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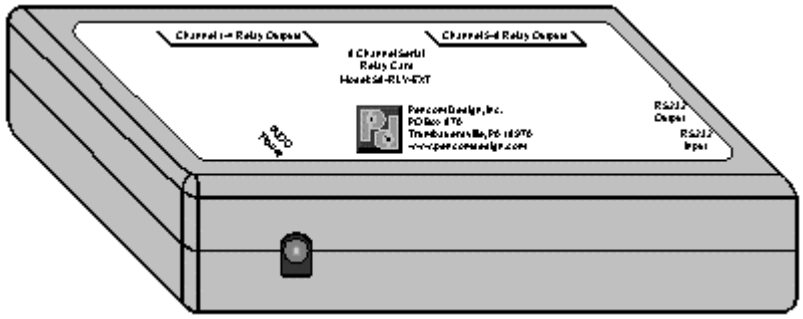
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INSTRUCTION MANUAL

8 Channel Serial Relay Card

Model: S8-RLY-EXT (Shown)
Model: S8-RLY-INT



Introduction

Thank you for buying our 8 Channel RS232 controlled Relay Card.

The goal of Pencom Design is to provide top quality equipment at low cost. All of our products are designed and tested in-house to meet our high quality standards.

Features

Low cost universal 8 channel serial relay card with heavy duty 10 Amp 250VAC/28VDC SPDT power relays, controlled through one of the PC RS232 serial ports.

The serial relay card is designed for single board operation or multiple board operation on the same serial port. Up to 16 boards may be connected in a daisy chain configuration, with up to 128 - 10 Amp relays under PC control.

Easy hook up using standard modular telephone cable, for connecting PC to single board and for multiple board configurations. A 9-pin serial to modular cable adapter is required to connect to the PC (Part number: ADP-MOD), available separately.

Any software language that is able to write to the PC serial port can communicate with this relay card – NO special drivers needed. Simple ASCII commands to control the relays. 9600 baud, 8 bits, no parity, 1 stop bit. Each relay will latch ON or OFF depending on what command is sent and will maintain this position until power is removed or changed again in software.

Two different Board design versions available.

- Circuit board mounted in an enclosure with an external wall transformer.
- Circuit board without an enclosure with internal on-board mounted transformer – for installation in a customers enclosure.

A windows based, relay testing software is available to verify operation of the 8 channel relay cards before writing your own software program. See our website to download the software or order on disk.

Applications

- Industrial control applications
- Automatic test equipment (ATE)
- Process control systems
- Power switching applications

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Specifications

Dimensions:

With light gray Enclosure: 6.89” Wide X 4.88” High X 1.52” Deep
Circuit Board (no enclosure): 6.73” Wide X 4.66” High X 1.412” Deep

Connections:

1	RJ-12 Modular phone jack for RS232 input to relay board from PC.
1	RJ-12 Modular phone jack for RS232 output to next relay board (daisy chain)
8	3 contact Terminal blocks for output connections for 14-22 AWG wire
1	Power Jack for DC wall transformer (external transformer version)
1	120VAC 2-pin Terminal Block (internal transformer version)

Power Requirements:

9 Volts DC @ 1.2 amp wall transformer (Model: S8-RLY-EXT)
120 VAC 50/60 HZ internal transformer (Model: S8-RLY-INT)

Transmission distance, PC to relay Card & card to card in multiple board configurations:

Standard RS232 specifications 50 feet, minimum.

Operating Temperature & Humidity:

0º to 70º centigrade, 90% Relative humidity (this device is not waterproof and must be installed in a suitable enclosure if used outdoors)

Parts Listing

All Models Require:

1 - RS232 9 pin Dsub to Modular Cable Adapter (Part number: ADP-MOD)
1 – RJ-11 Modular telephone cable (reverse wired).



These items included with the units:

Model: S8-RLY-EXT

1 - With enclosure
1 - AC to 9VDC Wall Transformer adapter



Model: S8-RLY-INT

1 - No enclosure
1 - With internal power transformer 120VAC 50/60 Hz with terminal block connection.

Note: The RS232 Modular cable adapter is not supplied, since these relay cards can be used in a single board application or a multi-board application. Only one adapter is needed in both of these configurations. The 4-cond modular cable assemblies are also not included due to the variety of cable lengths requested by the customer. When used in multiple board applications, one modular cable assembly is required for each additional board connected. Both these items are available separately from our website.

Setup Instructions

Important: make sure you use the proper modular cables (reverse wired) when connecting the relay cards together, these cables are not supplied with the unit due to variety of length required by the customer. Purchase the cables with your unit to assure correct configuration.

Single board configuration:

Connect the computer, RS232 Modular cable adapter, Modular cables, relay card, and wall transformer as shown in Figure 1. Make sure the cable from the PC is plugged into the RS232 input jack.

If your using model number S8-RLY-INT, this unit has an on-board power transformer that it is connected directly to 120VAC with a 2-contact terminal block instead of the external wall transformer as shown in Figure 1.

Download, install, and run the relay test software on your IBM compatible personal computer. Select the correct COM port in the software that’s connected to the relay card.

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Plug in the wall transformer or apply power to board (on-board transformer). Make sure the board address in the software is set to "A". This is the factory default and is normally used in a single board configuration. Click ON one of the relays in the software program and there should be an audible click from the relay selected.

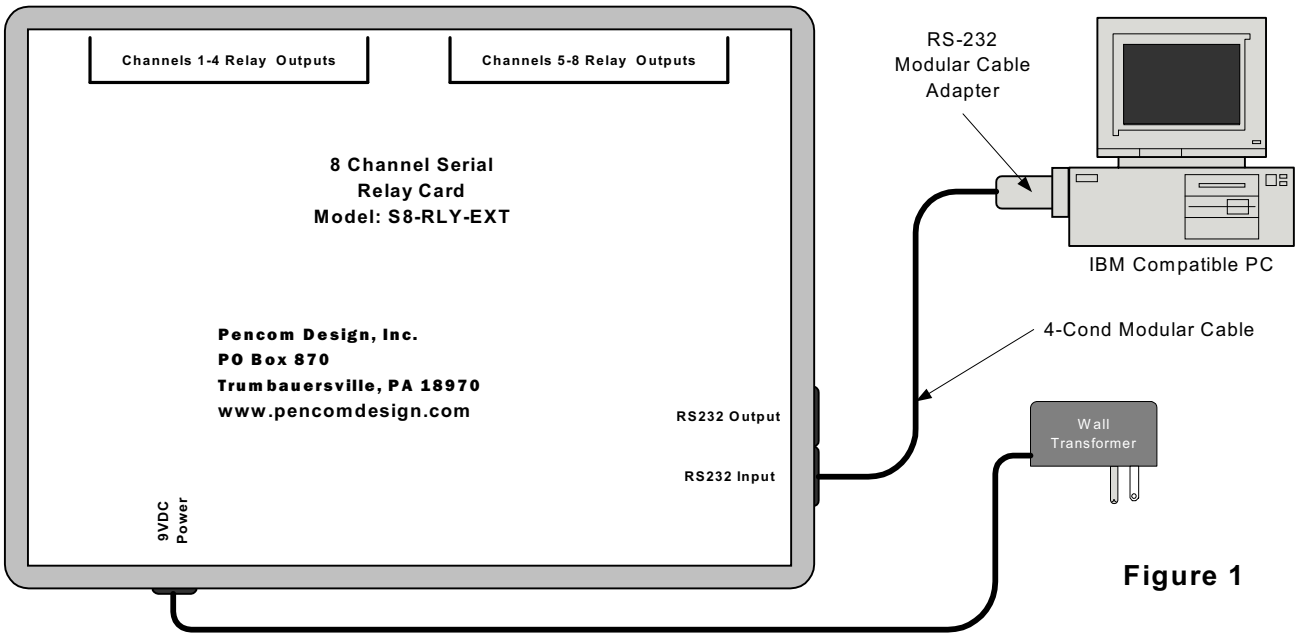


Figure 1

Multiple board configuration:

Connect the computer, RS232 Modular cable adapter, Modular cables, relay card, and wall transformer as shown in Figure 2. Make sure the cable from the PC is plugged into the first RS232 input jack. Each additional board is connected from the output of the first board to the input of the next board.

Note: connect the wall transformer as shown in figure 1 on each board. If your using model number S8-RLY-INT, this unit has an on-board power transformer that it is connected directly to 120VAC with a 2-contact terminal block instead of the external wall transformer as shown in Figure 1.

Download, install, and run the Relay test software on your IBM compatible personal computer. Select the correct COM port in the software that's connected to the relay card.

Dip Switch Setting				Board
1	2	3	4	Address
OFF	OFF	OFF	OFF	A
OFF	OFF	OFF	ON	B
OFF	OFF	ON	OFF	C
OFF	OFF	ON	ON	D
OFF	ON	OFF	OFF	E
OFF	ON	OFF	ON	F
OFF	ON	ON	OFF	G
OFF	ON	ON	ON	H
ON	OFF	OFF	OFF	I
ON	OFF	OFF	ON	J
ON	OFF	ON	OFF	K
ON	OFF	ON	ON	L
ON	ON	OFF	OFF	M
ON	ON	OFF	ON	N
ON	ON	ON	OFF	O
ON	ON	ON	ON	P

Table 1

Each 8-channel relay board has a four position DIP switch. For normal operation using only one board, all the switches are left in the OFF position. When used in multiple board applications these switches are used to uniquely identify each board. Since all the boards are connected to the same serial RS-232 channel, the host computer needs to communicate with each board without talking to the other boards on the same channel. The board address codes are listed in table 1.

Every board must be set to a different address to operate correctly. The board address code range is between A and P, these letter address codes will be used as part of the command codes when sending serial data from the host to the relay board. See 'connecting relay outputs' below for the case disassembly procedures to locate the DIP switch.

Plug in the wall transformer or apply power to board (on-board transformer). Make sure the board address in the software is set to the board you wish to test. Click ON one of the relays in the software program and there should be an audible click from the relay on the selected board.

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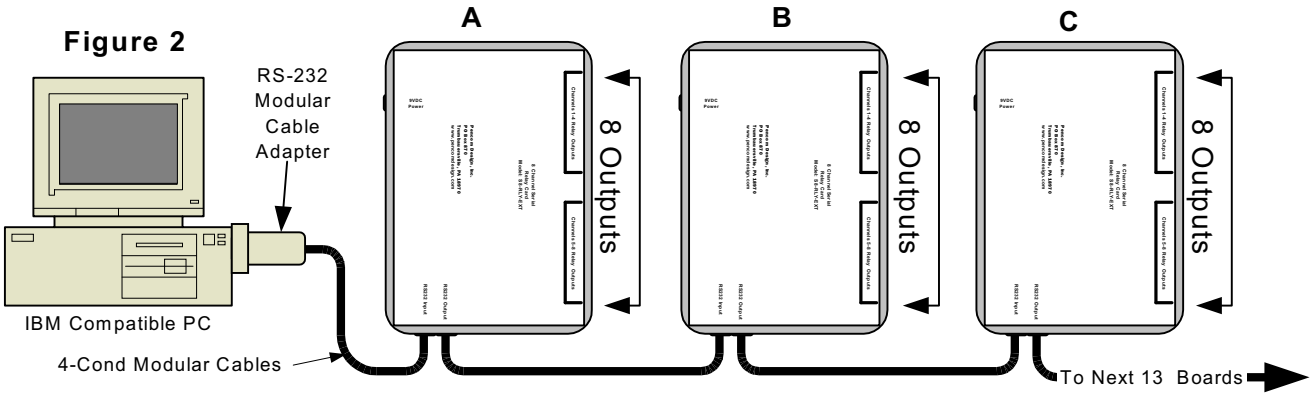


Figure 2

Connecting Relay Outputs

Remove the four case screws from the back of the serial relay card (depending on model). Lift off the top cover and the inside will resemble Figure 3. At the top of the board you will see a row of 3-contact terminal blocks marked with NC, COM, NO these are the relay outputs. Relay numbers are marked next to each terminal block. Warning do not touch any other components on the board since static electricity from your fingers may damage these devices.

Strip the insulation back on your wire approx. ¼ inch. Wire the hot (or positive if DC) side of the power to the COM pin, and the output to the device under control using the NO (normally open) or NC (normally closed) pins depending on your application. Insert the stripped wire into the side of the terminal block and tighten the screw to clamp the wire in place. The terminal blocks are designed for 14-22 AWG wire size. Do not exceed the 10 amp current rating of the relays. Most applications will use the normally open contacts.

Re-assembly: align the wires with the slot in the case making sure the wires are not crimped by the case. Make sure there is no bare wire extending from the case. Re-assemble with the four screws removed earlier.

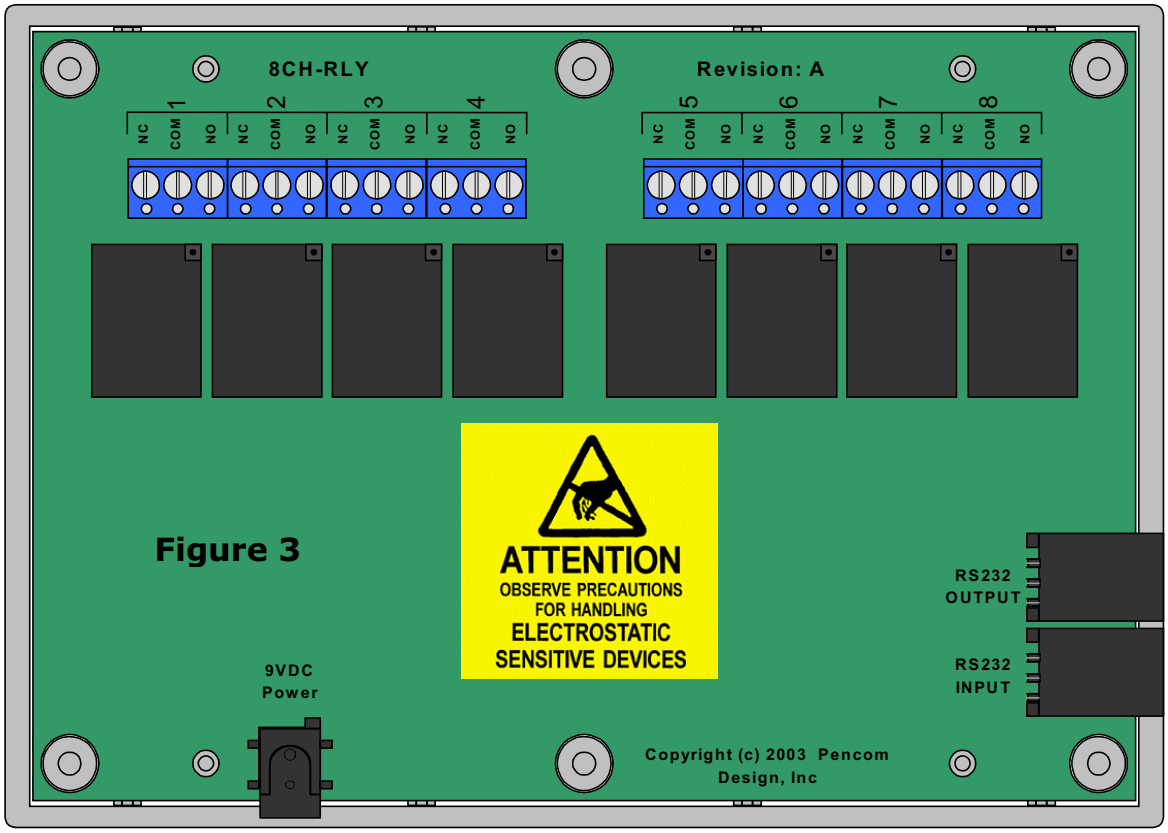


Figure 3

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Modular Cable Wiring

When routing modular cables, do not place them next to power cables as this will induce noise on the lines and could cause RS232 communication problems.

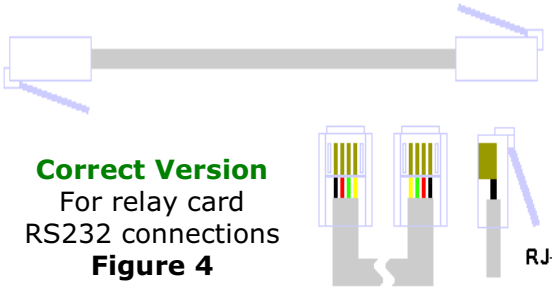
Important use only reversed wired modular cables in Figure 4, **NOT** network/printer/data cables, that are straight wired which may damage the boards as shown in Figure 5. Note in Figure 4, when you hold the modular connectors together on both ends of the wire with the gold pins facing you the same color wires are on opposite sides (the color doesn't matter only the position).

To make sure you are using the correct modular cables you may purchase the cables directly from Pencom Design, Inc.

The RS-232, modular cable adapter (9-pin Dsub to RJ-11) is not included with either version of the 8-channel relay cards as shown in Figure 1 & 2, it must be purchased separately and is required to operate in PC controlled mode. This adapter is not included since only one is required and it's only used with the relay cards in multiple card configurations.

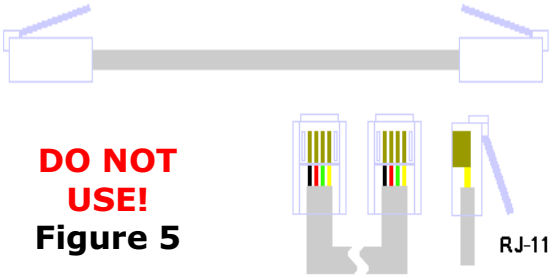
See figures 4 & 5 below to view diagrams of wiring differences:

Reverse connections normal telephone lines.



Correct Version
For relay card
RS232 connections
Figure 4

Straight connections for printer sharing and network use only.

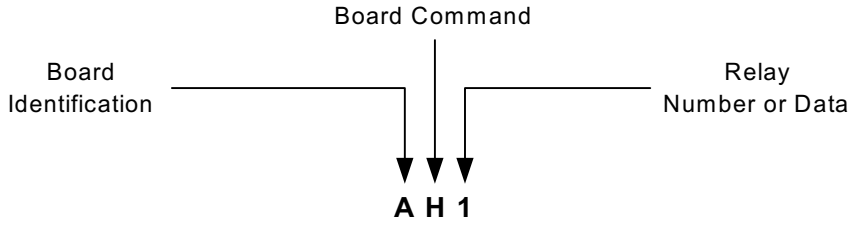


DO NOT USE!
Figure 5

Software

These relay cards can be used with almost any software language that is able to use the PC RS232 serial port. The relay card recognizes standard ASCII characters that are transmitted from the host computer. ALL commands must be in uppercase.

The commands are transmitted in the following format in one string front left to right:



Board Identification	Board Commands	Relay Number or Data
This is the letter code shown as the board address in Table 1.	H = Relay HIGH (ON) L = Relay LOW (OFF) R = Read relay status W = Write data latch	(H or L) = Relay number 1 – 8 or 0 = all relays on selected board (R) = receive a number 0 – 255 (W) = write a number 0 - 255

All the board commands and values explained below may be tested using the relay testing software available for download from our website.

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Board identification:
The board address is the first part of the command sent to the relay card(s) it ranges from A to P as shown in table 1. If your only using one card connected to the PC this command will always stay the same (factory default = A). If your using multiple boards, this part of the command will change depending on which board you want to address. The board address must be sent with any command. Note that all commands must be in uppercase.

Example: Dip switch setting = ON-OFF-ON-ON or (1011 in binary) = board address "L", you would replace the 'A' with a 'L' to address this board.

Board Commands:
The board command is the second part of the serial data sent to the relay card(s) These commands work in conjunction with the third part of the serial data that will be explained in the following section. There are four different board commands as explained below:

H = Relay High (ON) – Sending an "H" will direct the card to turn ON the relay (making a connection between the NO & COM contacts on the board).

L = Relay High (OFF) – Sending an "L" will direct the card to turn OFF the relay (breaking the connection between the NO & COM contacts on the board).

W = Write data latch – Sending an "W" will write directly to the port latch. This latch is 8 bits wide and corresponds to the number of relays on the board. This command allows you to turn multiple relays ON or OFF on the same board at the same time.

R = Read relay status – This code is a bit different than the three commands above. When this command is sent to the board – the board will respond back to the PC with a number which corresponds to the status of the relays on the board. This will be explained in more detail below:

Relay Number or Data:

The relay number or data command is the third part of the serial data sent to the relay card(s) this data is numerical. The data that is sent or received will relate directly to the board commands that were explained in the previous section.

If board command is **"H" or "L"**:
Send a number from 1 to 8 which represents the relay number on the board and will turn ON or OFF the individual relay specified. You may also send a zero which will turn ON or OFF **ALL** relays on this board.

If board command is **"W"**:
Send a number from 0 to 255. When this number is converted into binary it represents the relay numbers on the board. This command allows you to turn multiple relays ON or OFF at the same time with one command. Binary data is one's and zero's which represents ON and OFF on the relay card (ON = 1 & OFF = 0). See the example below.

Example:
If you wish to turn ON relay 2, 5 & 7 and leave all the others OFF you would send decimal number 82. This will turn ON the proper relays and turn all the rest OFF. Conversion from binary to decimal can easily be accomplished using the scientific calculator built into windows. Select the 'bin' check box in the calculator program and enter the binary number from left to right. Click the 'Dec' check box and the number will be converted to binary.

Relay numbers on board								Decimal	Relays Active
8	7	6	5	4	3	2	1	Equivalent	
0	1	0	1	0	0	1	0	82	(relays 2,5,7 ON)
1	0	1	0	1	0	1	0	170	(relays 2,4,6,8 ON)
0	0	0	0	0	0	0	0	0	(All relays OFF)
1	1	1	1	1	1	1	1	255	(All relays ON)

If board command is **"R"**:
Send any number from 0 to 255 (it doesn't matter it will be ignored). The relay card will immediately respond with decimal number from 0 to 255 representing which relays are active in the same method as explained above.

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There are numerous software languages that can utilize the PC for serial communications. Information is readily available on the internet and in books explaining how to output to the serial ports, in other languages. We are only showing you one example using the popular graphical language Visual Basic. It's an easy language to learn and has many powerful features.

Visual Basic Example

This example transmits data out to the relay card using the MSComm function to turn ON Relay #3 on card address set to "B".

MSComm1.Output = "B" & "H" & "3" & Chr$(13)

1. "B" = Board address
2. "H" = Board Command (relay = high)
3. "3" = Relay Number as a string (quotes required), if using it in an equation use str(3).
4. "Chr$(13) = carriage return, this must be sent after each command string.
5. The ampersand "&" operator is used to force string concatenation of the expressions.

Setup the Mscomm properties as follows:

DTREnable = True	InBufferSize = 1024	Rthreshold = 1
EOFEnable = False	InputLength = 0	RTSEnable = False
NullDiscard = True	InputMode = 1	Sthreshold = 1
HandShaking = 0	OutBufferSize = 512	Settings 9600,8,n,1

The following code receives the data from the relay board on the "R" (Read command).

```
Private Sub MSComm1_OnComm()
   'Receive data on the serial port
   Select Case MSComm1.CommEvent
      Case comEvReceive
         Dim buffer As Variant
         Dim Data As String
         buffer = MSComm1.Input
         ShowData (StrConv(buffer, vbUnicode))
   End Select
End Sub
Private Static Sub ShowData(Data As String)
   'Eliminate line feeds.
   Do
      i = InStr(Data, Chr$(10))
      If i Then
        Data = Left$(Data, i - 1) & Mid$(Data, i + 1)
      End If
   Loop While i
   'Eliminate carriage returns.
   Do
      i = InStr(Data, Chr$(13))
      If i Then
        Data = Left$(Data, i - 1) & Mid$(Data, i + 1)
      End If
   Loop While i
   'Display data in a text box
   TxtData.Text = Data
End Sub
```

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