

QUASAR PROJECT KIT # 3029 - COMBINATION LOCK

General Guidelines for Electronic Kits and Assembled Modules

Thank you for choosing one of our products. Please take some time to carefully read the important information below concerning use of this product. The assembly and operating instructions are on the following pages. Help with component identification can be found on our website at www.quasarelectronics.com/componentid.htm. If you are unsure about any aspect of the assembly or use of this product please contact our Support Team before proceeding.



WEEE Directive (Waste Electrical and Electronic Equipment)

Notice To All European Union Citizens. Important environmental information about this product.

The crossed out wheeled bin symbol on this product, package or documentation indicates that disposal of this product after its lifecycle could harm the environment. Do not dispose of this product (or batteries if used) as unsorted municipal waste. It should be disposed by a specialized company for recycling.

The unit should be returned to your distributor or to a local recycling service. Please respect the local environmental rules. If in doubt contact your local authorities about waste disposal rules.

Safety: General rules concerning safe use of our Kits or Modules.

To ensure your safety, please observe these safety measures. In no way are these complete. As safety requirements vary, please check with your local authorities, in order to comply with local requirements. If in doubt, seek the help of a qualified person.

Battery or wall-adaptor operated devices are safe devices. They do not require special attention unless mains voltage is connected to an output e.g. a relay.



To ensure electrical safety, and also protection from fire or personal injury, make sure your mains operated equipment complies with these safety hints:

- Use a suitable plastic enclosure. If a metal enclosure is used, make sure it is properly earthed.
- Use a power switch if the device consumes more than 10W. Use a double pole switch for mains operated, transformer-less kits.
- Mount a fuse in series with the mains switch. Use a slow blow (T) 50mA fuse for transformers up to 10W and a 100mA fuse for transformers up to 20W.
- Use a mains input connector, or a robust power cord with a clamp.
- Internal wiring carrying mains voltages must have a minimum cross-sectional area of 0.5mm².

If supplied, attach the power rating label near the power cord of the device and fill-out the mains voltage, frequency, power consumption and fuse values.

Troubleshooting and Support

90% of non working kits are due to poor soldering.

We operate a Get-You-Going service for non-working kits but there is a charge based on the time and components needed to complete the repair. Quite often it is not economically viable for us to repair and it is cheaper to supply a new ready made product at full cost.

Disclaimer

Quasar Electronics reserves the right to change product specifications or to discontinue products without notice. Quasar Electronics cannot be held responsible for any loss or damage, direct or indirect, which might occur from the use of a product. Quasar Electronics Kits or Modules are intended for educational and demonstration purposes only. They are not intended for use in commercial applications. If they are used in such applications the purchaser assumes all responsibility for ensuring compliance with all local laws. In addition, they are not suitable for use as or as a part of life support systems, or systems that might create a hazardous situation of any kind.

QUASAR PROJECT KIT # 3029 - COMBINATION LOCK

This Kit gives a cheap, easily understandable and adaptable combination lock. The relay will only respond to the right sequence of four numbers keyed in on the remote keypad. Touching any other key will reset the lock. The key combination can be easily changed on the main mother board.

The kit is constructed on a single-sided printed circuit board (PCB). Protel Autotrax and Schematic were used.

ASSEMBLY INSTRUCTIONS

Components may be added to the PCB in any order. It is usually easiest to add the lowest height components first; the resistors. Make sure you get the diode, electrolytic capacitor and LED around the correct way. The short lead of the LED is the cathode. The bar on the overlay shows the hole for the LED cathode. There are 3 links to add to the main PCB. These are short links - use some of the wire cut off the resistor legs for them. They are shown by the 3 lines next to three 4M7 resistors. The overlay shows how to solder the two box headers to each PCB.

Connecting the Wire Cable. We have supplied the cable connected to 10 pin sockets at both ends. Check that pin 1 on both sockets (marked by a triangle on the body of the socket) are electrically connected together. Pin 1 is the cable strand marked in red. It is connected to the pin marked with a triangle on the plastic body of the socket. Check that when you connect the two PCB's together that pad 1 on the main PCB connects to pad 1 on the keypad PCB. (Use a multi-meter to do this.)

OPERATING INSTRUCTIONS

Choose four numbers you want to be the secret combination. The numbers must be different. Let us choose 1357. That is, we want to touch 1 then 3 then 5 then 7 on the Remote Keypad for the relay to trigger. Touching any other number we want to reset the unit.

On the main PCB connect Pad A to one of the pads on line 1 using some of the hookup wire provided. Connect Pad B to a pad on line 3, pad C to a pad on 5, pad D to a pad on line 7. Now connect the five remaining numbers to the five pads on the RESET pad.

Connect a 9 to 12V power supply. The Combination Lock is now ready. The relay output is rated to switch resistive loads of up to 48Vac or 28Vdc @ 3 Amps maximum current. The 4013 IC's will work from 3V to 18V so the unit is quite flexible and can be adapted to many situations.

CIRCUIT DESCRIPTION

The circuit is built around two 4013 dual D flip-flop (FF.) Each 4013 contains two D flip-flops. The four FF are connected to A, B, C and D pads. ABCD gives the 4 digits which must be keyed in in sequence for the relay to trigger. The five remaining digits may be connected to the RESET PAD. If one of these digits is keyed in during the ABCD sequence then the circuit will reset.

The circuit diagram and the block diagram of the 4013 show how the lock works. The ABCD touch pads are connected to the Clock input pins 3 and 11 of each 4013. ABCD pads are normally tied low by the 4M7 resistors. Touching the pads of each keypad briefly pulls the input high and the state of the FF is altered. The output Q pins (1 and 13) are wired so that when the correct sequence is keyed in then pin 13 of IC2 turns on the transistor.

The reset keys are all wired to the Set pins (6 and 8) of each IC.

WHAT TO DO IF IT DOES NOT WORK

Poor soldering is the most likely reason that the circuit does not work. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB - the IC's, and the electrolytic capacitors. Thirdly, follow the track with a voltmeter to check the voltage at various parts of the circuit. Did you add the 3 links?

Did you check the cable? Use a continuity tester or resistance meter to check the cable connections. Insert the cable into both PCB's and use the meter to check that pad 1 connects to pad 1 on the other PCB. Check for all 9 pads and the high voltage pad.

If you are satisfied that the lock is assembled correctly then use the DC range on your voltmeter and connect it to pin 1 of IC1. Touch a reset pin then the pad number that Pad A is connected to. The state of pin 1 should change. If it does not change then that FF is not working for some reason. Similarly check pins 13 of IC1. Then move to pins 1 and 13 of IC2.

Email us if you have problems or comments:

sales@quasarelectronics.com

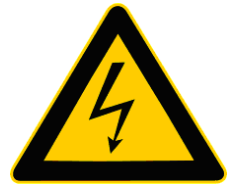
See our website at <http://www.QuasarElectronics.com>

GENERAL RELAY INFORMATION

Warning! Risk of Electric Shock!

This information concerns kits and modules with relay outputs. TO USE THE RELAY OUTPUTS SAFELY YOU MUST OBSERVE THE MAXIMUM VOLTAGE AND CURRENT LIMITS QUOTED IN THE **PRODUCT DOCUMENTATION** (this is because the board design may not be rated to switch the maximum voltage and current limits printed on the relay itself or specified in the relay manufacturer's data sheet).

Controlling mains equipment with relay outputs must be treated with extreme caution. Electric shocks can cause severe and permanent injury or even death. Construction, installation, testing and commissioning should only be attempted by suitably qualified persons, or under the supervision of a suitably qualified person. These products are not suitable for children. Before connecting mains powered equipment to the relay outputs please check with the relevant authorities in order to ensure compliance with all current safety regulations. Many areas of the assembly may operate at mains voltage. A suitable isolating enclosure must be used. Exposed screw terminal blocks on some products must be insulated to prevent contact with exposed metallic parts at mains potential. Connected equipment should be suitably fused.



You will find relay outputs on many of the kits and modules that we sell. A relay is an electrically operated on/off switch. The voltage and current limits specified in the product documentation generally relate to resistive or light inductive loads.

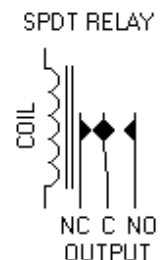
Relay Terminals

Most boards have SPDT (Single Pole Double Throw) style relays. These have three outputs:

C = Common

NO = Normally-Open contacts connect the circuit when the relay is activated; the circuit is disconnected when the relay is inactive. It is also called a Form A contact or "make" contact.

NC = Normally-Closed contacts disconnect the circuit when the relay is activated; the circuit is connected when the relay is inactive. It is also called a Form B contact or "break" contact.

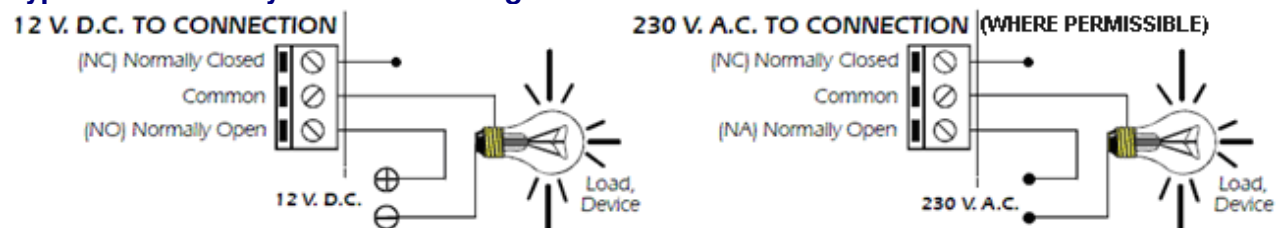


Connecting the Device you want to Control

You must provide an external power source to the device you want to control. No voltage is present at the relay terminals (remember it is just a switch). The relay is normally connected in *series* with the positive (+) power wire of the device you want to control.

In this case, the positive wire from the power source should be connected to Common. Then either the NO or NC terminal (as appropriate for your purpose) is connected to the positive (+) wire going to the device you want to control. The negative (-) wire does not connect to the relay at all. It goes directly from the power source negative output to the device negative (-) terminal.

Typical SPDT Relay Connection Diagrams



Anti-Spark SPDT Relay Connection Diagram

Sometimes the connected equipment can cause arcing across the relay contacts. This must be corrected by installing a resistor and capacitor (not supplied) between the two contacts of the relay as shown below. Component values are for 230Vac mains.

