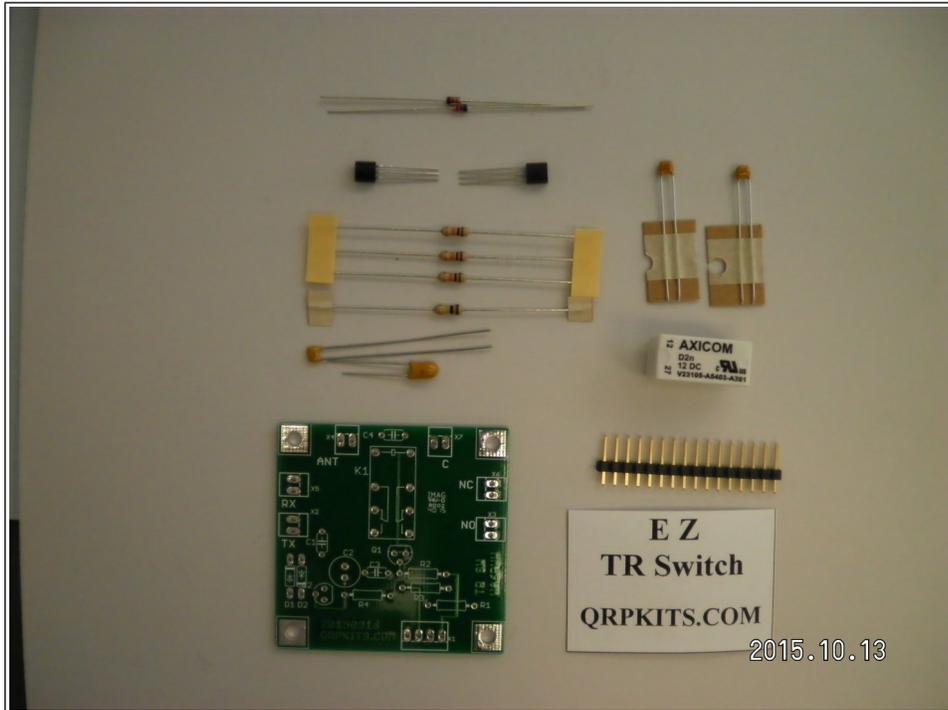


## Read This Page First

- If you are reading this you know the manuals are always available at QRPKITS.com.
- This is version 4.2 of the manual dated 4/27/2016.
- There is no need to print out the whole assembly manual unless you want a copy. Print the Parts List and Schematic then view the rest of the manual on a computer, laptop, or tablet. The Parts List has columns for inventory and construction.
  - **Please take time to inventory the parts before starting. Report any shortages to QRPKITS.com (In many cases it may be faster and cheaper to pull a replacement from your parts supply, but please let us know if we missed something.)**

This Page Left Blank Intentionally  
Do Not Print

# QRPKITS.COM - Easy TR Switch



## Kit Description

The Easy TR Switch is an RF sensing switch that can be used to switch an antenna between a receiver and transmitter. It also has a second switched pair of inputs and outputs that can be used for other switching applications such as muting or switching an audio channel or even to switch a remote amplifier or preamp.

## Features and Specifications

The Easy TR switch provides switching between two separate sets of contacts to two separate output/input pairs. It will sense RF input and switch at about 100mW of RF and can be used over a frequency range of 160-6M.

## Support

PACIFIC ANTENNA

QRP KITS.COM

[qrpkits.com@gmail.com](mailto:qrpkits.com@gmail.com)

## Tools Needed

- Temperature Controlled Soldering Station with small tip or 15-35 watt soldering iron with small tip.
- Solder 60/40 or 63/37 Tin-Lead
- Small Diagonal Cutters
- Small Needle Nose Pliers
- Pencil, Pen, and/or Highlighter
- BRIGHT work light

## Optional

- Magnifying headpiece or lighted magnifying glass.
- Multi-meter
- Solder Sucker or Solder Wick
- Knife or Wire Stripper
- Cookie Sheet to build in and keep parts from jumping onto the floor.

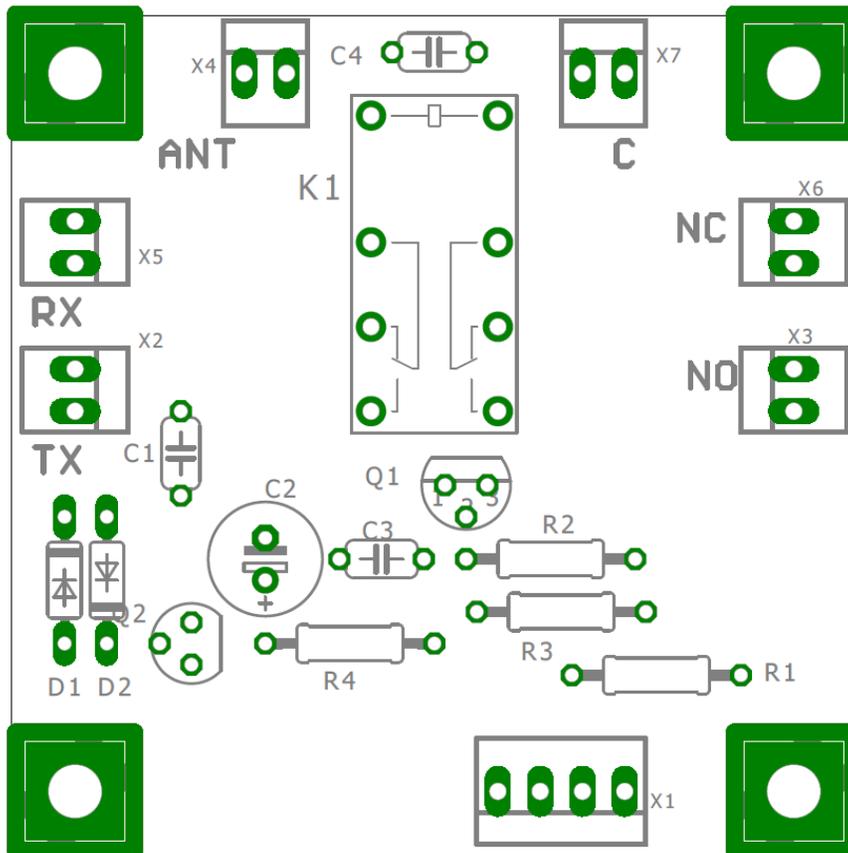
## Construction Techniques

- Please take time to inventory the parts before starting. Report any shortages to QRPKITS.com (In many cases it may be faster and cheaper to pull a replacement from your parts supply, but please let us know if we missed something.)
- Pre-sorting the resistors and capacitors can speed up the assembly and reduce mistakes.
- There is no need to print out the whole assembly manual unless you want a copy. Print the Parts List and Schematic (last two pages) then view the rest of the manual on a computer, laptop, or tablet. The Parts List has columns for inventory and construction.
- You can insert several parts at a time onto the board. When you insert a part bend the leads over slightly to hold the part in place, then solder all at the same time. Clip the leads flush.
- Most parts should be mounted as close to the board as possible. Transistors should be mounted about 1/8" above the board. Solder one lead on ICs or IC sockets and then check to make sure the component is flush before soldering the remaining leads.
- Use a Temperature Controlled Soldering Station with small tip or 15-35 watt soldering iron with small tip. Conical or very small screw driver tips are best.
- DO NOT use a large soldering iron or soldering gun.
- If you are a beginner, new to soldering, there are a number of resources on the web to help you get on the right track soldering like a pro. Google Soldering Techniques.

## Parts List

| Qty | Value        | Component    | Description   |
|-----|--------------|--------------|---|
| 3   | 10K          | R1, R2, R3   | Resistor, 1/4W, Brown-Black-Orange                      |
| 1   | 100K         | R4           | Resistor, 1/4W, Brown-Black-Yellow                      |
| 2   | 1N4148       | D1, D2       | Diode, glass body                                       |
| 1   | 47pF         | C1           | Monolythic or Disk Ceramic Capacitor                    |
| 1   | 22pF         | C1 alternate | Monolythic or Disk Ceramic Capacitor                    |
| 1   | 100pF        | C1 alternate | Monolythic or Disk Ceramic Capacitor                    |
| 2   | 0.1uF        | C3, C4       | Monolythic Ceramic Capacitor                            |
| 1   | 4.7uF        | C2           | Tantalum polarized capacitor                            |
| 1   | 2N3906       | Q1           | PNP Transistor  |
| 1   | BS170        | Q2           | N-Channel MosFet  |
| 1   | Relay        | K1           | Axicom V23105 12V relay                                 |
| 1   | Header Strip | X1-X7        | 16 Pin header (not needed if off board connectors used) |
| 1   | PCB          | PCB          | Circuit Board   |

## Board Layout



Note: Pin 1 of X1 is the pad closest to the X1 Label

Install the following components on the PC board.

#### Resistors

|    |                                    |
|----|------------------------------------|
| R1 | 10K Ohm, 1/4W, Brown-Black-Orange  |
| R2 | 10K Ohm, 1/4W, Brown-Black-Orange  |
| R3 | 10K Ohm, 1/4W, Brown-Black-Orange  |
| R4 | 100K Ohm, 1/4W, Brown-Black-Yellow |

#### Capacitors

|    |  |
|----|--|
| C1 | 22pF or 47pF or 100pF monolithic or disk ceramic (use 47pf for most bands from 40-20M) |
| C2 | 4.7uF Tantalum (align + side lead with + pad on board outline)                         |
| C3 | 0.1uF monolythic ceramic   |
| C4 | 0.1uF monolythic ceramic   |

#### Transistors and diodes

|    |   |
|----|---|
| Q1 | 2N3906 (align flat to board outline with center pin away from flat) |
| Q2 | BS170 (align flat to board outline with center pin away from flat)  |
| D1 | 1N4148 (align band to board outline)                                |
| D2 | 1N4148 (align band to board outline)                                |

#### Misc parts

|    |   |
|----|---|
| K1 | Axicom V23105 Relay, (only fits one way due to pin configuration) |
|----|---|

## Features and Operation

The TR switch provides switching between two separate sets of contacts to two separate output/input pairs. It will sense RF input on the TX inputs and switch at about 100mW of RF and can be used over a frequency range of 160-6M. It can handle up to 100W of RF under matched conditions. If switching is not reliable on certain frequencies, the value of C1 may need to be adjusted up or down. In general, increase C1 for lower frequency operation and decrease it for high frequency use. The supplied 47pF capacitor should work over most bands from 80-20M. The kit also includes a 22pF and 100pF for improved performance on bands outside this range.

If direct keying is preferred, it can be accomplished by closing a connection between pin 2 and ground (pin 4) of X1. Also, to lock out keying by RF input to bypass the switch, connect pin 3 to ground (pin 4).

#### X1 Connections:

Pin 1: +12V (Pin next to X1 label on board, connect to 12 power supply)

Pin 2: External keying control line (Ground this pin to key manually)

Pin 3: Bypass control line (Ground to bypass the TR switch)

Pin 4: Ground

|   |    |   |      |    |
|---|----|---|------|----|
| 4 | 3  | 2 | 1    | X1 |
| G | BP | K | +12V |    |

## Troubleshooting

The Easy TR switch is intended to be easy to assemble and should operate without any problems. However, if it fails to operate, there are a few things to check:

Check the board for cold solder joints, these will appear rough rather than shiny. If in doubt, reheat connections to ensure a good connection.

Check for any solder bridges or solder whiskers that may short between adjacent pads

Verify correct location and orientation of the diodes D1 and D2 as well as the transistors Q1 and Q2. They should be oriented as shown on the PC board outlines.

Verify that power and ground are connected to Pins 1 and 4 of pads X1.

Test by connecting Pin 2 of X1 to ground with 12 power applied to Pin 1. You should be able to hear the relay click. If not, recheck components and solder connections as indicated above.

When applying RF to the TX input, you should hear the relay click. If possible, test at 7-10Mhz first to verify function and if not working at low or high frequencies, increase or decrease the value of C1 and retest. The kit is supplied with a 47pF capacitor for C1. For very low frequencies, 100pF or larger may improve switching performance and at the highest frequencies, 22pF or less may be needed for best operation.

If you still experience problems, please contact us at [grpkits.com@gmail.com](mailto:grpkits.com@gmail.com) and we will be happy to assist you.

# Schematic

