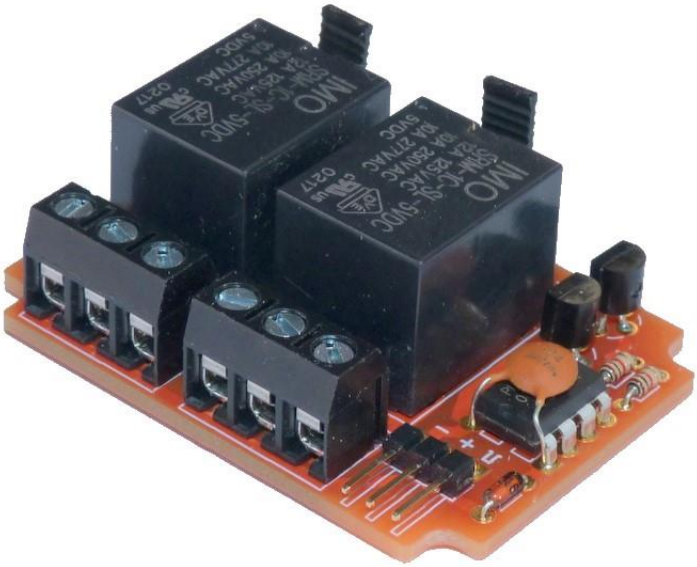
Dual 10A RC Relay MK2



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INTRODUCTION

This unit allows the signal from a standard radio control receiver to independently activate a pair of relays, each capable of switching up to 10amps at 30volts for the control of lamps, motors, bilge pumps, solenoids, sound effects etc.

This is an alternative method to that often used of fitting a servo with a cam to operate a microswitch at some point on its travel. A further benefit is that this unit's software allows the user to optionally configure the switching action to be latching or non-latching (momentary). Latching action is mainly used for circuits intended to stay ON the majority of the time (lights, smoke generators etc) whereas non-latching is mainly used for circuits that will only be switched ON briefly (sound effects, bow thrusters etc)

As this is a dual switch unit, it is really intended for use with a (spare) proportional channel of the receiver to allow the user to operate the relays independently i.e. moving the transmitter joystick in either direction from centre operates the appropriate relay.

If used on a switched digital channel of the receiver, both relays operate simultaneously and in opposition (ie one ON and the other OFF, then vice versa). This is not recommended.

A dual switch unit, like this one, can be wired up to give simple forward/reverse/stop control of a motor – be it a robot buggy or a bow-thruster in a model boat. A wiring diagram for this application is included elsewhere in this guide.

SPECIFICATION

Receiver voltage range: 4.4v to 6v

Receiver Channel:
A single proportional channel allows independent operation of each relay (1.5mSec neutral assumed).

Relay Contacts:
Two single pole change-over relays rated 10amp, 30volt.

Operating Modes:
Each switching channel may be configured for latching or non-latching operation by its jumper link

Loss of / Invalid Signal:
Both relays turn OFF and twenty consecutive 'good' pulses (less than 0.5 sec in total) must be received before normal operation resumes

Switch-on Delay:
At power-up, both relays are held in the OFF state for a period of 4 seconds. This is to allow time for RC receivers (particularly 2.4GHz types) to stabilise/lock-in to prevent inadvertent operation of the attached loads at power up

RELAY INFORMATION

Each relay has a single pole changeover (SPCO) set of contacts. These are completely isolated from the receiver circuit and may be wired up in exactly the manner that an ordinary switch would be.

The legends on the unit lid identify the screw terminal blocks associated with the two sets of relay contacts. Wiring is inserted through the slot in the case sides and the clamping screws are tightened via the slot in the case lid. The relay contacts are labelled as NC (normally closed), COM (common) and NO (normally open). When a relay is OFF, the COM contact is connected to the NC contact. When a relay is ON, the COM contact is connected to the NO contact – the latter are the pair of contacts most frequently used to simulate an ordinary switch.

The switched loads may be wired as desired using the main battery in the system or indeed other batteries of different voltage(s) to suit the load(s). Conventionally, loads are connected to ground (0v) and their 'hot' side is connected to the appropriate power source via the relay contacts.

OPERATION

Trip Points

The trip points (for operation of the switches) are set to be at about 40% of the joystick's travel (from centre) such that adjusting the other channel sharing the same joystick is unlikely to cause unintended operation of the switches. The span and offset on individual transmitters may serve to vary the trip points a little.

An amount of hysteresis or 'dead-band' has been applied to the trip points. This prevents relay chatter if the stick is held at the trip point and receiver noise varies the pulse width slightly – so for example in the non-latching mode of operation the relay turns ON at about 40% of stick travel (from centre) but doesn't turn OFF until below about 20% of stick travel.

Latching Mode

Moving the joystick to the trip point turns the relay ON. The joystick can then be returned below the trip point (usually to centre) and the relay remains ON. Now moving the joystick back in the same direction past the trip point causes the relay to turn OFF.

Non-Latching Mode

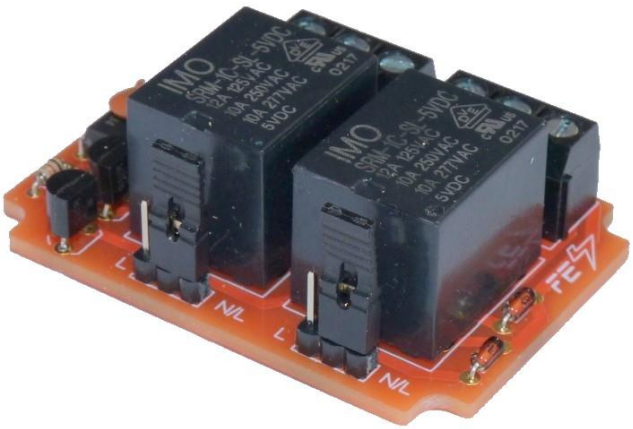
This is also referred to as 'momentary' operation. Moving the joystick to the trip point turns the relay ON but it only remains ON until the joystick is released back to its central position. i.e the relay only operates whilst the joystick is held away from its centre position.

Mode Selection

Each relay may be set for LATCHING or NON-LATCHING operation by moving the jumper link adjacent to that relay into the position marked “L” or “N/L” on the printed circuit board.

In the image right, the jumpers are shown setting both relays to NON-LATCHING operation.

The jumpers are continuously monitored so any changes made are immediately acted upon.

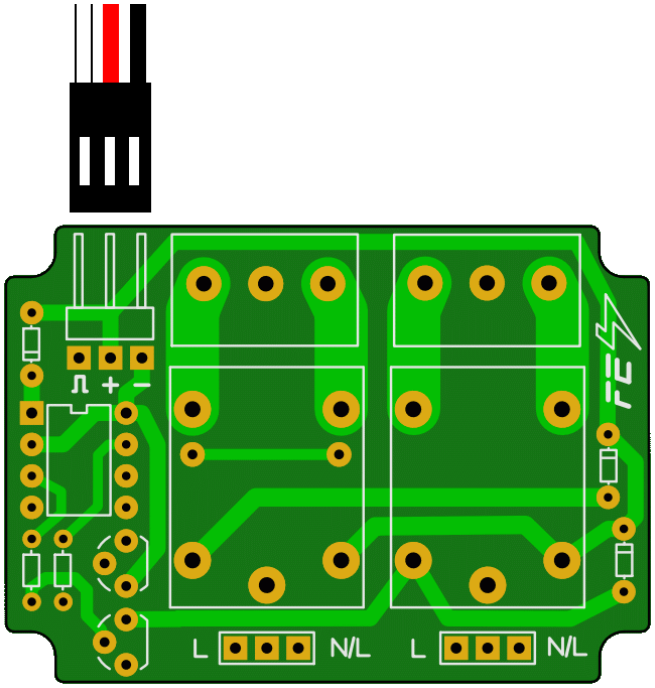


To gain access to the jumper links, the lid of the unit requires to be opened by removing the 4 screws. *When replacing the lid, take care not to over-tighten the screws lest you strip the threads in the plastic case.*

Though it anticipated that the mode of each switch will be set prior to installation, it is not necessary to remove power from the unit to adjust the mode(s) when required - the link positions are read immediately they are changed and the relays behave accordingly.

WIRING

Receiver - the unit is supplied with a short male/male Futaba lead to connect it to the receiver. The lead plugs into the unit as shown – ie with the white wire closest to the edge of the unit.



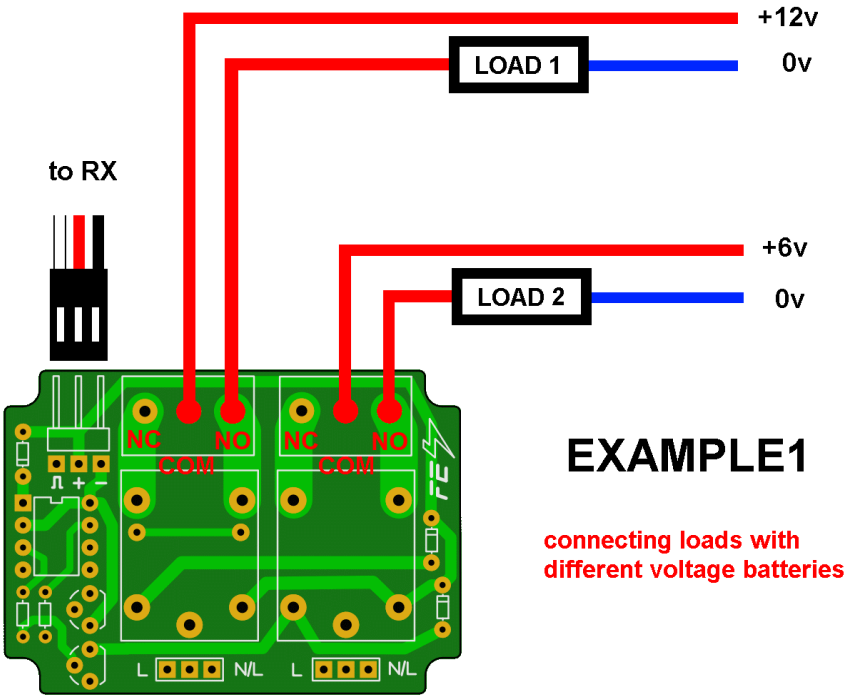
The remaining end is plugged into the chosen channel of the receiver.

The unit takes its power, including driving the relays, from the receiver's 5v supply.

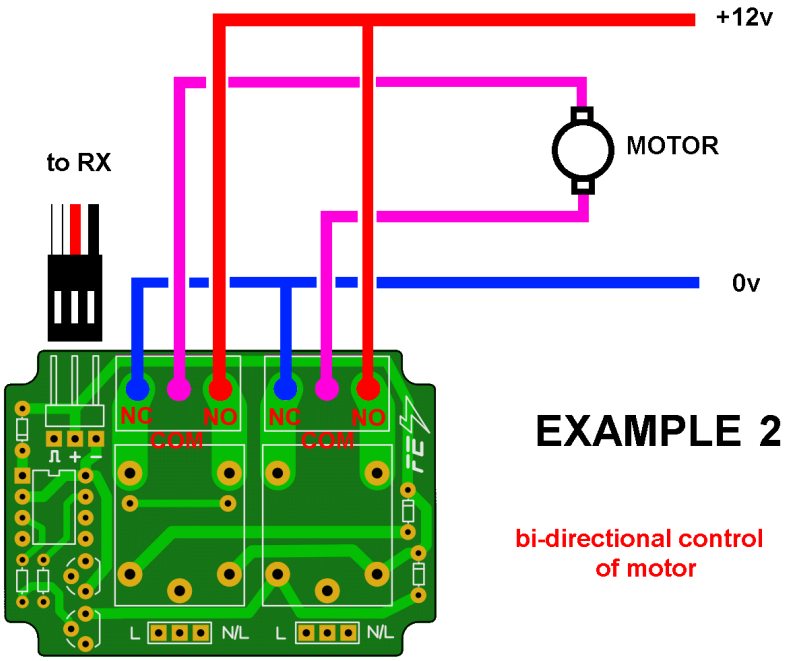
The assignment of the colours to functions of this cable is as follows:-

white = signal
red = receiver +ve (5v)
black = receiver -ve (0v)

Loads - the diagram below shows an example of how two loads requiring different voltages can be wired to the unit.



The following diagram illustrates how the unit may be connected up to give simple bi-directional control of a motor, including stop. Both switches should be configured in non-latching (momentary) mode for this application.



TESTING AND SETTING UP

Before testing the unit, the latching / non-latching mode jumpers should be set to the desired state for each channel. As supplied the factory default setting is non-latching.

Initially, connect the unit to the receiver alone. Switch on the transmitter first, then power the receiver. Allow at least four seconds (switch-on delay period) for the unit to become active before operating the receiver.

Then move the joystick of the chosen channel and see if the relays operate in the expected positions described earlier. The relays will be heard to gently click when they pull in and drop out. This click may be easier to hear if the unit is firmly pressed onto a table or work surface which serves to amplify the sound.

Now the unit may be wired to the chosen loads in the chosen configuration and the function test repeated.

NOTES

If controlling motors in the forward/reverse/stop configuration, it should be noted that in the stop position the relay contacts short the motor terminals together. Thus with a motor running at high speed and especially if it is driving a high inertia load, shorting its terminals will cause it to stop extremely quickly (the so-called 'suicide' braking method) which could cause mechanical damage to the motor, its gearbox and/or load – quite apart from causing very high currents to flow from the motor through the relay contacts, again possibly damaging or reducing the life of either or both. In the same way, instantaneous reversing gives both the motor and the relay contacts a hard time.

In practice this is only an issue with heavy vehicles with excellent traction, which are more likely to be controlled by an ESC rather than this unit. In proving tests of the prototype unit both the relays and a selection of various motors/motor-gearboxes survived thousands of start/stops followed by further thousands of reversals.

Typically in marine applications water flow over a (suddenly) stopped propeller doesn't cause back-driving of the motor and the high currents associated with shorted dynamo action.

If the motor is wired up for unidirectional control through a single set of NO (normally open) contacts, then none of the foregoing applies.