# Borders Model Boat Club

About Switchers

A "Switcher" is a gadget which provides a switching function from a radio channel. This enables you to operate accessories on your model, such as lights, by radio control. Usually the unit contains a relay, but some solid state units are on the market.

Some switchers only provide a simple on/off function, but others may have options providing more complex switching functions, such as toggling (push on, then push again for off) . This type of switcher is often used with two channel radio, with the switching point set so that the unit toggles when a control, possibly the throttle, is pushed momentarily to one of the extreme control positions.

Using a Typical Switcher
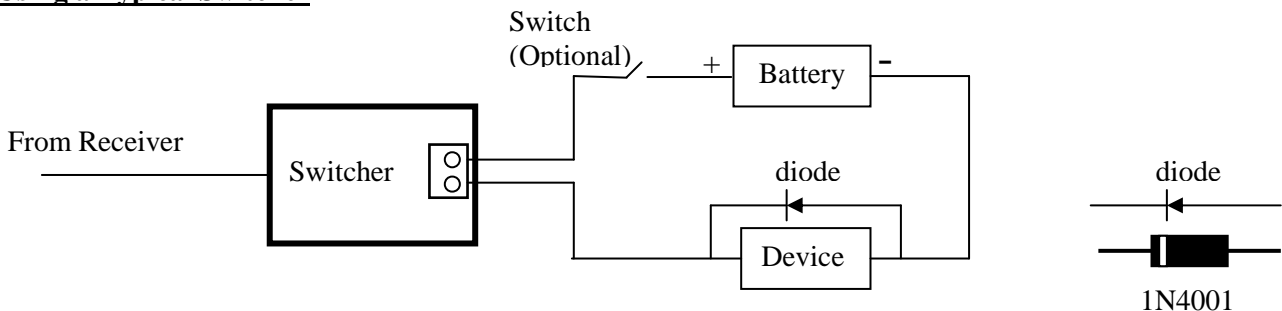
The best place for a relay switcher and optional switch is in the +ve line from your device to the battery. To protect the relay contacts from being burnt by any inductive kick back it is usual to fit a "catching" diode across the terminals of the device being switched. A suitable diode is a 1N4001 which must be fitted with the banded end at the +ve side of the device. Alternatively a 100nF ceramic capacitor could be used.

A fuse may be fitted if desired in the line between the + terminal of the battery and the switcher terminal.

Typical DIY Circuits

Older Switcher Designs

These offer only the simple on/off function and usually use logic chips.
The circuit below is typical, and uses a 4013 "Dual D type Flip Flop". It has a possible advantage over the more modern microprocessor circuits in that no chip programming is required. The downside is that they have no filtering of the input signal, and can be triggered by radio interference.
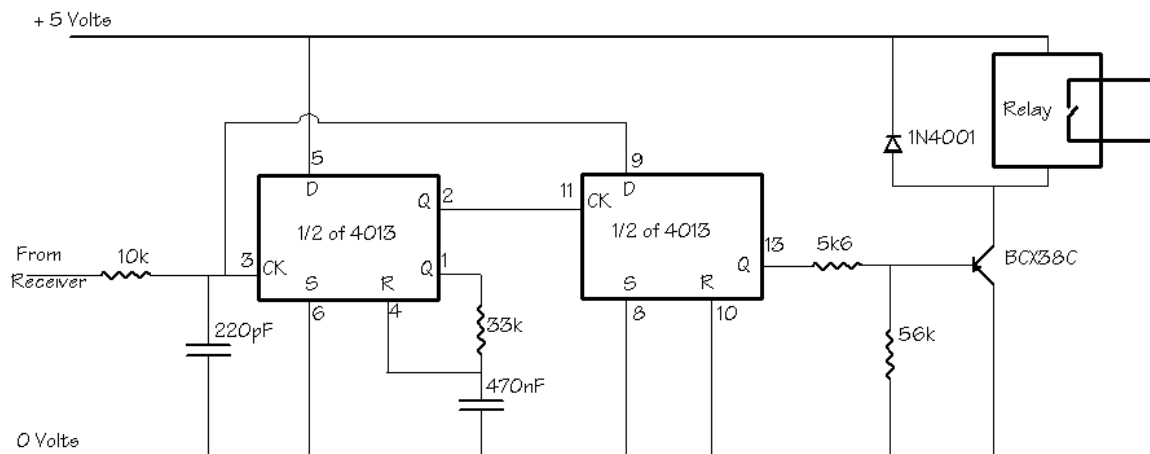
How it works

The receiver sends pulses, which vary in length from 1 to 2 milliseconds, which represent the travel of a servo. Thus 1.5 milliseconds will represent the mid position.
The first Flip Flop is configured so that when the leading edge of a pulse arrives from the receiver, it generates a 1.5 millisecond pulse. The second Flip Flop is configured as a latch and stores the state of the incoming signal when the 1.5 millisecond pulse ends. If the incoming pulse is shorter than 1.5 milliseconds, a low level is stored. If the pulse is longer, then a high level is stored. (to provide adjustment of the switching point, a variable resistor can be substituted for the 33K resistor

The output from the chip to the transistor can be taken from either pin 12 or pin 13. Since these are complementary outputs, it enables the sense of the switch to be reversed.

The circuit can be made up on a small piece of Stripboard (eg Veroboard).

Modern Switcher Designs

These use microprocessors to make the units simpler and more versatile. The designs usually have options which are selected by switches or jumpers on the circuit board. These will usually include the facility to program the switch point (the control position which causes the gadget to switch), a choice between simple on/off switching, or toggle switching, and possibly a choice between "Normally On" or "Normally Off" settings. They usually incorporate a programmed routine that checks the length of incoming pulses, rejecting any that are outside of the standard range. This makes them virtually immune to radio interference.
 The circuit below which uses a PIC12F629 microprocessor is typical and has provision for these three options. The relay must have a 5 volt coil, and have contacts rated for the current they must carry in your application. The maximum supply voltage for a PIC12F629 is 6.5 volts. It is important to remember this if you are using a receiver battery with higher than usual voltage in order to get more servo power.
 ----------Remember that for the circuit to work, a suitable program must be loaded into the microprocessor chip.   As supplied they have no program loaded and so are inert.---------
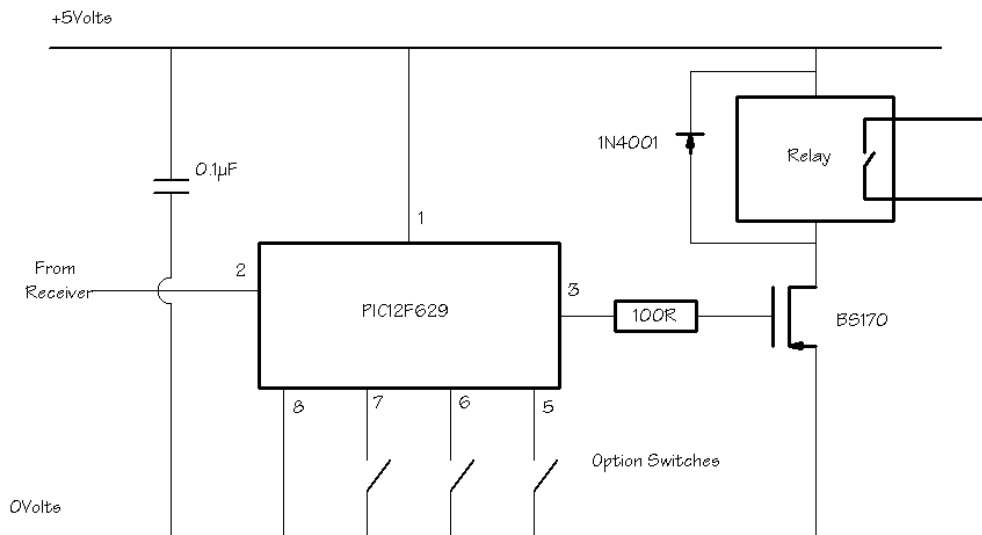
Contact klubsec@btinternet.com for information about a suitable program. (Pre-programmed chips and kits of parts are only available for members of the Borders Model Boat Club.)

The information given in this data sheet is given in good faith and is believed to be correct. However no liability can be accepted for any damage caused by following any advice given in the sheet.

GCH July 2015