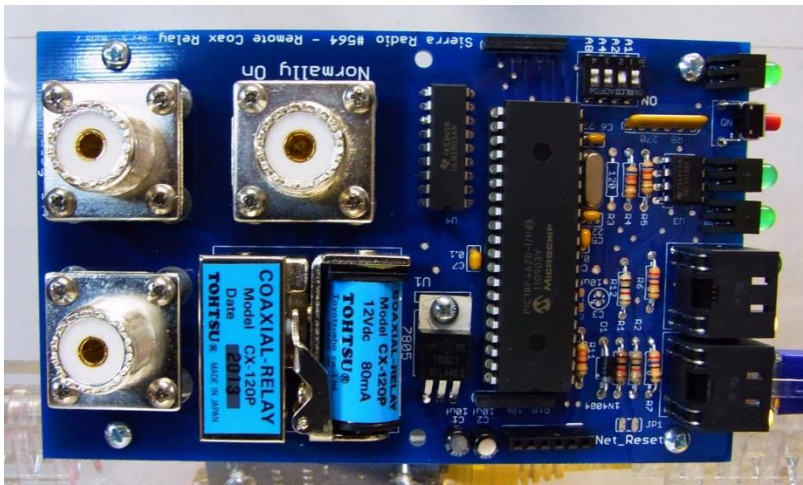


# Sierra Radio Systems



## RCR-1 Remote Coax Relay



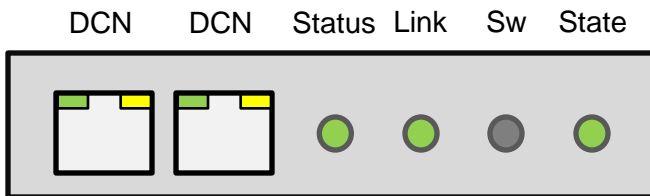
Reference Manual

Version 1.0

# Introduction

The Sierra Radio Systems remote RF coax relay provides a convenient way to remotely switch radio, antennas, and station accessories from across the shack, property or across the world

- SPDT RF switching
- Maximum power 200 watts
- Frequency range 0-200 MHz
- Remote control over wired DCN Sierra Radio Device Control Network
- Manual pushbutton operation
- 3 Status LEDs: Status, Link, Relay state



## DCN – Device Control Network

These is the network data and power connection ports. Both jacks are identical and allow multiple devices to be chained together.

The DCN supplies power on four pins. Pins 4 & 5 are +12.0-+13.8VDC. Pins 7, and 8 are ground. Data is on pins 1 and 2.

## Status LED

Indicates the status of the relay system. A blinking or solid LED indicates the system is in normal operation. If the LED is off, there is no power or the system is in a faulty state.

## Link LED

Indicates when the relay is registered to the DCN master system. The relay will operate if linked or not.

## SW - Pushbutton switch

Manual relay switching. Push the button to change state back and forth between on and off conditions.

## State LED

Indicates if the relay is in the On state.

# Assembly

If you purchased the kit version of the remote coax relay, you will find assembly very easy. Just follow the component silkscreen on the PCB and install all the parts in the kit. The only decision you will need to make is to decide which side of the PCB you will mount the SO-239 coax connectors.

## Top Mounting the SO-239s

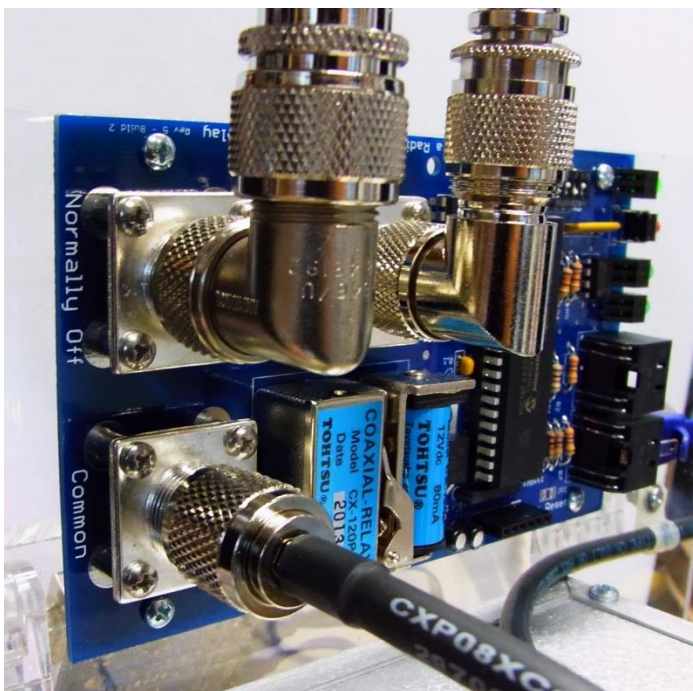
If you are mounting the PCB into a chassis box with internal RF cabling you may want to mount the So-239's to the top of the PCB. This is typically done when you are building a custom RF switching box for applications like remote antenna phasing or when you have other devices such as fitters or pre-amps that are located in the same box.

## Bottom Mounting the SO-239s

If you are mounting the PCB in a chassis box and want the SO-239 connectors to protrude through holes to the outside of the chassis, you should mount the SO-239 connectors to the back of the PCB (away from the silkscreen side).

## Programming the microcontroller

The remote coax relay is controlled by a PIC microcontroller, part number 18F4620. This CPU chip comes pre-programmed with firmware to operate the relay. If you want to write your own control software or download new versions of firmware from Sierra Radio, you may want to get an in-circuit programmer. Our part number #433 or any PICKit2 compatible programmer will work fine. Note that you will need a male to male header connector if you are not using the SRS programmer.

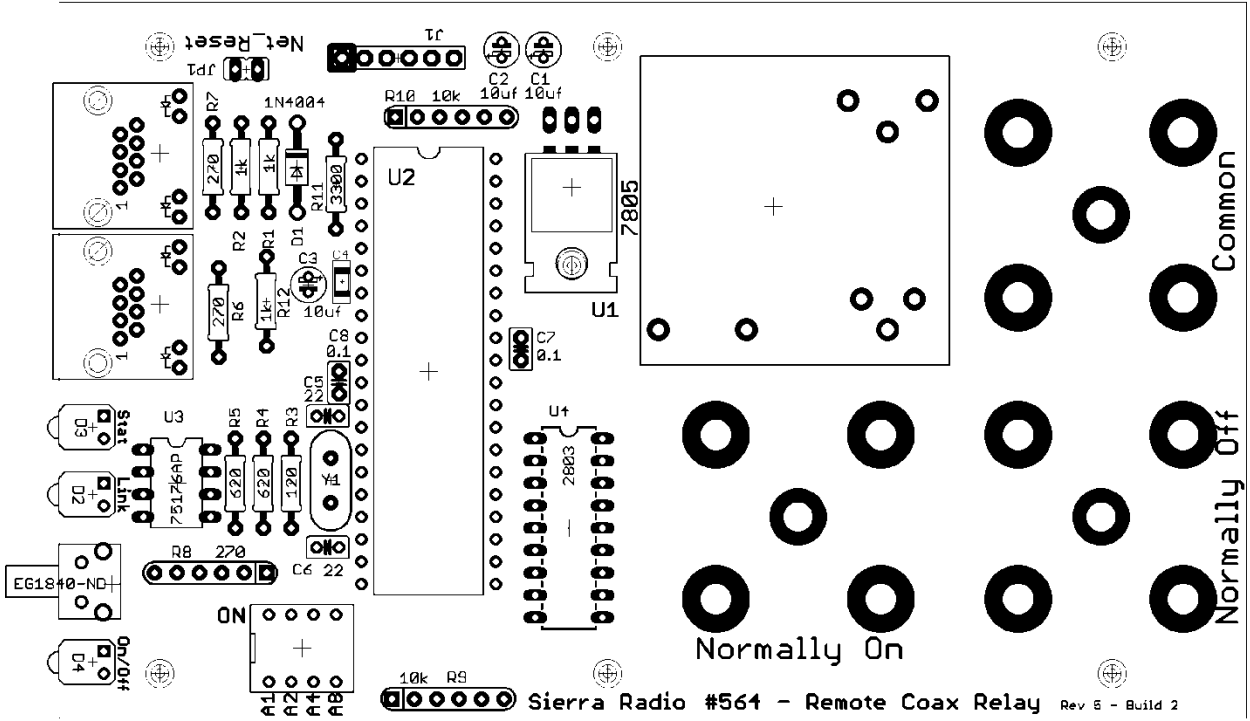


The assembled coax relay board shown on the left has the SO-239 connectors mounted to the top of the PCB. Six additional mounting holes are provided to mount the PCB to a chassis box.

Top mounting the connectors is convenient when mounting the relay board inside a box with other equipment such as preamps or other coax relays.

The connectors are mounted to the PCB using 4 standoffs for mechanical stability and forming a good RF connection.

# Assembly



# Device Control Network

## Baud Rate

The DCN protocol sends ASCII data at 9600 baud, non-inverted, 8 bits, no parity.

## Command Packet

A command packet is a string of text that is sent between the master PC or gateway device and the station accessory. A command packet is a string of ASCII characters that contains the payload to be transmitted from point A to point B and the additional characters necessary to provide synchronization, packet type identification, addressing, and error checking.

The DCN control protocol defines 3 packet formats. In each case, the command payload, is identical. The only difference is the characters around the command payload that route the payload to the right destination.

## Packet Types

1. Fully addressed packet `/A09:STATE:89`  
Sends the payload to a specific address with error checking. Typically used on a wired or wireless network with multiple target devices to be controlled.
2. Fully addressed w/o error checking `/009:STATE:XX`  
Note: the second character "0" is a zero.  
Sends the payload to a specific address but ignores the error checking field. The packet must contain two characters in this position and they can be any arbitrary characters.  
Typically used on a wired or wireless network with multiple target devices to be controlled.  
This is a convenient way to manually send a command with a dumb terminal program to a specific device without having to calculate the CRC error check value.
3. Direct packet `//STATE`  
Typically used in a direct connection between one master (PC or control head) and one target device to be controlled. This greatly simplifies the code on both ends and is also a convenient way to manually send commands from a dumb terminal. If multiple devices, even with different network addresses, are connected to the network, all devices will decode and execute this command. This can be a quick way to reset all devices on a network. Avoid using this command with multiple devices that will automatically generate a response to eliminate packet collisions on the network.

# DCN COMMAND SYNTAX

## Fully Addressed Packet Format

A fully addressed packet typical packet looks like this...

```
/A09:STATE:82<13>
```

```
-----  
| Start | Packet | From   | To     | : | Payload | : | CRC | End   |  
| of    | Type   | Address| Address|   |         |   | Value| of    |  
| Packet|        |       |       |   |         |   |      | Packet|  
-----
```

## Start of Packet

A forward slash character / is reserved for the start of packet framing indication. When a slave device sees the slash, it knows there is a new packet.

## Packet Type

The packet type character defines the format of the packet and instructions for how the packet is to be interpreted.

```
//          Direct          IE: //reset  
/A          Addressed       IE: /A02:reset:99  
/0          Addressed no error checking IE: /002:reset:XX
```

## From Address / To Address

The device address is a single printable ASCII character. While any character will work, by convention, the following characters are recommended and used for default values.

```
0    System master  
1    Station controller  
2    GPIO board  
3    Remote coax relay  
4    Radio router  
5-9  Unassigned  
A-Z  User assigned devices  
*    Broadcast to all devices.
```

We do not recommend using lower case letters or punctuation.

## Payload

The payload is the command to be delivered to the target device. Payload contents are application dependent and will vary from device to device. There are commands typically found on all SRS devices including PING, STATUS, SETADDR, etc. in addition to application specific commands. Payloads may contain multiple arguments separated by commas. For example //LCD,2,5,Hello. In this case, the payload is "LCD,2,5,Hello".

## **DCN COMMAND SYNTAX**

### **End of Packet**

The end of packet character is a carriage return, ASCII byte value 013 (decimal). When an end of packet character is encountered, the input buffer is evaluated.

The evaluation process identifies a packet by finding the start of packet synchronizing character / and extracts the buffer contents up to the end of packet character.

The command parser then extracts the packet type, addresses, error check value and payload.

The error check value is calculated and compared to the packet's error check value. If the values do not match, the buffer is flushed.

If the packet is good, then the "to address" is examined. If the to address is the same value as the devices address, the payload will be dropped into the command decoding subroutine in the target device for evaluation and execution, if not, the packet is ignored and flushed from the buffer.

If the payload is not recognized by the target device's command decoding subroutine, the command payload is flushed.

# DCN Wired Connections

RJ45 Plug Colour Code  
Contact Side - Tab is on Back



A simple power injector can be made by applying the shack's 13.8 VDC power to a piece of CAT5 ethernet cable. Connect pins 4 and 5 to +13.8 VDC and pins 7 and 8 to ground.

## Device Specific Commands

/003:RY1,1:XX	Turn relay on
/003:RY1,0:XX	Turn relay off
/003:STATE:XX	Get relay state