFoxt/solaris* after the package *SOLFoxt* is installed on the system.

1. Download and uncompress the source.

2. Build the program.

 # cp Makefile.solaris Makefile
 # make clean; make depend; make

3. Run **dt** on the port(s) to be tested. For examples:

To write a 1M file to the port /dev/tty0 with the speed of 115200 bps and 64 bytes transferred each time:

 # dt of=/dev/tty0 bs=64 limit=1M speed=115200

If two ports /dev/tty0 and /dev/tty8 are connected together, to write to /dev/tty8 and read back from /dev/tty0:

 # dt if=/dev/tty0 of=/dev/tty8 dsize=128 bs=64 limit=1M speed=115200 rdelay=1 wdelay=1 enable=microdelay

4. If the first 8 ports are connected to the last 8 ports, then a script called **dts** which uses **dt** can test all the 16 ports as the following:

 # dts
/dev/tty0 -> /dev/tty8 PASSES = 3
/dev/tty0 <- /dev/tty8 PASSES = 3
/dev/tty1 -> /dev/tty9 PASSES = 3
/dev/tty1 <- /dev/tty9 PASSES = 3
/dev/tty2 -> /dev/tty10 PASSES = 3
/dev/tty2 <- /dev/tty10 PASSES = 3
/dev/tty3 -> /dev/tty11 PASSES = 3
/dev/tty3 <- /dev/tty11 PASSES = 3
/dev/tty4 -> /dev/tty12 PASSES = 3
/dev/tty4 <- /dev/tty12 PASSES = 3
/dev/tty5 -> /dev/tty13 PASSES = 3
/dev/tty5 <- /dev/tty13 PASSES = 3
/dev/tty6 -> /dev/tty14 PASSES = 3
/dev/tty6 <- /dev/tty14 PASSES = 3
/dev/tty7 -> /dev/tty15 PASSES = 3
/dev/tty7 <- /dev/tty15 PASSES = 3

CHAPTER 7: TROUBLESHOOTING

1. My system can't boot up.

Check if the board makes full contact with the PCI slot. In some case the system cannot recognize any ambiguous signals because of the bad connection. The system will be stuck for this reason.

If the system is a SPARC machine, use the Open Boot PROM to determine if the board is there. For complete documentation on the Open Boot PROM, see the *Open Boot PROM Toolkit User's Guide* and the monitor(1M) man page. This example is from an Ultra AXi system:

```
ok cd /
ok ls
f007fbf8 SUNW,afb@1e,0
f007f378 SUNW,UltraSPARC-IIi@0,0
f0066fb4 pci@1f,0
f004fe04 virtual-memory
f004f824 memory@0,0
f002dac4 aliases
f002da54 options
f002d91c openprom
f002d8b0 chosen
f002d840 packages
ok cd pci
ok pwd
/pci@1f,0
ok ls
f0067dbc pci@1
f00677b0 pci@1,1
ok cd pci@1,1
ok ls
f0090d3c pci1415,1@4,1
f0090a6c serial@4
f008929c network@1,1
f0068a80 ebus@1
ok
```

If the board is inserted properly, the *pci1415* and *serial* nodes should appear. If these nodes do not show up, try to re-insert the board.

2. The serial ports can't perform any data transfers.

The first thing to check is the cable connections. Are they connected tightly? If this still doesn't work, check if the software is installed properly. Please refer to the **Verify the Installation** section for your particular operating system. If the software is not installed properly, try to reinstall the software and reboot the system. If it still does not work, please contact Solflower Computer Inc.

3. Some ports work, but some doesn't.

Check the cable connections. Check the settings of the ports. Use the test programs that are mentioned in the software installation chapters to see if the ports can perform some basic functions such as loopback.

APPENDIX A: 1-TO-8 SERIAL CABLE CONNECTOR PINOUTS

There are two groups of signals, A and B. Each group consists of four serial channels, 0 to 3. The Minidin68 is the main connector that connects to the board.

Signal name	Minidin68 Pin#	DB25 Pin#
CGNDA0		1
TXDA0	37	2
RXDA0	36	3
RTSA0	2	4
CTSA0	3	5
DSRA0	1	6
SGNDA0	5	7
DCDA0	35	8
		9-19
DTRA0	38	20
		21
RIA0	4	22
		23-25
CGNDA1		1
TXDA1	41	2
RXDA1	40	3
RTSA1	7	4
CTSA1	8	5
DSRA1	6	6
SGNDA1	5	7
DCDA1	39	8
		9-19
DTRA1	42	20
		21
RIA1	9	22
		23-25
CGNDA2		1
TXDA2	45	2
RXDA2	44	3
RTSA2	11	4
CTSA2	12	5
DSRA2	10	6
SGNDA2	47	7
DCDA2	43	8
		9-19
DTRA2	46	20
		21
RIA2	13	22
		23-25

Signal name	Mindin68 Pin#	DB25 Pin#
CGNDA3		1
TXDA3	50	2
RXDA3	49	3
RTSA3	15	4
CTSA3	16	5
DSRA3	14	6
SGNDA3	47	7
DCDA3	48	8
		9-19
DTRA3	51	20
		21
RIA3	17	22
		23-25
CGNDB0		1
TXDB0	54	2
RXDB0	53	3
RTSB0	19	4
CTSB0	20	5
DSRB0	18	6
SGNDB0	22	7
DCDB0	52	8
		9-19
DTRB0	55	20
		21
RIB0	21	22
		23-25
CGNDB1		1
TXDB1	58	2
RXDB1	57	3
RTSB1	23	4
CTSB1	25	5
DSRB1	24	6
SGNDB1	22	7
DCDB1	56	8
		9-19
DTRB1	59	20
		21
RIB1	26	22
		23-25

Signal name	Mindin68 Pin#	DB25 Pin#
CGNDB2		1
TXDB2	62	2
RXDB2	61	3
RTSB2	28	4
CTSB2	29	5
DSRB2	27	6
SGNDB2	64	7
DCDB2	60	8
		9-19
DTRB2	63	20
		21
RIB2	30	22
		23-25
CGNDB3		1
TXDB3	67	2
RXDB3	66	3
RTSB3	32	4
CTSB3	33	5
DSRB3	31	6
SGNDB3	64	7
DCDB3	65	8
		9-19
DTRB3	68	20
		21
RIB3	34	22
		23-25

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