

Serial & Parallel Diagnostic Loopback Plugs

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One of the many tools a PC service and repair technician keeps in their toolbox is a set of loopback plugs (wrap plugs) for diagnosing problems with RS-232 Serial and Parallel ports. A problem arises when you may have to use various software diagnostic utilities, many which in turn have their own style of loopback plug configurations. This can be easily resolved by using crimp-type D-Subminiature connectors and two-part connector hoods that screw together, and which can be found at your local electronic parts store for just a few dollars.

The crimp-type connectors attach to standard 22-gauge stranded wire, and can be easily punched back out of their housing position with a blunt object such as the tip of a closed pair of needle nose pliers when a configuration change is needed. You will likely still need to utilize your soldering skills, however, as several of the configurations require multi-pin connections.

My suggestion for other PC repair technicians out there (and what I do myself), would be to construct a set of loopback plugs for the diagnostic utilities you use most. Then, for those times when you need to use a different diagnostic package, keep extra pin configuration wire-sets in your toolbox so you can quickly reconfigure your loopback plugs for use with that vendor's software.

This document outlines pin-out configurations used by those various diagnostic utilities, as well as the pin definitions for the serial and parallel ports used on IBM-compatible PCs. Although there are many vendor configurations included (as well as some "generic" loopback plug configurations collected through the years), some vendors such as the manufacturer of the PC-Doctor diagnostic utility make available loopback plugs for USB, game ports and even audio ports. Should you know of the wiring for those plugs, or know of a vendor's pin-out configuration not listed here, I would certainly welcome the information and will expand this document to include those configurations as collected. My email address is dscribner@bigfoot.com, and I look forward to adding the information to this list for others to use!

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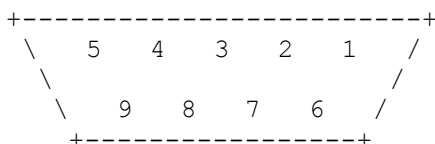
RS-232 Serial Loopback Plugs (DB-9 Pin)

IBM-PC RS-232 Serial (COM) Port DB-9 Pin-outs

DB-9 PIN (Male)	FUNCTION	ABBREVIATION
1 <-----	Data Carrier Detect	DCD or CD
2 <-----	Receive Data	RXD or RD or RX
3 ----->	Transmit Data	TXD or TD or TX
4 ----->	Data Terminal Ready	DTR
5 -----	Signal Ground	GND
6 <-----	Data Set Ready	DSR
7 ----->	Request To Send	RTS
8 <-----	Clear To Send	CTS
9 <-----	Ring Indicator	RI

Transmitted and receive data are referenced from the data device and not the modem.

DB-9 Female Serial Connector Port (face-view, as seen on PC)



Serial Port Loopback (9-pin – IBM)

Name	Pin	Pin	Name
DCD	1	7, 8	RTS, CTS
RXD	2	3	TXD
DTR	4	6, 9	DSR, RI

Serial Port Loopback (9-pin – Norton)

Name	Pin	Pin	Name
DCD	1	4, 6, 9	DTR, DSR, RI
RXD	2	3	TXD
RTS	7	8	CTS

Serial Port Loopback (9-pin – PassMark and PC-Doctor)

Name	Pin	Pin	Name
DCD	1	4, 6	DTR, DSR
RXD	2	3	TXD
RTS	7	8	CTS

Note: PC-Doctor can also support other vendor specific wrap plugs, a list of which can be obtained through the Test Options menu.

Serial Port Loopback (9-pin)

Name	Pin	Pin	Name
DCD	1	4, 6	DTR, DSR
RXD	2	3	TXD
RTS	7	8, 9	CTS, RI

Serial Port Loopback (9-pin)

Name	Pin	Pin	Name
DCD	1	6, 9	DSR, RI
RXD	2	3	TXD
DTR	4	6	DSR
RTS	7	8	CTS

Serial Port Loopback (9-pin – another version)

Name	Pin	Pin	Name
DCD	1	4, 6	DTR, DSR
RXD	2	3	TXD
RTS	7	8	CTS

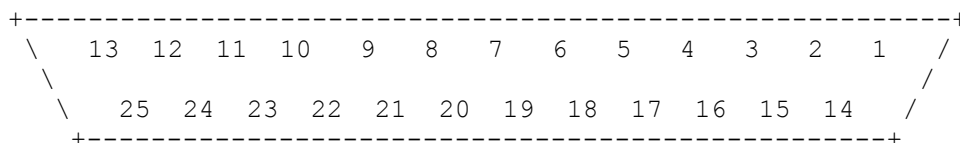
RS-232 Serial Loopback Plugs (DB-25 Pin)

IBM-PC RS-232 Serial (COM) Port DB-25 Pin-outs

DB-25 PIN (Male)	FUNCTION	ABBREVIATION
1 -----	Chassis Ground	CG or GND
2 ----->	Transmit Data	TXD or TD or TX
3 <-----	Receive Data	RXD or RD or RX
4 ----->	Request To Send	RTS
5 <-----	Clear To Send	CTS
6 <-----	Data Set Ready	DSR
7 -----	Signal Ground	SG or GND
8 <-----	Data Carrier Detect	DCD or CD
9 ----->	Transmit+ (Current Loop)	TD+
11 ----->	Transmit- (Current Loop)	TD-
18 <-----	Receive+ (Current Loop)	RD+
20 ----->	Data Terminal Ready	DTR
22 <-----	Ring Indicator	RI
25 <-----	Receive- (Current Loop)	RD-

NOTE: Current loop technology was supported in the PC and XT interfaces. Current Loop was discontinued when the AT interface was introduced. Transmit and receive data are referenced from the data device, not the modem.

DB-25 Female Serial Connector Port (face-view, as seen on PC)



Serial Port Loopback (25-pin – IBM)

Name	Pin	Pin	Name
GND	1	7	GND
TXD	2	3	RXD
RTS	4	5, 8	CTS, DCD
DSR	6	11, 20, 22	TD, DTR, RI
TCK	15	17, 23	RCK, CHCI
RD+	18	25	RD-

Note: An old-style IBM loopback plug used a 3.9 K-Ohms resistor connected between the pin 6 and pins 11 and 22 leads. This loopback plug was used to test the IBM SDLC- and BSC-Adapters, which are not that common anymore, but if you run across one at least you can configure a plug to test it with!

Serial Port Loopback (25-pin – Norton)

Name	Pin	Pin	Name
TXD	2	3	RXD
RTS	4	5	CTS
DSR	6	8, 20, 22	DCD, DTR, RI

Serial Port Loopback (25-pin – PassMark)

Name	Pin	Pin	Name
TXD	2	3	RXD
RTS	4	5	CTS
DSR	6	8, 20	DCD, DTR

Serial Port Loopback (25-pin – PC-Doctor)

Name	Pin	Pin	Name
TXD	2	3	RXD
RTS	4	5	CTS
DSR	6	8, 20	DCD, DTR

Note: PC-Doctor can also support other vendor specific wrap plugs, a list of which can be obtained through the Test Options menu.

Serial Port Loopback (25-pin – yet another version)

Name	Pin	Pin	Name
TXD	2	3	RXD
RTS	4	5, 22	CTS, RI
DSR	6	8, 20	DCD, DTR

SERIAL PORT LOOPBACK DIAGNOSTIC TESTING RULES

When the diagnostic asserts RTS (output) it then tests for the presence of CTS and Ring Indicator (input). If CTS and RI are detected the RTS driver and CTS/RI receivers are considered operational. When DTR is asserted (output) the diagnostic tests for the presence of CD and DSR (input). If CD/DSR are detected the DTR driver and CD/DSR receivers are considered operational. Data is transmitted and received on the data lines and the data is compared in the diagnostic buffer. If any status's are not detected an error message is displayed.

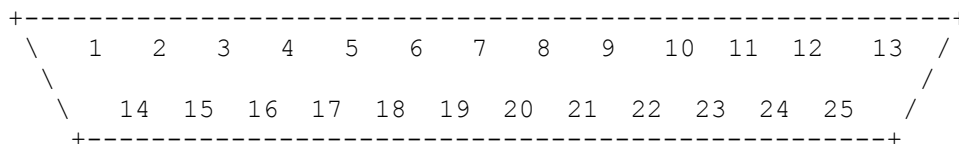
Parallel Loopback Plugs (DB-25 Pin)

IBM-PC Parallel Printer Port DB-25 Pin-outs

DB-25 Male	DB-25 Female	Signal
Pin 1	----->	- Strobe*
Pin 2	----->	+ Data 0 (least significant)
Pin 3	----->	+ Data 1
Pin 4	----->	+ Data 2
Pin 5	----->	+ Data 3
Pin 6	----->	+ Data 4
Pin 7	----->	+ Data 5
Pin 8	----->	+ Data 6
Pin 9	----->	+ Data 7
Pin 10	<-----	- Acknowledge*
Pin 11	<-----	+ Busy
Pin 12	<-----	+ Paper End
Pin 13	<-----	+ Select
Pin 14	----->	- Auto Feed*
Pin 15	<-----	- Error*
Pin 16	----->	- Initialize Printer*
Pin 17	----->	- Select In
Pin 18	- 25 <-----	- Ground (Data Return)

Note: Signals marked with an asterisk (*) denote an active low signal.

DB-25 Male Parallel Connector Port (face-view, as seen on PC)



Parallel Port Loopback (IBM)

Name	Pin	Pin	Name
Strobe*	1	13	Select
Data Bit 0	2	15	Error*
Acknowledge*	10	16	Initialize*
Busy	11	17	Select In

Parallel Port Loopback (Norton and PassMark)

Name	Pin	Pin	Name
Data Bit 0	2	15	Error*
Data Bit 1	3	13	Select
Data Bit 2	4	12	Paper Out
Data Bit 3	5	10	Acknowledge*
Data Bit 4	6	11	Busy

Parallel Port Loopback (AMI, CheckIt and PC-Doctor)

<u>Name</u>	<u>Pin</u>	<u>Pin</u>	<u>Name</u>
Strobe*	1	13	Select
Data Bit 0	2	15	Error*
Acknowledge*	10	16	Initialize*
Busy	11	17	Select In
Paper Out	12	14	Auto Feed*

Note: PC-Doctor can also support other vendor specific wrap plugs, a list of which can be obtained through the Test Options menu.

Parallel Port Loopback (Micro2000)

<u>Name</u>	<u>Pin</u>	<u>Pin</u>	<u>Name</u>
Strobe*	1	13	Select
Acknowledge*	10	16	Initialize*
Busy	11	17	Select In
Paper Out	12	14, 15	Auto Feed*, Error*

Parallel Port Loopback (yet another version)

<u>Name</u>	<u>Pin</u>	<u>Pin</u>	<u>Name</u>
Strobe*	1	13	Select*
Acknowledge*	10	16	Initialize*
Busy	11	17	Select In
Paper Out	12	20	Ground

Note: This parallel loopback version actually works very well to “spoof” your PC into thinking a parallel printer is attached, since the Paper Out and Error pins are not used. This is especially beneficial for older DOS-based programs that are “hard-coded” to recognize only the LPT1: port for printing. Although this works for those programs running under DOS, or in Windows 95/98SE, it will not work for those programs that do not support legacy devices in DOS-mode, such as Windows Me.