SELECTING AN ELECTRONIC R/C SWITCHER – WHAT THEY ARE AND WHAT THEY DO.

A digital proportional radio-control receiver is a clever little gizmo. It can receive a series of signals from the transmitter; decode and amplify them and convert them into a series of corresponding pulses of +ve charge. It sends these pulses down the white or yellow wires to peripheral devices like servos and electronic speed controllers. These have their own electronic decoders and amplifiers which turn the pulses into controls for electric motors. OK – so that's a very simple overview but if you wanted a full technical description of a modern radio system then you wouldn't be reading this website, would you?

You'll notice that in all of these devices there is a decoder; this means that you can't simply plug a bulb or a motor into the receiver and expect it to work without some sort of circuit to unscramble the signal from the receiver.

For a long time now, many boat modellers have used the rotating output disc of a servo to operate a micro-switch. See Fig #1. This, in turn, switches a motor or lights ON and OFF. In certain applications microswitches still have their uses e.g. as limit switches to prevent a motorised function such as a deck-lift or sail-winch from over-running its stops at each end of its travel. If you look at the mechanism of an electrically-operated garage door then you'll probably see a couple of microswitches – one at each end of the screw-track; that's exactly what limit switches are. As simple ON/OFF devices in model boats for functions such as lights and sound units, however, they have distinct limitations.

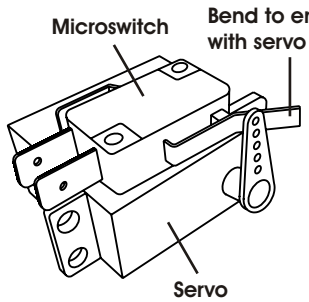

Fig #1

Firstly the current-carrying ability of a microswitch is restricted by its physical size. Thus if you want to operate a high-current device such as a fire-monitor pump motor then you'll need a pretty hefty microswitch on top of your servo. Problems can arise when fitting the switch to the servo and also for adjusting its switching point. With the necessary wiring for both the servo and the switch this combination can soon become an awkward item to fit. Secondly, a microswitch will only remain ON for as long as the servo disc is depressing the switch plunger; move the transmitter stick a little and the servo will release the plunger, with the result that the switched circuit goes OFF. If you have a spare channel on your transmitter which is operated by a simple 2-way toggle switch (often labelled "Retract U/C", "Flaps" or "Idle Up" for our aeromodelling colleagues) then this could be used for such a set-up. More often than not, however, the boat modeller will want to switch more than one auxiliary function and would soon run out of channels if he were to adopt microswitches for all of them.

You should note that Tx channels which are operated by simple 2-way toggle switches are very limited in terms of which functions they can control. If you were to connect a servo to one of these channels then it would only have two possible positions; fully one way or fully the other. This is because these channels are effectively non-proportional and therefore incapable of transmitting a "neutral" signal to the receiver. Ideally the channels used for an ACTion switcher should be operated by either a transmitter proportional stick, a rotary knob or a 3-way centre-biased ON/OFF/ON toggle switch. If in doubt, give us a call.

ACTion produce a range of electronic switchers which do away with the need for a physical switch or a servo. YOU DON'T NEED TO UNDERSTAND ELECTRONICS TO FIT AND OPERATE THEM!! They are "little black boxes" with a conventional 3-wire servo lead which plugs into the desired receiver output channel, and a number of screw terminals inside to connect up the lights, sound units or whatever else you want to operate. Some of them have internal relays whose contacts are identical in name and function to those found on a microswitch, so they are no more difficult to connect than one of those – See Fig #2. The relays we use are fully sealed, so there is no need to worry about the ingress of dust or water upsetting your system. In normal conditions they will operate for several hundred-thousand cycles before there is any chance of them sticking or otherwise misbehaving. Of course, in the unlikely event that a relay *does* become suspect ACTion offer a full repair and replacement service for all our units, so you won't have to chuck it way and buy a new one. At the time of writing, our standard repair charge for all of the switchers except the P93 is £10, and that includes all parts *and* the return carriage to a UK address.

There are several aspects to a switcher which you must understand before you can decide which one is best for your particular application. The first one is its capacity to carry electrical current. As with a microswitch, a higher current will require a larger device to switch it, so the 10 Amp-capacity P93 is physically a lot bigger than the P44, which will only carry 1 Amp. To determine the current in your circuit you must connect it up to a battery or DC power supply of the same voltage which you'll be using in your model. Connect a digital multimeter in series into this circuit, with its range set to 10 Amps. Switch on the circuit and read the current value. If it's very low then you might try a different range on the multimeter. Typically a 6v Grain of Wheat bulb will take 62mA while a 540 motor of the type fitted to pumps will require something like 3 to 4 Amps. Be careful! Most digital multimeters have different connections for the test probes when using the 10A DC Current range from those used for all the other ranges. Plug the test leads into the wrong sockets and you'll blow the fuse in the meter at the very least!

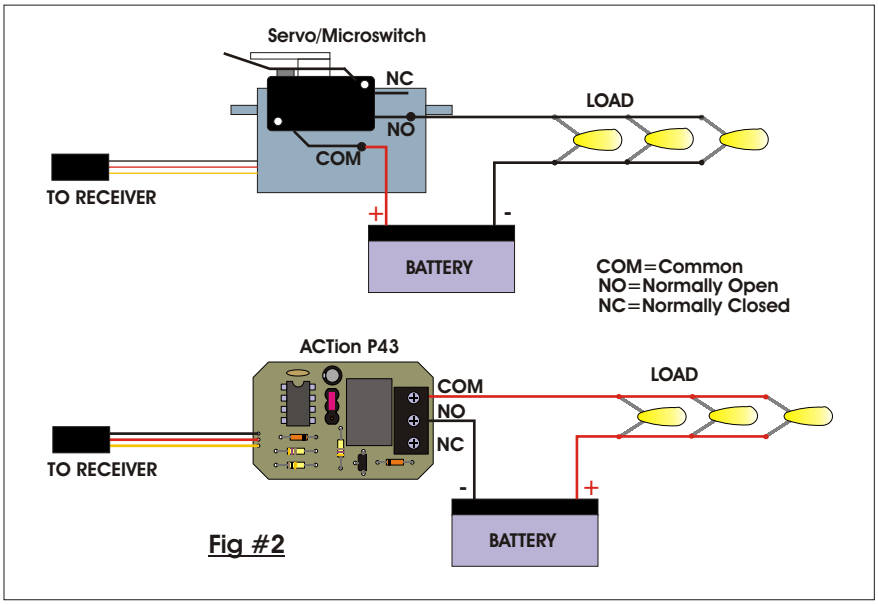

Fig #2

Once you know how much current you need to switch, the next decision is whether you need a latching or a momentary action. A latching switch is like a light switch in that once you've turned it ON it will remain ON until you "revisit" it to switch it OFF. A momentary (or non-latching) action is similar to a microswitch; it will turn the circuit ON when you move the Tx stick but as soon as you let go of the stick or switch then it will turn OFF again, like a bell-push. You would choose a momentary switching action for functions which you only need ON for a very short time, like a fog-horn sound unit or fire-monitor pump; and a latching switch for circuits which you want to remain ON for a while, such as lights or an engine sound simulator.

If you look at the table below, you'll see that it shows the maximum current capacity for each of our switchers AND whether it is a latching or momentary switch – many will do both, depending upon where you set the little on-board switches inside the unit. Don't worry – there are FULL wiring diagrams and instructions with every unit to explain how to set them up, and we're only a phone-call away if you get really stuck! It also shows the range of voltage which can be switched but, apart from the P69 "Pico Switcher" (of which more later), these all include both the standard 6v & 12v circuits adopted in the vast majority of installations.

The final decision is how many functions you need to operate. A "function" in this case is an individual circuit which comprises of a "load" (e.g. a bulb or series of bulbs; a sound unit; a motor etc) and a power source (a battery). Looking at the table for the P43, for example, you'll see that it offers one momentary operation only. This means that if you connect it to a channel which is operated by the movement of one of the transmitter sticks then it will switch ON when the stick reaches a certain point of its travel. Move the stick further in the same direction and the switch will stay ON, but move it back away from that position then the switch goes OFF again.

P44, on the other hand, will operate TWO separate circuits from one channel e.g. Tx stick moved to the left/up operates one circuit and the same stick moved to the right/down operates the other. It also has the facility to choose either latching or momentary action on each circuit, so you can have two of the same action or one of each. This makes it ideal where you want to operate lights (latching) and a horn (momentary) from the same channel. You can, of course, use a different battery for each circuit e.g. 6v for lights and 12v for a horn.

P91 does essentially the same as P44 except that it will handle much larger currents and the switching points are variable, so you can adjust the switch to come ON at any point on the Tx stick's travel between neutral and full-deflection. Don't forget that you can also run a switcher via a Y-lead from another channel so, for example, you can connect a series of running lights to a switcher which is connected to the throttle output, and contrive for them to come on only when the model moves forward. Another use for P91 would be to switch on the central motor of three in a warship or MTB at ¾ Full Ahead speed, using either a Y-lead or the "third motor" output from our P40 Motor Mixer.

P69 Pico is also a selectable twin-function switch, but because of its tiny size it uses small transistors instead of relays and it takes the power for the two circuits directly from the receiver battery instead of a separate supply. This means that it can't handle anything which requires more than 6 volts or 300 mA per circuit. It is, however, a "shoe-in" for lights, a smoke unit and a steam whistle in the Model Slipway Clyde Puffer or Steam Drifter.

P62 Quadswitch is a very clever unit which will operate up to FOUR latching circuits from the one channel. This is done by "jabbing" the Tx stick either one, two, three or four times in one direction to switch ON the appropriate circuit, and the same number of times in the opposite direction to turn the circuit OFF again. Like P44, you can use separate batteries (of differing voltages) for each circuit, if required.

Finally, P44 and P93 can be used to operate one motor in both directions, which makes them very useful for such applications as rotating turrets, cranes, winches, deck-lifts, cargo doors etc. We can even supply a set of limit switches and a wiring diagram to show you how to connect them up. The P93 High Power Multi Controller, in fact, is a whole *range* of different units all in one – check out the specification for yourself.

The coloured datasheets elsewhere on the website will give further details of each of the switchers and examples of typical installations, but if you're uncertain about which one to use in your particular model then just pick up the phone or send us an E-Mail.

Switch #	Latching	Momentary	Functions per channel	Max current /function	Switching range (V)	Lights	Sound Units	Motors (Max Current)	Pump motors	Bow thrusters	Winches, lifts, doors
P69	Yes	Yes	2	300 mA	4.8 - 6.0	Yes	Yes	Yes (300mA)	No	No	No
P43	No	Yes	1	1A	6.0 - 30.0	Yes	Yes	Yes (1A)	No	No	No
P44	Yes	Yes	2	3A	6.0 - 30.0	Yes	Yes	Yes (3A)	No	No	Yes
P62	Yes	No	4	1A	6.0 - 30.0	Yes	Yes	Yes (1A)	No	No	No
P91	Yes	Yes	2	10A	6.0 - 30.0	Yes	Yes	Yes (10A)	Yes	Yes*	No
P93	Yes	Yes	2	10A	6.0 - 30.0	Yes	Yes	Yes (10A)	Yes	Yes	Yes
										*Twin pump types	