



NCRA Tehnical Memo

---

NTM- 102.(08/92)

Title : RS232 protocol/link tester

Author/s : Aniruddha B. Adoni

---

Keywords: RS232

---

ABSTRACT

---

The device described here is a handy equipment to select different connections for RS232 protocols, locate link errors. This handy tool can connect standars or zero modem connection between DCE-DTE or DTE-DTE link. Here on example, two 25 pin D type connectors are selected. One can choose 9 or 25 pin connector, male or female.

---

## RS232 Protocol Selector/Tester

---

Aniruddha Adoni

21 August, 1992

### Introduction:

For a faithful interface, RS232 interface is an old interface in communication as its protocol is important in conveying data over longer distances. In most primitive form, only two lines are required for data transfer namely ground line and data line. The data line is alternatively used by transmitter and receiver. This is half duplex type of communication and now not much used.

Now a three wire connection appears to be minimum to link with full duplex communication. This handshaking software is realised on basis of the Xon-Xoff protocol. Here Xoff code is send by receiver as soon as it receives maximum data it is able to handle. This Xoff code transmission should be interrupted untill receiver transmits Xon code. Communication resumes on reception of the Xon code at transmitter side. Thus Xon-Xoff protocol is advantageous for bidirectional link with three lines. But true full-duplex is not possible with Xon-Xoff protocol.

For particular connection, to avoid confusion between receiver and transmitter, we should be clear about DTE (Data Terminal Equipment) and DCE (Data COMMunication Equipment). A DTE is PC or terminal and DCE is usually modem or printer. It is not only possible to connect DCE-DTE but DTE-DTE configuration also. Most of the time for RS232 link, 25 or 9 pin D type connectors are used. A detail pin configurarion is as shown in table(1).

### Description:

Generally 8 pins (lines) are more important for a reliable data link. A short description of these lines for 25 pin connector is as follows :

Pin 2	: TxD : Transmit Data	:Used by DTE to send data to DCE.
Pin 3	: RxD : Receive Data	:Carries data from DCE to DTE device.
Pin 4	: RTS : Request to send	:Signal from DTE to DCE to indicate that :DTE is about to send data.
Pin 5	: CTS : Clear to send	:DCE responds via this to DTE for RTS.
Pin 6	: DSR : Data set ready	:DCE reforms DTE that it is online and :ready to use.
Pin 8	: DCD : Data carrier detect	:This is used by DCE to set-up stable :data connection with another DCE.
Pin 20	: DTR : Data terminal ready	:DTE tells DCE that it is on and ready :to use DCE to set up link.

As shown in fig. 1 DCE-DTE and DTE-DTE connections can be used. When RS232 interface is not complete at DCE or DTE end, we can apply different type of connection to establish link called as 'zero modem' or 'local echo' connection.

There can be confusion for signal levels for RS232 interface if some equipment do not follow the standard convention. According to RS232 standards :

For control signal levels ( DTR,DSR,DCD,RTS,CTS ) :

Logic High : Between +3V and +27V

Logic Low : Between -3V and -27V

For data lines ( RxD and TxD ) :

Logic High : Between -3V and -27V

Logic Low : Between +3V and +27V

Some equipments by using +5V and Ground for RS232 interface violates the standards by not assuring the required voltage swing.

The device described here is a handy equipment to select different connections for RS232 protocols, locate link errors. This handy tool can connect standars or zero modem connection between DCE-DTE or DTE-DTE link. Here on example, two 25 pin D type connectors are selected. One can choose 9 or 25 pin connector, male or female. As per requirement, 3 pieces are made with 25 pin D type connectors at both the ends with different male-female combinations. The device requires double sided PCB, connections as shown ( fig 3), six 330 ohm resistors, six bicolour diodes, one two pole two way switch and four two pole three way switches. Thus with negligible cost, we can select or test RS232 protocol/connections. Here while using this; S2,S3,S4,S5 should be operated simultaneously.

Diode D1 : for TxD line.                      D2 : for RxD line

D3 : for RTS                                  D4 : for CTS

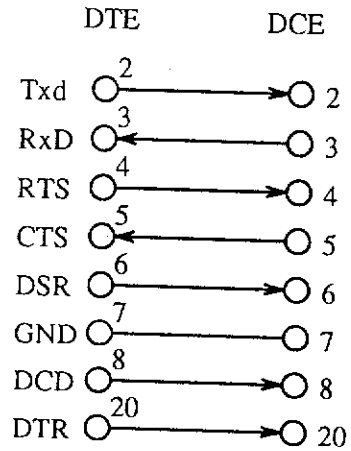
D5 : for DSR and                              D6 : for DTR

One colour indicates positive volage and other for negative voltage. Switches S2 to S6 are for zero modem connection or can be used for Xon-Xoff.

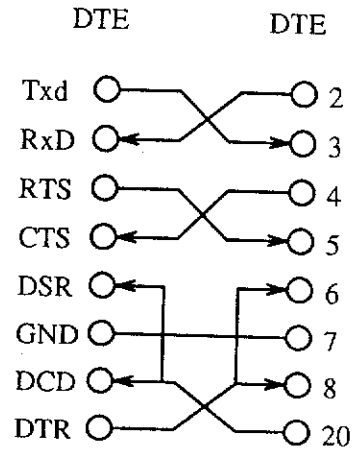
One can make PCBs having 25-25, 25-9, 9-9 pin D connectors for cards; put these cards one above the other; make S1 to S5 common so that anybody can use this tool with any type of D type connector. It will be easier and faster to select or test RS232 protocol between any two machines with serial cable of required 8 lines and enough length along with the described equipment.

Table (1)

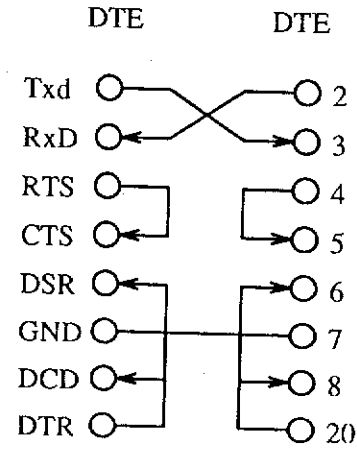
D-25 pin	D-9 pin	Signal	Function	DTE	DCE
1		CG	chassis ground		
2	3	TxD	transmitted data	out	in
3	2	RxD	received data	in	out
4	7	RTS	request to send	out	in
5	8	CTS	clear to send	in	out
6	6	DSR	data set ready	in	out
7	5	SG	signal ground		
8	1	DCD	data carrier detect	in	out
9			positive test voltage		
10			negative test voltage		
11			not assigned		
12		SDCD	secondary DCD	in	out
13		SCTS	secondary CTS	in	out
14		STxD	secondary TxD	out	in
15		TxC	transmit check (DCE)	in	out
16		SrxD	secondary RxD	in	out
17		RxC	receive clock	in	out
18			not assigned		
19		SRTS	secondary RTS	out	in
20	4	DTR	data terminal ready	out	in
21		SQ	signal quality detect	in	out
22	9	RI	ring indicator	in	out
23		SEL	speed selector DTE	in	out
24		TCK	speed selector DCE	out	in
25		BSY	data line busy	in	out



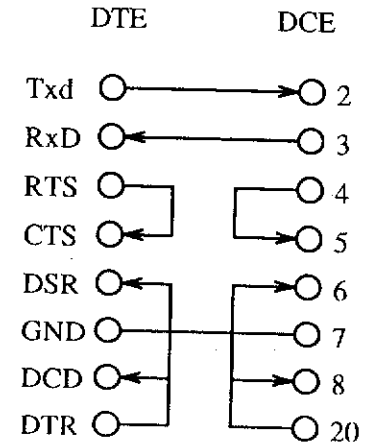
DTE-DCE



DTE-DTE



DTE-DTE



DTE-DCE

**STANDARD CONNECTION**

**ZERO MODEM / LOCAL ECHO**

*Figure : 1*

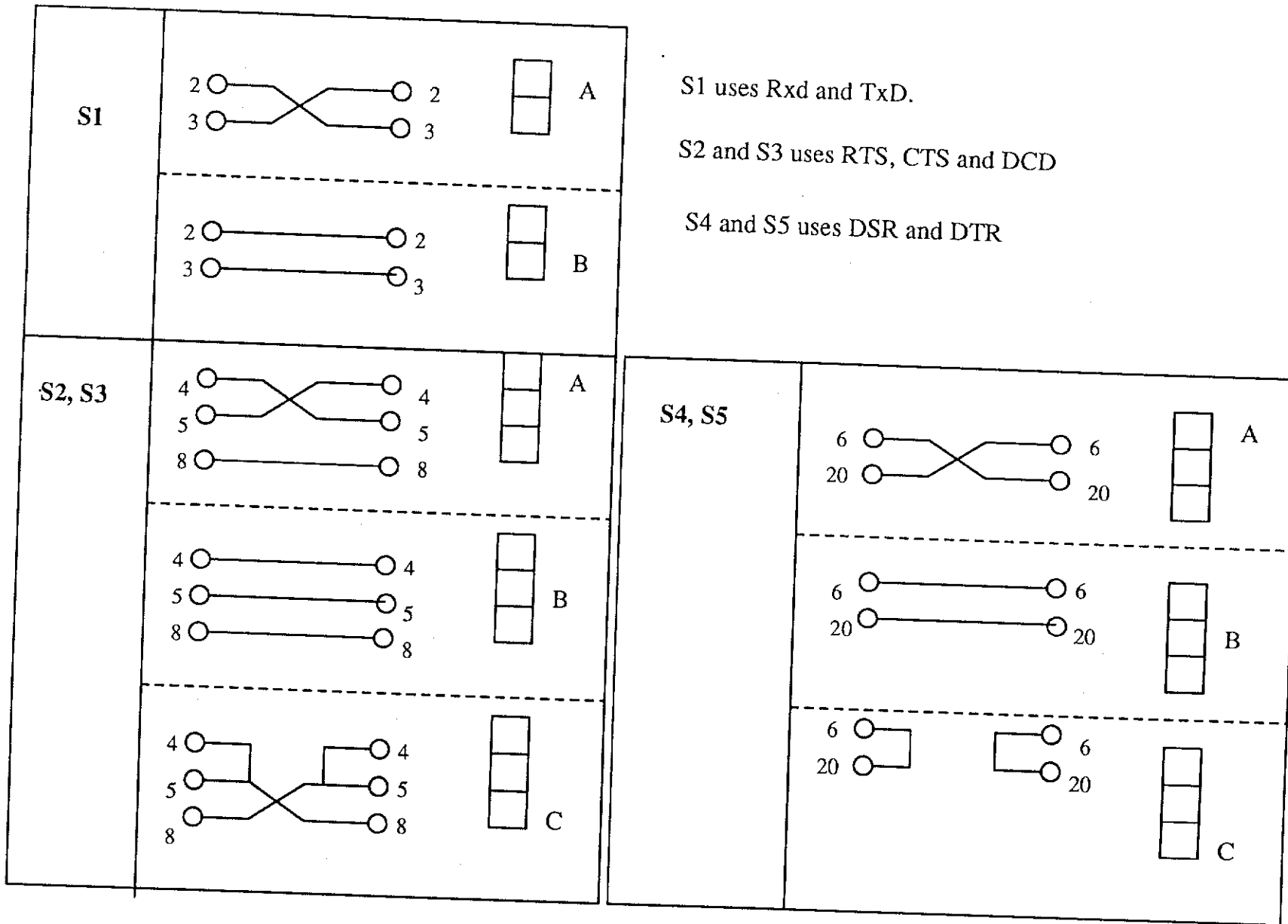


Figure : 2

