TECHNICAL REFERENCE

In This Section...

EIA-232, EIA-232-E, EIA-574, & EIA-561 Interfaces

EIA-232 Interface Reference

EIA-232 defines the connection on a DB25 interface connector for nonsynchronous or synchronous operation.

Signal/Voltage Source	Signal Designations		Signal Designations	Signal/Voltage Source
			1 Shield	Common
DTE	Secondary Transmitted Data 14		2 (TD) Transmitted Data	DTE
DCE	Transmit Clock 15		3 (RD) Received Data	DCE
DCE	Secondary Received Data 16		4 (RTS) Request To Send	DTE
DCE	Receiver Clock 17		5 (CTS) Clear To Send	DCE
DTE	Local Loopback 18		6 (DSR) DCE Ready	DCE
DTE	Secondary Request To Send 19		7 Signal Ground	Common
DTE	Data Terminal Ready 20		8 (CD) Rcvd Line Signal Detect	DCE
DTE	Remote Loopback 21		9 (+) DC Test Voltage	-
DCE	Ring Indicator 22		10 (-) DC Test Voltage	-
DTE/DCE	Data Signal Rate Selector 23		11 Unassigned	-
DTE	External Transmit Clock 24		12 (SCF/CI) Secondary CD	DCE
DCE	Test Mode 25		13 Secondary Clear To Send	DCE

EIA-232-E (Alt A) Interface Reference (Male)

EIA-232-E defines a high density 26-pin connector called the *Alt A* connector.

Signal/Voltage Source	Signal Designations		Signal Designations	Signal/Voltage Source
DCE	(CTS) Clear To Send 13		26 Not Used	-
	Not Used 12		25 Test Mode	DCE
	Not Used 11		24 External Transmit Clock (XTC)	DTE
	Reserved for Testing 10		23 Data Rate Signal Selector	DTE/DCE
	Reserved for Testing 9		22 Ring Indicator	DCE
DCE	(CD) Carrier Detect 8		21 Remote Loopback	DTE
Common	(SG) Signal Ground 7		20 Data Term Ready (DTR)	DTE
DCE	(DSR) Data Set Ready 6		19 Secondary RTS	DTE
DCE	(CTS) Clear To Send 5		18 Local Loopback	DTE
DTE	(RTS) Requtest To Send 4		17 Receive Clock (RC)	DCE
DCE	(RD) Receive Data 3		16 Secondary RD	DCE
DTE	(TD) Transmit Data 2		15 Transmit Clock (TC)	DCE
-	(FG) Shield 1		14 Secondary TD	DTE

Is your interface a DTE or a DCE?

In general, a DTE provides a voltage on the TD, RTS, and DTR pins of the DB-25 connector, whereas a DCE has voltage on the RD, CTS, DSR, and CD pins. Determine whether you have a DTE or DCE by performing the following procedure:

Note: The point of reference for all signals is the terminal (or PC).

1. Using a volt meter, connect the black lead to pin 7 (signal ground) of the DB-25 connector. Attach the red lead to pin 2 (transmit data). If the measured voltage on pin 2 (TD) is more negative than -3 volts, it is a DTE, otherwise it should be near zero volts.
2. Leave the the black lead connected to pin 7. Attach the red lead to pin 3 (receive data). If the voltage on pin 3 is more negative than -3 volts, it is a DCE.
3. If pins 2 and 3 show a voltage of at least 3 volts, then either you are measuring incorrectly, or your device is not a standard EIA-232 device. Call technical support for assistance.

EIA-574 Interface Reference

EIA-574 standard defines EIA-232 on a DB-9 connector. (For nonsynchronous applications only, since it does not provide for the synchronous clocking signals.)

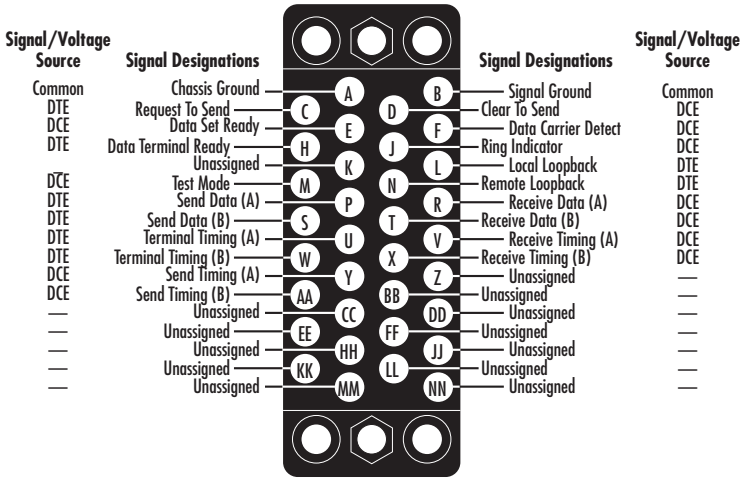
Signal/Voltage Source	Signal Designations		Signal Designations	Signal/Voltage Source
			1 Receive Line Signal Detector	DCE
DCE	Data Set Ready 6		2 Received Data	DCE
DTE	Request To Send 7		3 Transmitted Data	DTE
DCE	Clear To Send 8		4 Data Terminal Ready	DTE
DCE	Ring Indicator 9		5 Ground/common Return	Common

V.35 Interface

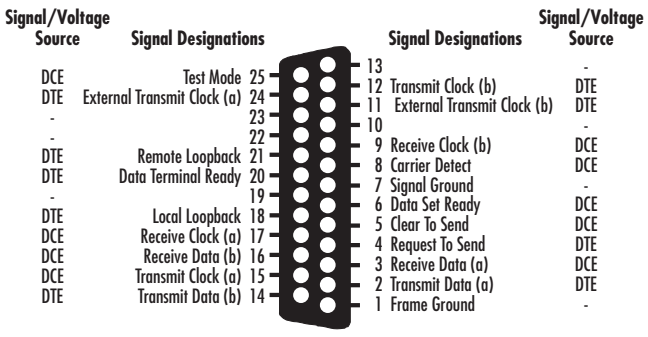
CCITT V.35 uses two types of circuits: balanced and unbalanced (V.28). Recommendation V.28 is essentially the *electrical* equivalent of EIA-232, whereas V.24 is essentially the *functional* equivalent of EIA-232. This includes signal definition and use. DTE & DCE conform to the same perspective as EIA-232. V.35 signals are commonly implemented on the rectangular M/34 connector (34 pins). CCITT V.35 signals may also be implemented on the DB-25 connector (25 pins).

V.35 (on M/34 connector) Interface Reference

EIA-561 defines RS-232 on a modular connector. (For nonsynchronous applications only, since it does not provide for the synchronous clocking signals.)



V.35 (on DB-25 connector) Interface Reference



ELECTRICAL CHARACTERISTICS

Balanced Circuits

Circuit 103: TD
Circuit 104: RD
Circuit 114: TC
Circuit 115: RC

Cable: Balanced twisted multi-pair. Characteristic impedance = 80 to 120 ohms at the fundamental frequency

Generator: Source impedance = 50 to 150 ohms.

Voltage: With a 100-ohm load, V(ab) = 0.55 volts ±20% where terminal *a* is more positive than *b* for a binary zero, and terminal *b* is more positive than *a* for a binary one.

Load: Input impedance = 100 ±10 ohms

Unbalanced Circuits (CCITT V.28)

Circuit 102: Signal Ground
Circuit 105: RTS
Circuit 106: Ready for Sending (CTS)
Circuit 107: DSR
Circuit 109: CD

V.35 Pinout Comparison

DB-25 Pinout	M34 Pinout	Signal
1	A	Frame ground
7	B	Signal ground
4	C	RTS
5	D	CTS
6	E	DSR
8	F	CD
20	H	DTR
18	L	LL
25	M	TM
21	N	RL
2	P	TD-a
3	R	RD-a
14	S	TD-b
16	T	RD-b
24	U	XTC-a
17	V	RC-a
11	W	XTC-b
9	X	RC-b
15	Y	TC-a
12	AA	TC-b

EIA-499 (V.36) & EIA-530 Interfaces

EIA-530 is a physical interface that uses two types of circuits: balanced (EIA-422) and and unbalanced (EIA-423). EIA-530 calls out the DB-25 connector.

EIA-449 (V.36) is a physical interface that uses two types of circuits: balanced (EIA-422) and and unbalanced (EIA-423). EIA-449 specifies the DB-37 connector.

EIA-449 (V.36) Interface Reference

Signal/Voltage Source	Signal Designations		Signal Designations	Signal/Voltage Source
Common	Receive Common 20		1 Shield	Common
-	Unassigned 21		2 Signal Rate Indicator	DCE
DTE	Send Data (B) 22		3 Signal Rate Indicator	-
DCE	Send Timing (B) 23		4 Send Data (A)	DTE
DCE	Receive Data (B) 24		5 Send Timing (A)	DCE
Return	Request To Send (B) 25		6 Receive Data (A)	DCE
DCE	Receive Timing (B) 26		7 Request To Send (A)	DTE
Return	Clear To Send (B) 27		8 Receive Timing (A)	DCE
DTE	Terminal In Service 28		9 Clear To Send (A)	DCE
Return	Data Mode (B) 29		10 Local Loopback	DTE
Return	Terminal Ready (B) 30		11 Data Mode (A)	DCE
Return	Receiver Ready (B) 31		12 Terminal Ready (A)	DTE
DTE	Select Standby 32		13 Receive Ready (A)	DCE
DCE	Signal Quality 33		14 Remote Loopback	DTE
DTE	New Signal 34		15 Incomming Call	DCE
DTE	Terminal Timing (B) 35		16 Select Frequency	DTE
DCE	Standby/indicator 36		17 Terminal Timing (A)	DTE
Common	Send Common 37		18 Test Mode	DCE
			19 Signal Ground	Common

EIA-530 Interface Reference

Signal/Voltage Source	Signal Designations		Signal Designations	Signal/Voltage Source
DTE	Transmitted Data (B) 14		1 Shield	Common
DCE	Transmit Clock (A) 15		2 Transmitted Data (A)	DTE
DCE	Received Data (B) 16		3 Received Data (A)	DCE
DCE	Receiver Clock (A) 17		4 Request To Send (A)	DTE
DTE	Local Loopback 18		5 Clear To Send (A)	DCE
Common	Request To Send (B) 19		6 DCE Ready (A)	DCE
DTE	Data Terminal Ready (A) 20		7 Signal Ground	Common
DTE	Remote Loopback 21		8 Carrier Detect (A)	DCE
Common	Data Set Ready (B) 22		9 Receiver Clock (B)	DCE
Common	Data Terminal Ready (B) 23		10 Carrier Detect (B)	Common
DTE	DTE Transmitter Clock (A) 24		11 DTE Transmitter Clock (B)	DTE
DCE	Test Mode 25		12 Transmitter Clock (B)	DCE
			13 Clear To Send (B)	Common

EIA-530/499 Interconnection

EIA-530 Signal Name	DB-25 Pin #	DB-37 Pin #	EIA-499 Signal Name
Shield	1	1	Shield
TD	2, 14	4, 22	Send Data
RD	3, 16	6, 24	Rcv Data
RTS	4, 19	7, 25	RTS
CTS	5, 13	9, 27	CTS
DCE Rdy	6, 22	11, 29	Data Mode
DTE Rdy	20, 23	12, 30	Term Rdy
SG	7	19	SG
CD	8, 10	13, 31	Rcvr Rdy
TSET (DCE-Src)	15, 12	5, 23	Send Tmg
RSET (DCE-Src)	17, 9	8, 26	Rcv Tmg
LL	18	10	LL
RL	21	14	RL
XTC (DTE-Src)	24, 11	17, 35	Term Tmg
TM	25	18	TM

EIA-530 Interface Pinout DB-25

		Pin #	Pin #		
			1	Shield	
Transmit Data-B	BA	14	2	BA	Transmit Data-A
TSET (DCE-Src)-A	DB	15	3	BB	Receive Data-A
Recv Data-B	BB	16	4	CA	RTS-A
TSET (DCE-Src)-A	DD	17	5	CB	CTS-A
Local Loop	LL(ii)	18	6	CC	DCE Ready-A
RTS-B	CA	19	7	AB	Signal Ground
DTE Rdy-A	CD	20	8	CF	RLSD-A (CD-A)
Remote Loop	RL(ii)	21	9	DD	Recv Signal Element Timing(DCE-Src)-B
DCE Rdy-B	CC	22	10	CF	RLSD-B (CD-B)
DTE Rdy-B	CD	23	11	DA	Trans Signal Element Timing (DTE-Src)-B
TSET(DTE-Src)-A	DA	24	12	DB	Trans Signal Element Timing (DCE-Src)-B
Test Mode	TM(ii)	25	13	CB	CTS-B

(ii) Indicates Category II circuits.
Category I Circuits: The circuits electrically specified as EIA-422.
Category II Circuits: Circuits electrically specified as EIA-423.

The X.21 Interface

CCITT X.21 is a physical and electrical interface that uses two types of circuits: balanced (X.27/V.11) and and unbalanced (X.26/V.10). CCITT X.21 calls out the DB-15 connector.

Equivalent/corresponding EIA-232 or CCITT V.35 signals

Transmit = TD

Receive = RD

Control = RTS

Indication = CD

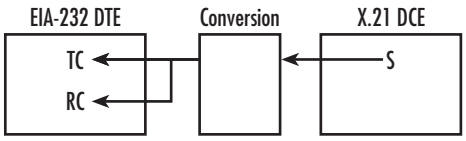
Signal Element Timing = TC & RC (see note 2)

Byte Timing = rarely used

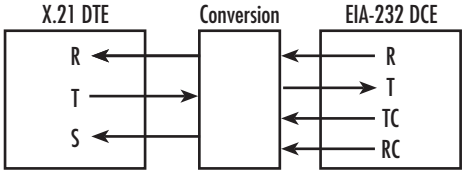
DTE Signal Element Timing: even more rarely used. Not supported (see note 4)

Clocking with X.21

How can only one clock signal be used for both data signals, T & R? With EIA-232 or V.35, the TC & RC are kept separate.



As shown in the diagram above, if the DTE is EIA-232/V.24 and the DCE is X.21, clock signal S comes from the DCE toward the DTE and both RC & RC are inputs on the DTE. After the X.21 signal is converted to the proper electrical format, connect the clock signal S to both TC & RC on the DTE.



As shown above, if the DTE is X.21 and the DCE is EIA-232/V.35, both TC & RC must be combined into one clocking signal for X.21. Insert a data buffer between the DTE and DCE which will be controlled by both clocks. This will maintain the clock *frequency lock* without requiring TC & RC from DCE to *phase locked*.

ELECTRICAL CHARACTERISTICS

Data signaling rates of 9600 bps and below.

V.27 (= V.11) & X.26 (= V.10)

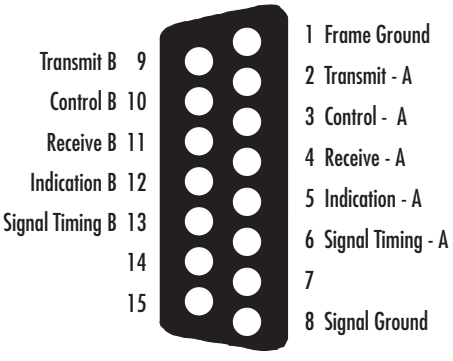
Data signaling rates above 9600 bps.

X.27 (= V.11)

[V.10 specifies an interface circuit with an unbalanced transmitter with a differential receiver.]

[V.11 specifies an interface circuit with a differential, balanced signal from transmitter to receiver which may accommodate an optional DC offset voltage. This approximates EIA-422]

X.21 Interface Reference



Functional characteristics of interchange circuits

Interchange Circuits	DB15	Name	Direction To DCE	Direction From DCE	Remarks
G	1	Signal Ground or Common Return			See Note 1
Ga	8	DTE Common Return	X		
T	2 & 9	Transmit	X	X	
R	4 & 11	Receive			
C	3 & 10	Control	X	X	
I	5 & 12	Indication		X	
S	6 & 13	Signal Element Timing		X	See Note 2
B		Byte Timing			See Note 3
X		DTE Signal Element Timing	X		See Note 4

(ii) Indicates Category II circuits.
Category I Circuits: The circuits electrically specified as EIA-422.
Category II Circuits: Circuits electrically specified as EIA-423.

Note 1: This conductor may be used to reduce environmental signal interference at the interface. In the case of shielded interconnecting cable, the additional connection considerations are part of Recommendation X.24 and ISO 4903.

Note 2: Timing for continuous isochronous data transmission will be provided.

Note 3: May be provided as an optional additional facility

Note 4: The use and the termination of this circuit by the DCE is a national matter

Parallel & IEEE-1284 Interfaces

Standard Parallel

Both the 36-pin Centronics® and DB-25 connectors are commonly used for Computer-to-Printer communication. The two physical variations are electrically compatible with one another, so that only a special cable is required to allow them to operate with each other.

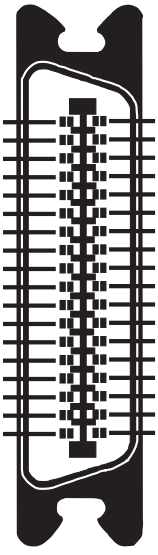
IEEE-1284 Bi-Directional Parallel

Standard Parallel communication sends data (in parallel) in one direction. So a host can send data to a printer, but the printer cannot send data back to the host. The only way the printer can communicate vital feedback to the host ("out of paper," "buffer full," etc.) is to raise or lower a control pin. The IEEE-1284 Standard outlines methods by which a printer can receive data from a host *(forward channel) and* communicate data back to the host *(reverse channel)*—not just raise or lower control pins.

The two primary IEEE-1284 modes (the ones used by Patton hardware) are "Compatible" and "Nibble." *Compatible Mode* is the baseline, and is simply forward channel parallel communication as implemented in the "classic" 36-pin Centronics® format. *Nibble Mode* is reverse channel communication using the four status lines of the parallel interface.

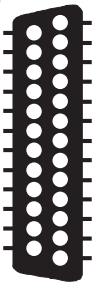
Here's how Nibble Mode works: Data is sent from the printer to the host, under the control of the host. Since only four lines are used (instead of the eight commonly required for parallel data) the byte is segmented into two 4-bit pieces and sent sequentially down the line. The byte therefore becomes two "nibbles."

Centronics Parallel Interface



Signal/Voltage Source	Signal Designations		Signal Designations	Signal/Voltage Source
Printer	+ 5 Volts	18	36 Undefined	-
Common	Chasis Ground	17	35 Undefined	-
Common	Logic Ground	16	34 Undefined	-
Printer	OSCXT	15	33 Undefined	-
Common	Supply Ground	14	32 Fault	Printer
Printer	Select	13	31 Input Prime	Computer
Printer	Paper End	12	30 (R) Input Prime	Common
Printer	Busy	11	29 (R) Busy	Common
Printer	Acknowledge	10	28 (R) Acknowledge	Common
Computer	Data Bit 8	9	27 (R) Data Bit 8	Common
Computer	Data Bit 7	8	26 (R) Data Bit 7	Common
Computer	Data Bit 6	7	25 (R) Data Bit 6	Common
Computer	Data Bit 5	6	24 (R) Data Bit 5	Common
Computer	Data Bit 4	5	23 (R) Data Bit 4	Common
Computer	Data Bit 3	4	22 (R) Data Bit 3	Common
Computer	Data Bit 2	3	21 (R) Data Bit 2	Common
Computer	Data Bit 1	2	20 (R) Data Bit 1	Common
Computer	Data Strobe	1	19 (R) Data Strobe	Common

IBM PC Style Parallel Interface



Signal/Voltage Source	Signal Designations		Signal Designations	Signal/Voltage Source
Common	Return Ground	25	13 Select (Active High)	Printer
Common	Return Ground	24	12 Paper End (Active High)	Printer
Common	Return Ground	23	11 Busy (Active High)	Printer
Common	Return Ground	22	10 Acknowledge (Active Low)	Printer
Common	Return Ground	21	9 Data Bit 8 (MSE)	Computer
Common	Return Ground	20	8 Data Bit 7	Computer
Common	Return Ground	19	7 Data Bit 6	Computer
Common	Return Ground	18	6 Data Bit 5	Computer
Computer	Select Input (Active LOW)	17	5 Data Bit 4	Computer
Computer	Initialize Printer (Pimer Active LOW)	16	4 Data Bit 3	Computer
Printer	Error (Fault - Active LOW)	15	3 Data Bit 2	Computer
Computer	Auto Line Feed (Active LOW)	14	Data Bit 1 (LSB)	Computer
			Data Strobe (Active LOW)	Computer

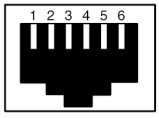
Primary IEEE-1284 Modes

DB-25 Pin #	DB-36 Pin #	Compatible Mode	Nibble Mode
1	1	nStrobe	HostClk
2	2	Data 1 (least significant bit)	
3	3	Data 2	
4	4	Data 3	
5	5	Data 4	
6	6	Data 5	
7	7	Data 6	
8	8	Data 7	
9	9	Data 8 (most significant bit)	
10	10	nAck	PtrClk
11	11	Busy	PtrBusy
12	12	PError	ActDataReq
13	13	Select	Xflag
14	14	nAutoFd	HostBusy
15	32	nFault	ndataAvail
16	31	nInit	nInit
17	36	nSelectIn	1284 Active
18	19	Signal Ground (nStrobe)	
19	20 & 21	SG (Data 1 & 2)	
20	22 & 23	SG (Data 3 & 4)	
21	24 & 25	SG (Data 5 & 6)	
22	26 & 27	SG (Data 7 & 8)	
23	29	SG (Busy & nFault)	
24	28	SG (PError, Select, and nAck)	
25	30	SG (nAutoFd, nSelectIn & nInit)	

Not defined on the DB-36 connector: pins 15, 33, 34 & 35

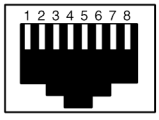
Modular Connections and Pairing

Standard color codes for modular jacks with flying leads.



RJ-12 (6 pin)

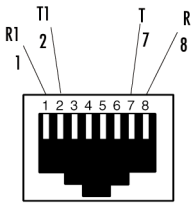
1	blue
2	yellow
3	green
4	red
5	black
6	white



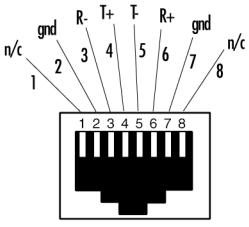
RJ-45 (8 pin)

1	blue
2	orange
3	black
4	red
5	green
6	yellow
7	brown
8	slate

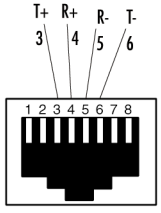
Patton product interfaces as they are implemented on various modular jacks.



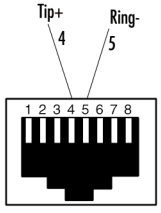
DDS Telco (RJ-45)



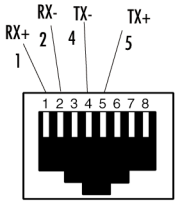
Patton Short Range Modem (RJ-45)



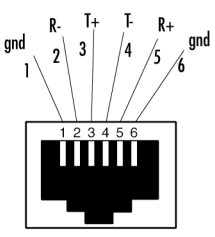
ISDN BRI S/T (RJ-45)



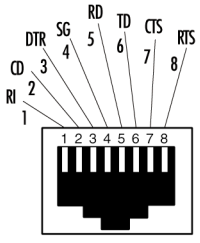
ISDN BRI U (RJ-45)



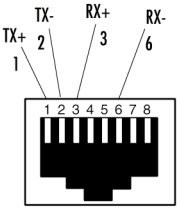
T1/E1 Telco (RJ-45)



Patton Short Range Modem (RJ-12)

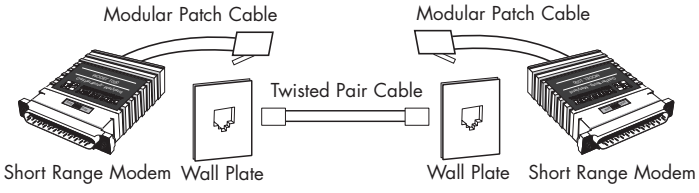


EIA-561 (RJ-45 8-pin)

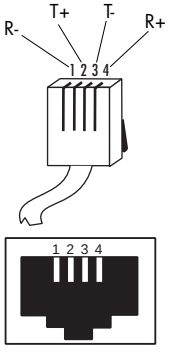


Ethernet 10Base-T (RJ-45)

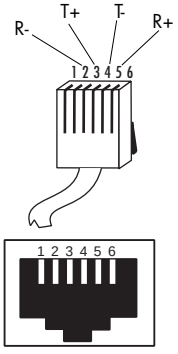
How to connect two Patton short-range modems in a point-to-point topology.



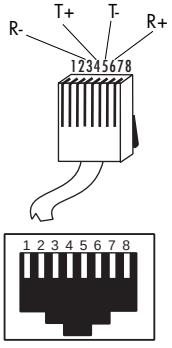
Step 1 - Pin-out the plugs on your modular patch cables so that they match one of the diagrams below. The cables are oriented with the plug pointing up and the clip to the back.



RJ-11 Plug/Jack (4-wire)



RJ-12 Plug/Jack (6-wire)



RJ-45 Plug/Jack (8-wire)

Step 2 - Make sure the wire pairing on the point-to-point connection (between wall plates) matches the diagram below. Colors may vary, but twisted pair cable must be used.