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How to Do a Serial Loopback Test

erview

A loopback test allows you to send and receive data from the same serial port to verify that the port is operational. To perform this test, you need to temporarily connect the proper pins to allow signals to be sent and received on the same port.

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pback Test

A loopback test can be used to troubleshoot serial communications. It can show problems in the serial port, the cable, or the software generating the messages without having to connect to third party hardware. By connecting the proper wires, a loopback test can verify the operation of serial communication. Loopback tests can be used for RS-232, RS-422, and RS-485 serial communication.

For more information on RS-232, RS-422, and RS-485 see the Serial Communication Overview. Note that not all serial devices, especially those with many connections on one card, allow hardware flow control on every serial output of the device.

To perform a loopback test for RS-232, the TXD pin must be connected to the RXD pin. This allows the data to flow from the transmit to the receive pins. Since the communication is differential for RS-422 and RS-485, the TXD+ connects to the RXD+ and the TXD- connects to the RXD- pins.

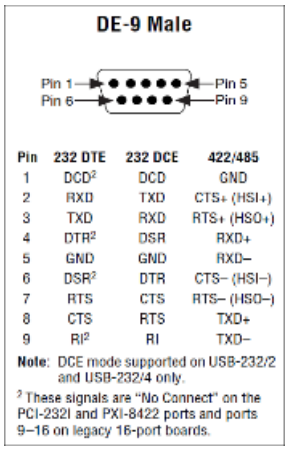
A more advanced loopback test that allows hardware flow control will need more pins connected to allow the flow control signals to be properly passed. For RS-232, the CTS and RTS pins must be connected along with the DTR and DSR pins. For RS-422 and RS-485, CTS+ should be connected to RTS+ and CTS- should be connected to RTS-.

For more information about National Instrument's serial interfaces, visit ni.com/serial.

nnectors

-9 (DB9) Connector

The DE-9 connector is the most common serial connector. This connector is found on National Instrument's one and two port serial interfaces.



Pin	232 DTE	232 DCE	422/485
1	DCD[2]	DCD	GND
2	RXD	TXD	CTS+ (HSI+)
3	TXD	RXD	RTS+ (HSO+)
4	DTR[2]	DSR	RXD+
5	GND	GND	RXD–
6	DSR[2]	DTR	CTS– (HSI–)
7	RTS	CTS	RTS– (HSO–)
8	CTS	RTS	TXD+
9	RI[2]	RI	TXD–

Note: DCE mode supported on USB-232/2 and USB-232/4 only.
[2] These signals are "No Connect" on the PCI-232I and PXI-8422 ports and ports 9–16 on legacy 16-port boards.

Figure 1: Pinout diagram for DE-9 Connector

To perform a loopback test with no hardware flow control, you will need to connect pins 2 and 3 for RS-232 and pins 4 to 8 and 5 to 9 for RS-422/485. These connections can be seen in **red** below (figure 2 for RS-232 and figure 3 for RS-422/485).

When using hardware flow control, you will need to connect pins 4 to 6 and 7 to 8 for RS-232. Pins 7 and 8 are used for RTS/CTS hardware flow control where pins 4 and 6 are used for DTR/DSR hardware flow control. For RS-422/485, you will need to connect pins 2 to 3 and 6 to 7. Both of these connections are required for RTS/CTS hardware flow control since RS-422/485 have differential connections. These connections can be seen in **blue** below (figure 2 for RS-232 and figure 3 for RS-422/485).

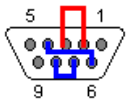


Figure 2: RS-232 female DE-9 plug with connections required for loopback test

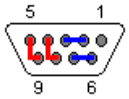


Figure 3: RS-422/485 female DE-9 plug with connections required for loopback test

-25 Connector

This connector is not as common as the DE-9 connector. This connector can still be used to perform a loopback test with a method similar to the one used for the DE-9 connector.

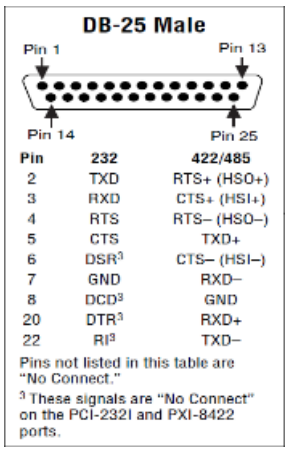


Figure 4: Pinout diagram for DB-25 Connector

Most of the ïã}on DB-25 connectors are not connected since only nine pins are used for RS-232, RS-422, and RS-485 communication.

To perform a loopback test with no hardware flow control with a DB-25 connector, connect pins 2 to 3 for RS-232. For RS-422/485 connect pins 5 to 20 and 7 to 22. The required connections can be seen in **red** on figures 5 and 6.

For hardware flow control using RS-232, pins 4 and 5 must be connected along with pins 6 and 20. When using RS-422/485, pin 5 must connect to pin 20 and pin 7 must connect to pin 22. This will allow the loopback test to use the proper flow control lines. These connections can be seen in **blue** on figures 5 and 6.

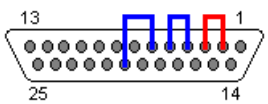


Figure 5: RS-232 female DB-25 plug with connections required for loopback test

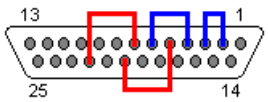
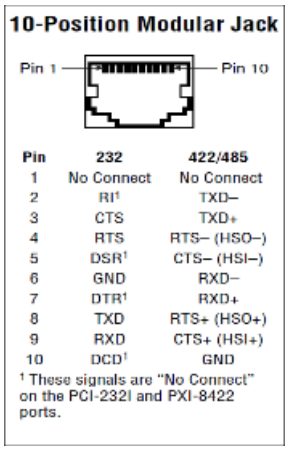


Figure 6: RS-422/485 female DB-25 plug with connections required for loopback test

This connector is most commonly found on National Instrument's 4 port serial interfaces. The National Instrument 4 port serial interfaces come with 4 10P10C to DE-9 male converter cables.



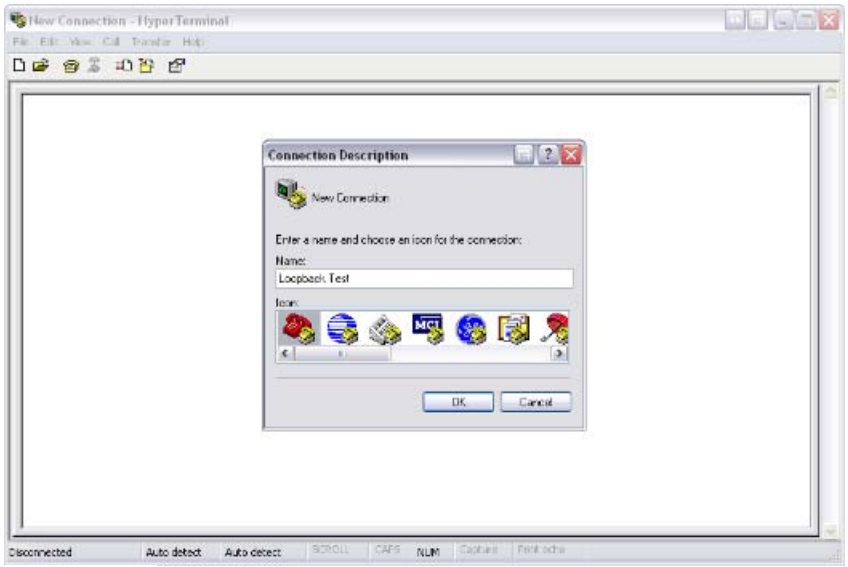
Pin	232	422/485
1	No Connect	No Connect
2	RI[1]	TXD–
3	CTS	TXD+
4	RTS	RTS– (HSO–)
5	DSR[1]	CTS– (HSI–)
6	GND	RXD–
7	DTR[1]	RXD+
8	TXD	RTS+ (HSO+)
9	RXD	CTS+ (HSI+)
10	DCD[1]	GND

[1] These signals are "No Connect" on the PCI-232I and PXI-8422 ports.

Figure 7: Pinout diagram for RJ50 Connector

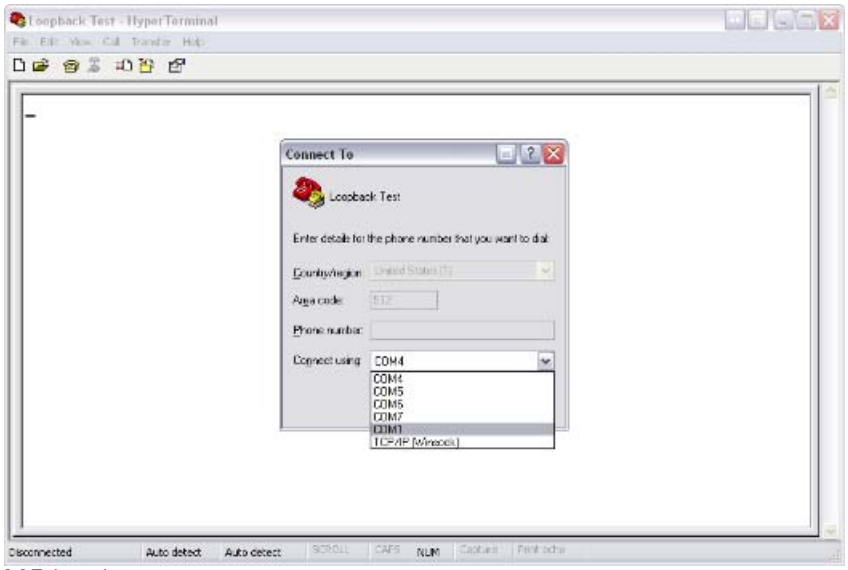
It is not recommended to use the 10P10C connector by itself to perform a loopback test due to the small separation between pins. Using a 10P10C to DE-9 connector (Part Number 192190-01), a looback test can be performed using the methods described above.

forming a Loopback Test in Hyperterminal



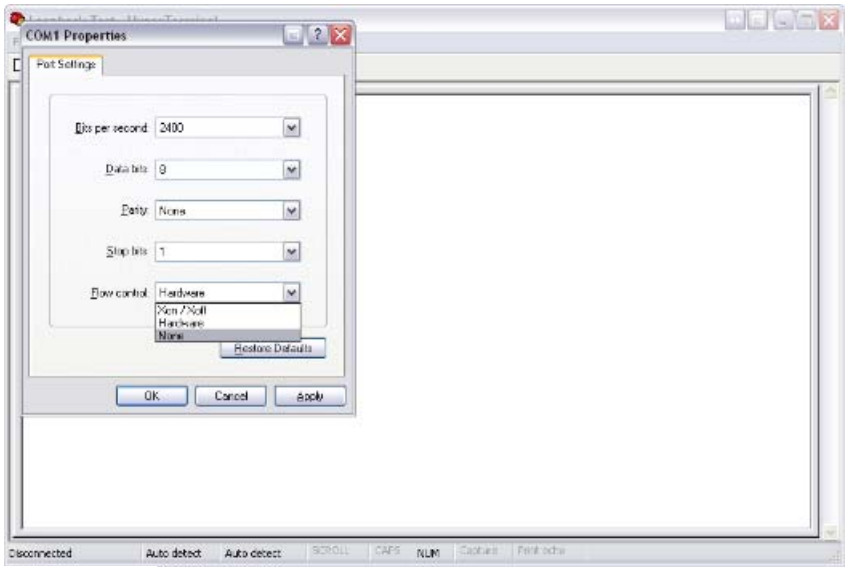
[+] Enlarge Image

1. Create a new connection with any name and icon.



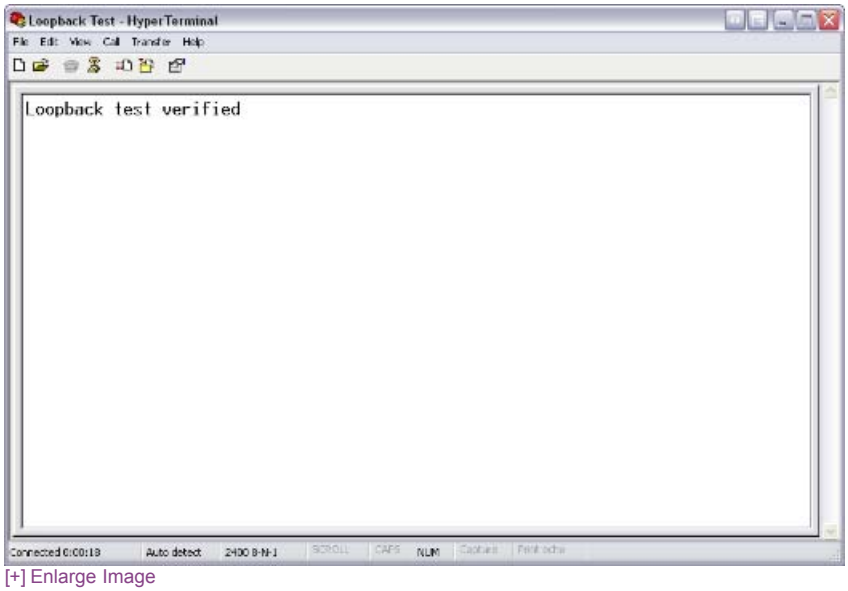
[+] Enlarge Image

2. Select the communications port you would like to test



[+] Enlarge Image

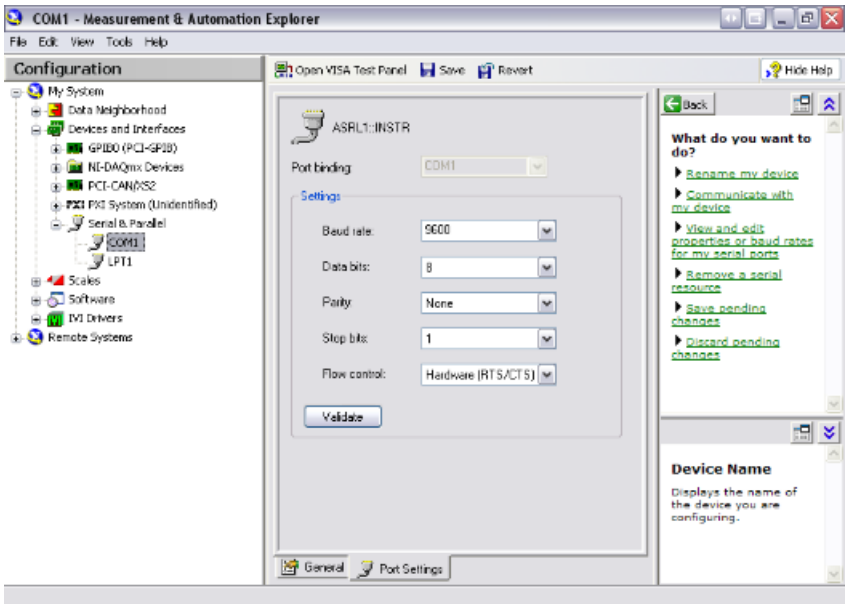
3. Select the type of flow control you would like to use. Note that Xon / Xoff is software flow control and will only require that the TXD and RXD pins to be connected.



[+] Enlarge Image

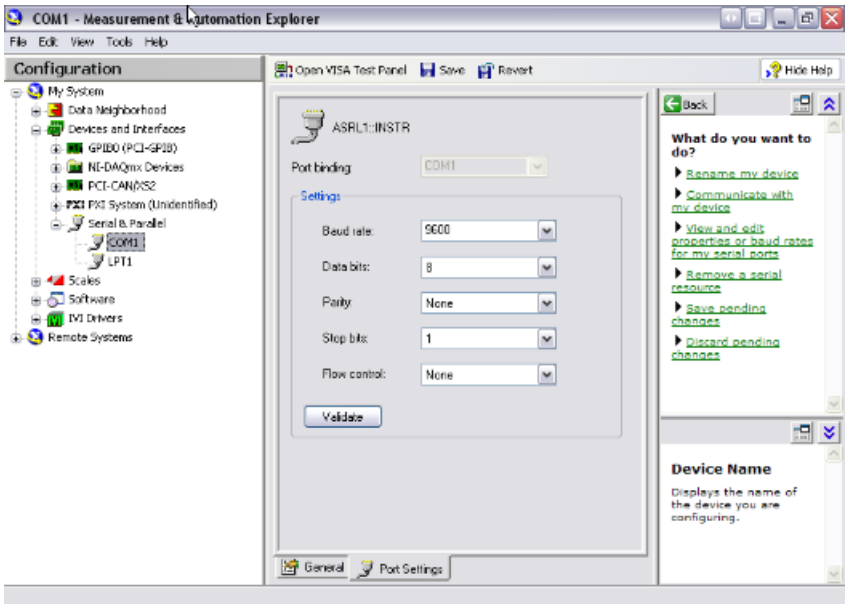
4. Type a message using the computer's keyboard. Any data that shows in Hyperterminal is received from the device.

forming a Loopback test in Measurement & Automation Explorer



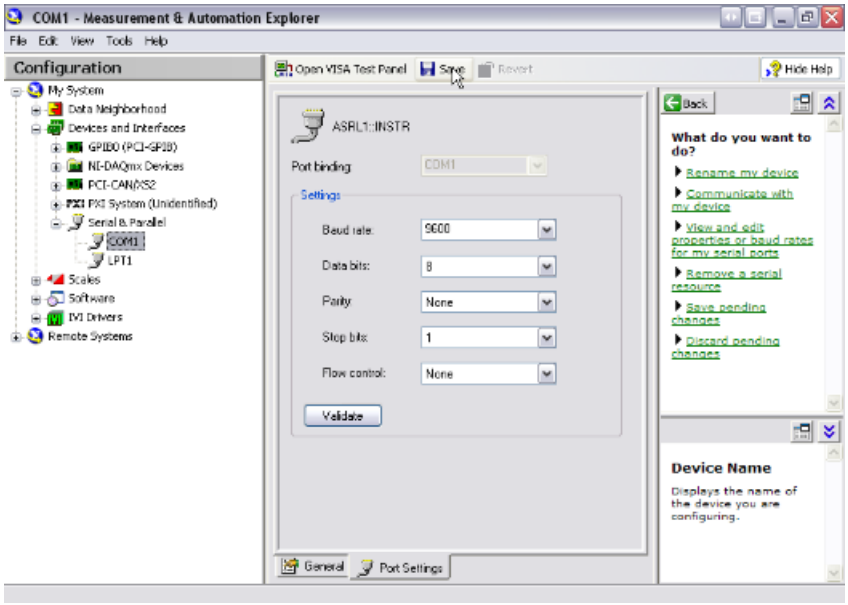
[+] Enlarge Image

1. Open Measurement & Automation Explorer and select the communications port you would like to use.



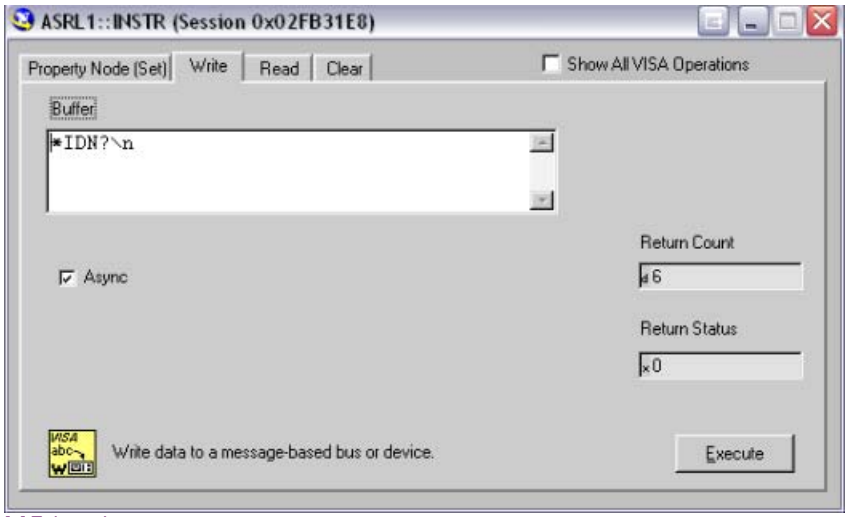
[+] Enlarge Image

2. Ensure the proper settings are selected for flow control.



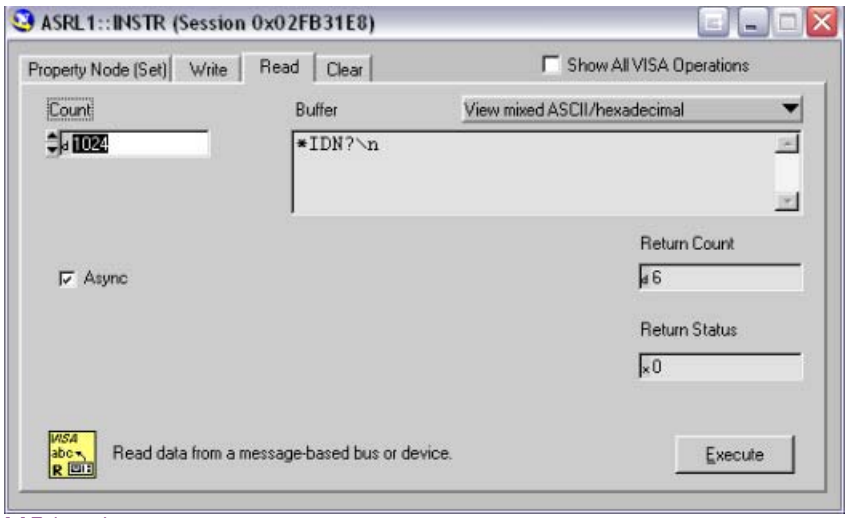
[+] Enlarge Image

3. Save the settings by selecting the **Save** button then select the **Open VISA Test Panel** button



[+] Enlarge Image

4. On the Write tab, type the message you would like to send (followed by a \n) then select **Execute**



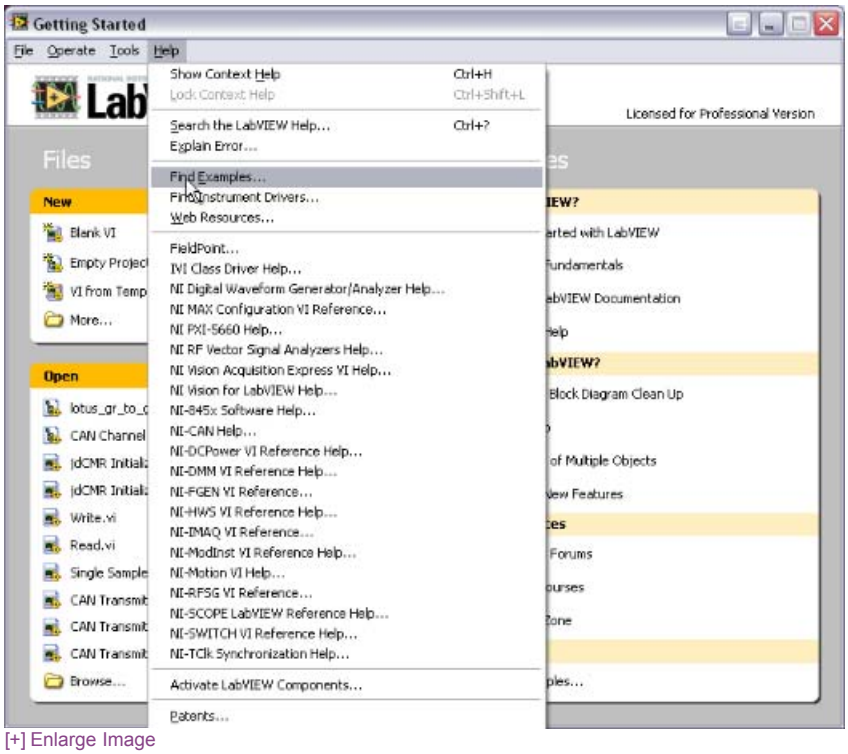
[+] Enlarge Image

5. On the Read tab, select **Execute** and verify the message

forming a Loopback test in LabVIEW

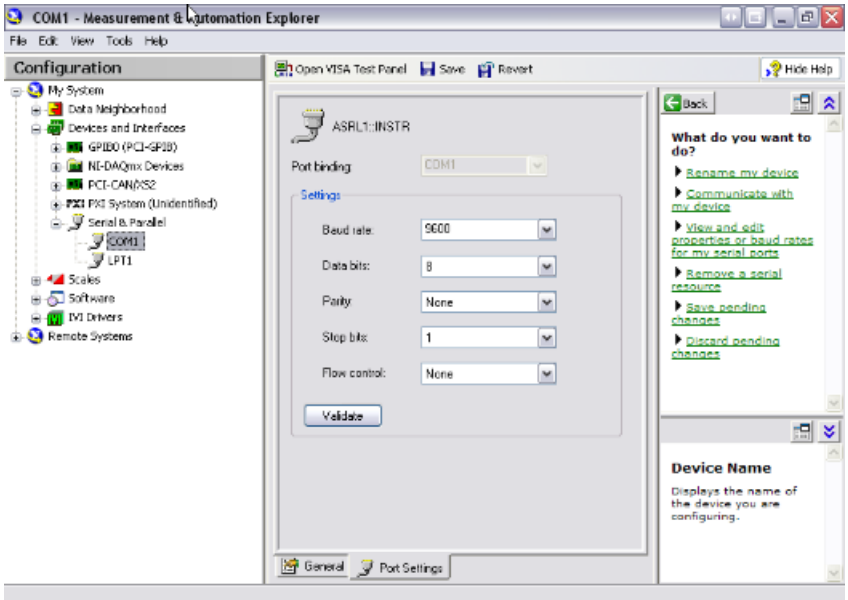
Note: For a free evaluation copy of LabVIEW, visit ni.com/trylabview

1. Start LabVIEW



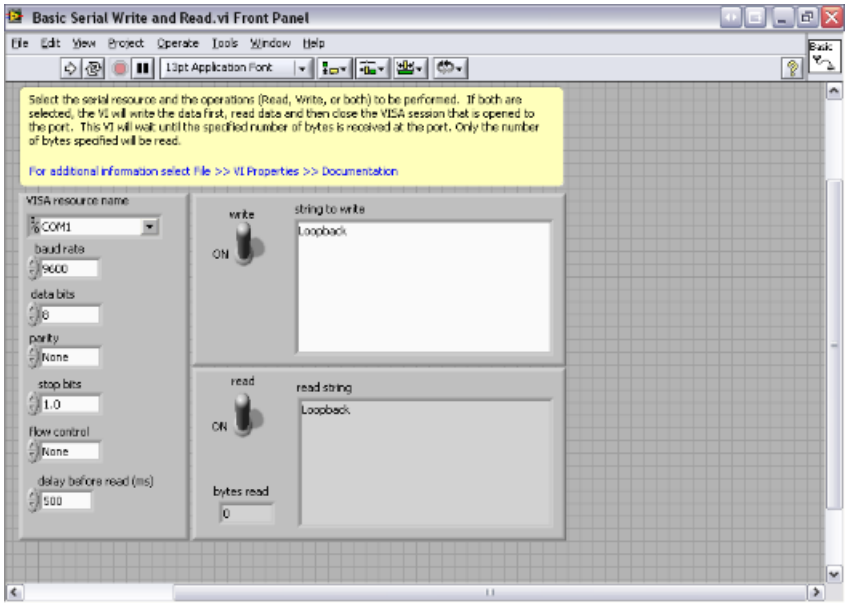
[+] Enlarge Image

2. Select **Help»Find Examples...**



[+] Enlarge Image

3. Browse to **Hardware Input and Output»Serial»Basic Serial Write and Read.vi**



[+] Enlarge Image

4. Ensure the proper settings are selected, enter the string you would like to write in the "string to write" box, and then select the white run arrow on the toolbar.

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LabView submit the error
Error -1073807343 occurred at Property Node (arg 1) in VISA Configure Serial Port (Instr).vi->Basic Serial Write and Read.vi Possible reason(s): VISA: (Hex 0xBFFF0011) Insufficient location information or the device or resource is not present in the system.
- FShimon@gmail.com - Mar 20, 2010

This is excellent, well-presented and very helpful information for me! I have just migrated a microcontroller app-dev from a PC to a COM-less Laptop and added a USB/Serial-adapter and now need to check it.
- peter.pollard@web.de - Jan 12, 2010

Excellent document for a starter
- *Vijay □□ 烨傡, Vikim* . cvijayin@gmail.com - Nov 12, 2009

I need to send continous data in over a period of time from hyperterminal. The other end will be looped back? Is there a script or commands?
- dreherd@telus.net - Nov 24, 2008

Thanks for the Tips. It works
- Oct 3, 2008

thanks! I've read it and i've checked successfully!
- Apr 6, 2008

very good document
- *siva prasad nandyala, wipro.* siva.nandyala@wipro.com - Mar 13, 2008

Very useful technical information. K.N. Lakshmi Pathi Advanced Electronics Company Riyadh
- *Kadaba Lakshmi Pathi, Advanced Electronics Company.* knlpathi@hotmail.com - Feb 3, 2008

Very useful technical information. K.N. Lakshmi Pathi Advanced Electronics Company Riyadh
- *Kadaba Lakshmi Pathi, Advanced Electronics Company.* knlpathi@hotmail.com - Feb 2, 2008

Hi, I'm trying a different type of environment of loopback. The loopback suggested by you is done locally. Wondering how the below can be done :- Step 1 : Tx characters from modem A to Modem B using hyper term. Step 2 : modem B upon receiving the characters auto tx the characters received back to modem A. A summary of the enviorment is that whatever Modem A transmits, Modem B will do a auto loopback to modem A. Are there any AT commands that support this operation? Any advice is most appreciated. Regards, Zhiwei
- *Zhiwei*. chiopigwinner@hotmail.com - Jan 10, 2008

thanks!
- *pham hung, DH Bach Khoa Ha Noi.* pkh_1985@yahoo.com - Jan 7, 2008

Thank you. This web site was a big help because I have been looking for a way to do this.
- larry.harrison@ucps.k12.nc.us - Nov 7, 2007

Simply Superb, But Need Further Details
This type of tesing I have already done and its working really great for me. But the problem that am

facing is, I use MSCOMM32.OCX to connect to the COM Port. I get message saying PORT ALREADY OPEN, When actually Port is closed and not used by other process and Vis Versa. Can any one put in some idea about why this happens. Thanks in Advance.
- lakshmikanthkamath@gmail.com - Jun 27, 2007

Thanks!
thank you very much, it really helps. =)
- Jun 8, 2007

Great!
This helps out a lot, thanks!
- Apr 22, 2007

Perfect, thanks
Who would have thought I'd finally get some use out of that Quarterdeck loopback plug set all these years later? Thanks!
- *Andrew*. andrew.rich@gmail.com - Feb 12, 2007

Great Document
Exactly what I needed to sove a problem with a new Serial card.
- *Jake*. jatexas@camtel.net - Jan 11, 2007

Superb Article
This is exactly the article I was looking for. Thanks a lot.
- *Susanta Mondal*. cse_susanta@rediffmail.com - Sep 25, 2006

I am not clearly know that when I use modem connect mode, what type of the loopback connector I need, or modem connect mode can not be tested by loopback? Thanks!
- *When I use modem connection mode?, china*. golden_ctbu@yahoo.com.cn - Apr 25, 2006

Great document
I was really looking to do some serial loopback tests, and this document also had the way to test them using HyperTerminal. Great document!
- *Dustin Martínez, Electronics School, University of Cauca (Colombia)*. tbb_mb@yahoo.com - Jan 24, 2006

great technical document
Thanks for this summary of testing serial ports!
- Oct 17, 2005

Looking to test Serial Port via DOS in Interrupt mode!
Looking to test Serial Port via DOS in Interrupt mode! Any quick examples I can "borrow"?
- *Roger Owens, Hamilton Sundstrand*. roger.owens@hs.utc.com - Apr 3, 2002