Transmission distance, PC to relay Board:
Standard RS232 specifications 50 feet, minimum.

Relay outputs:
10 Amp 240VAC/28VDC SPDT 1 form C power relays.

Operating Temperature & Humidity:
0º to 50º centigrade, 90% Relative

Parts Listing
All Models Include:
1 – Custom wired RS232 9 pin Dsub to Modular Cable Adapter
(Part number: ADP-MOD)

1 – RJ-11 Modular telephone cable (reverse wired)
Part Number MC4-7.

Model: S1-RLY-INT & S2-RLY-INT
With internal power transformer 120VAC 50/60 Hz with terminal block connection.

Model: S1-RLY-INT-2 & S2-RLY-INT-2
With internal power transformer 230VAC 50/60 Hz with terminal block connection.

Model: S1-RLY-EXT & S2-RLY-EXT
1 - AC to 9VDC Wall Transformer adapter

Setup Instructions
Important: make sure you use the proper modular cables (reverse wired) when connecting the relay board to the PC. A 7' cable is supplied with the unit, but some customers require longer cables to extend the distance from the PC. If you intend to extend the distance from the PC purchase the cables with your unit to assure correct configuration.

Connect the computer, RS232 Modular cable adapter, modular cable, relay card, and wall transformer as shown in Figure 1. If you have the internal transformer version reference Figure 2. **Note** if your version has a 230VAC input transformer connect one side of the 230V power to L1 and the other side to L2/N on the terminal block, ground wire is connected to GND.

Note only one output connection is shown on the drawing although this is a dual channel unit. The relays can control an AC or DC voltage.

Figure 1
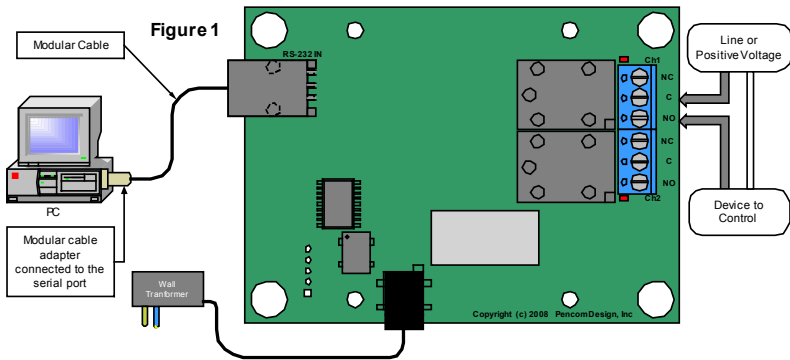
Download, install, and run the relay test software on your Windows based personal computer. Select the correct COM port in the software that's connected to the relay board. The Relay Test Program operation is explained in the help file.

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 software default and is used in a single or dual channel board configuration. Click ON #1 relay in the software program and there should be an audible click from the relay selected, and the LED will illuminate.
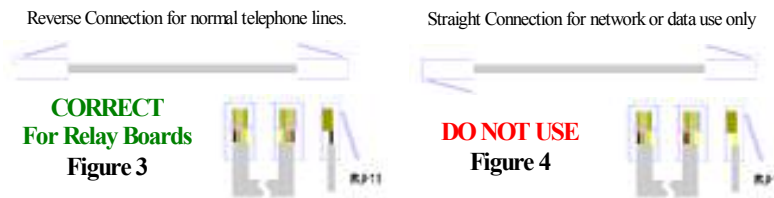

Figure 2
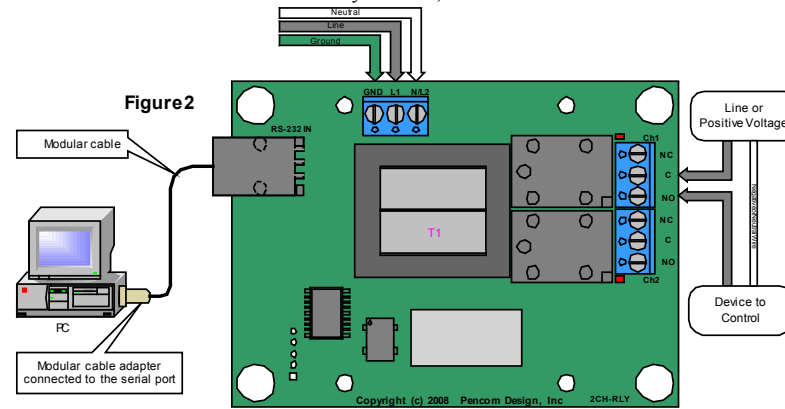
Connecting Relay Outputs
At the right side of the board as shown above you will see one or two 3-contact terminal blocks marked with NC, COM, NO these are the relay outputs. Relay channel numbers are marked next to each terminal block. Warning do not touch any other components on the board since static 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. See the relay datasheet available for download from our website.

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.
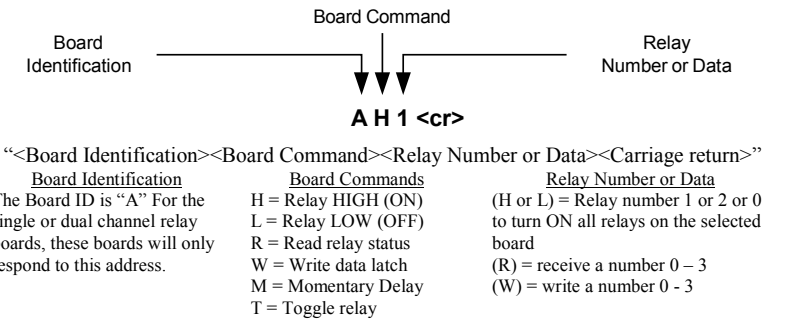
Important use only reversed wired modular cables in Figure 3, **NOT** network/printer/data cables-- that are straight wired which may damage the boards as shown in Figure 4. Note in Figure 3, when you hold the modular connectors together on both ends of the wire with the gold pins facing you the same color wires are on opposite sides (the color doesn't matter only the position).

See figures 3 & 4 below to view diagrams of wiring differences:

Reverse Connection for normal telephone lines.

CORRECT
For Relay Boards
Figure 3

Straight Connection for network or data use only

DO NOT USE
Figure 4

Software
The relay boards can be used with almost any software language that is able to use the PC RS232 serial port. The relay board recognizes standard ASCII characters that are transmitted from the host computer. Commands are case sensitive.

A H 1 <cr>

"<Board Identification><Board Command><Relay Number or Data><Carriage return>"

Board Identification	Board Commands	Relay Number or Data
The Board ID is "A" For the single or dual channel relay boards, these boards will only respond to this address.	H = Relay HIGH (ON) L = Relay LOW (OFF) R = Read relay status W = Write data latch M = Momentary Delay T = Toggle relay	(H or L) = Relay number 1 or 2 or 0 to turn ON all relays on the selected board (R) = receive a number 0 – 3 (W) = write a number 0 - 3

Board identification:
The board address is the first part of the command sent to the relay board it is set to "A" in firmware and may not be changed for the single and dual channel relay boards.

Board Commands:
The board command is the second part of the serial data sent to the relay board. These commands work in conjunction with the third part of the serial data that will be explained in the following section.

H = Relay High (ON) – Sending an "H" will direct the board 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 board 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. This command allows you to turn multiple relays ON or OFF on the same board at the same time.

R = Read relay status – When this command is sent to the board, the board will respond back to the PC with a decimal number, which corresponds to the status of the relays on the board. This will be explained in more detail below:

M = Momentary Command – This command will briefly activate or deactivate a single relay or all relays. The initial state of the relay will determine whether the relay toggles ON – OFF – ON or OFF – ON – OFF. The momentary delay default is 30 milliseconds, but may be changed from 10-50 milliseconds in the setup.

T = Toggle command - The toggle command will reverse the relay from it's current position. The initial state of the relay will determine whether the relay toggles ON or OFF.

Relay Number or Data:
The relay number or data command is the third part of the serial data that is sent to the relay board(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 the board command is **"H" or "L"**:
Send a number 1 or 2 which represents the relay number on the board and will turn ON or OFF the individual relay specified. Sending a zero that will turn ON or OFF **ALL** relays on this board.

If the board command is **"W"**:
Send a number from 0 to 3. 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 board (ON = 1 & OFF = 0). See table #1

"W" command Example:

To turn ON relay 2 and leave relay 1 OFF you would send decimal number 2.
To turn ON relay 1 and leave relay 2 OFF you would send decimal number 1.

Table 1

Relay #		Decimal	Relays
2	1	Equivalent	Active
0	0	0	Both Relays OFF
0	1	1	Relay #1 ON
1	0	2	Relay #2 ON
1	1	3	Both Relays ON

If the board command is **"R"**
   Send any number from 0 to 255 (it doesn't matter it will be ignored). The relay board will immediately respond with a decimal number from 0 to 3 representing which relays are active in the same method as explained above.

If the board command is **"M"**
   Send a number from 1 to 8 which represents the relay number available on the board, and it will momentarily active (or deactivate) the individual relay specified. You may also send a zero which will momentarily active (or deactivate) **ALL** relays on this board. The initial state of the relay will determine whether it is turned ON or OFF.

If the board command is **"T"**:
   Send a number from 1 to 8 which represents the relay number available on the board, it will reverse the relay from it's current position on the individual relay. Sending a zero which will toggle **ALL** relays on this board.

The board command structure is explained in more detail in application note #156 available for download from our website.

Visual Basic Example

This example transmits data out to the relay board using the MSComm function to turn ON Relay #2.

MSComm1.Output = "A" & "H" & "2" & Chr$(13)
1. "A" = Board address
2. "H" = Board Command (relay = high)
3. "2" = Relay Number as a string (quotes required), if using it in an equation use str(2).
4. Chr$(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 = False	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
```

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.

Additional information is available online at www.pencomdesign.com/support

Single/Dual Channel Serial Relay Board

Single Channel Versions:
Model: S1-RLY-EXT
Model: S1-RLY-INT
Model: S1-RLY-INT-2
Dual Channel Versions:
Model: S2-RLY-EXT (Shown)
Model: S2-RLY-INT
Model: S2-RLY-INT-2

Introduction
Thank you for buying our RS232 controlled Relay board.

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 1 or 2 channel serial relay board with heavy duty 10 Amp 240VAC/28VDC SPDT power relays.

Easy hook up using standard modular telephone cable. A 9-pin serial to modular cable adapter and cable is included to connect the PC with the device.

Almost any software language that is able to write to the PC serial port and concatenate the string can communicate with this relay board – NO special drivers needed. Simple ASCII commands to control the relays. 4800-38400 (9600 default) 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, both can be mounting in the customers enclosure, or a plastic enclosure (P/N RLY-ENC-EXT) is available separately for the –EXT version only.
- Circuit board with an external wall transformer. (-EXT)
- Circuit board with internal on-board mounted transformer. (-INT)

A windows based, relay testing software is available to verify operation, and program the optional features on the boards of our 1 & 2 channel relay boards 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)
- Lighting control equipment
- Process control systems
- Power switching applications

Specifications

Dimensions:
   External transformer version: 3.04" Wide X 4.20" Length X 1.012" High
   Internal transformer Version: 3.04" Wide X 4.20" Length X 1.500" High

Connections:
1	RJ-12 Modular phone jack for RS232 input to relay board from PC.
1 or 2	3 contact Terminal blocks for output connections for 14-22 AWG wire.
1	Power Jack for DC wall transformer (external transformer version)
1	120VAC or (230VAC) 3-pin Terminal Block (internal transformer version)

Power Requirements:
   9 Volts DC @ 300 MA wall transformer (Model: S1 & S2, "-EXT" versions)
   120 VAC 50/60 HZ internal transformer (Model: S1 & S2, "-INT" versions)
   230 VAC 50/60 HZ internal transformer (Model: S1 & S2, "-INT-2" versions)