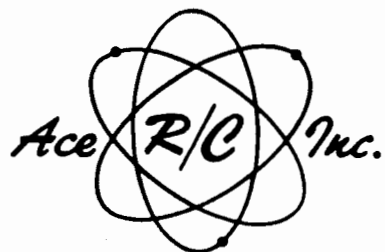
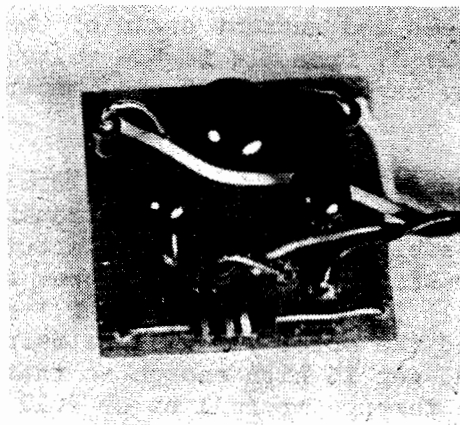


Designer Approved Kit

AOS-M

**ADD ON SWITCHER FOR
MOTORIZED ACTUATORS**

BY GERALD PERKINS



HIGGINSVILLE, MO. 64037

8/66

ADD ON SWITCHER FOR MOTORIZED ACTUATORS

Circuit by Gerald Perkins

Most everyone agree that a relayless receiver when used with an Add On Switcher and a double coil actuator is superior to receivers which use relays. They require no contact cleaning, no tiresome adjustment, and do not need arc suppression. While there have been some circuits presented that did the job, not all were fully capable of doing the job with many of the actuators on the market, since they were limited as to current carrying capacity and also voltage characteristics of the transistors, and also were finicky about which motor they liked to work with. Some also used two sets of batteries.

This circuit, by Gerald Perkins of Hendersonville, North Carolina, happily overcomes most of those objections. It is a simple and straight forward single pole double throw type of switcher, is very simple to wire and has a component callout of only 9 electronic parts. It does have one variable factor, but this simply means that it is adaptable for a wide range of relayless receivers and also a wide range of actuator devices.

It uses three transistors, two of which must be the complementary types--NPN and PNP of the switching variety. Gerald says that he has used the Texas Instrument 2N1302-3 and 2N1304-5 because of the low V_{CE} saturation and fairly uniform characteristics. The GE 4JC1C1132 and 4JX11C1847 also will work well. The Fairchild 2N3638 and 2N3646 work very well and also since they are epoxy units seem to withstand the current drains without overheating.

R4 which is in series with the motor is the variable in the circuit. By varying this you can tailor the speed and current drain of the actuator to suit the voltages that are going to be used, from 2.4 to 4.8 volts, or even more in some cases. Drain should not in any case exceed 500 milliamperes with the Fairchild devices.

Top view of the TI, GE and Fairchild transistors are given in the PC layout, so you will not have any difficulty in mounting the transistors on the PC base. Install V1, then V2, then V3, seeing that they stand about 1/8 inch above the PC base. Then install the four resistors. Note that three stand on end, and one lies flat on the board. R4, you will find, may vary from 2.7 ohm to 10 ohm depending on the voltage supply used, and the motor you will be using in your actuator. If you are using it with the Rand, get it high enough so that the motor control portion of the Rand will cycle through on full on or full off. If this resistor is too high the Rand unit will not cycle through the motor control positions.

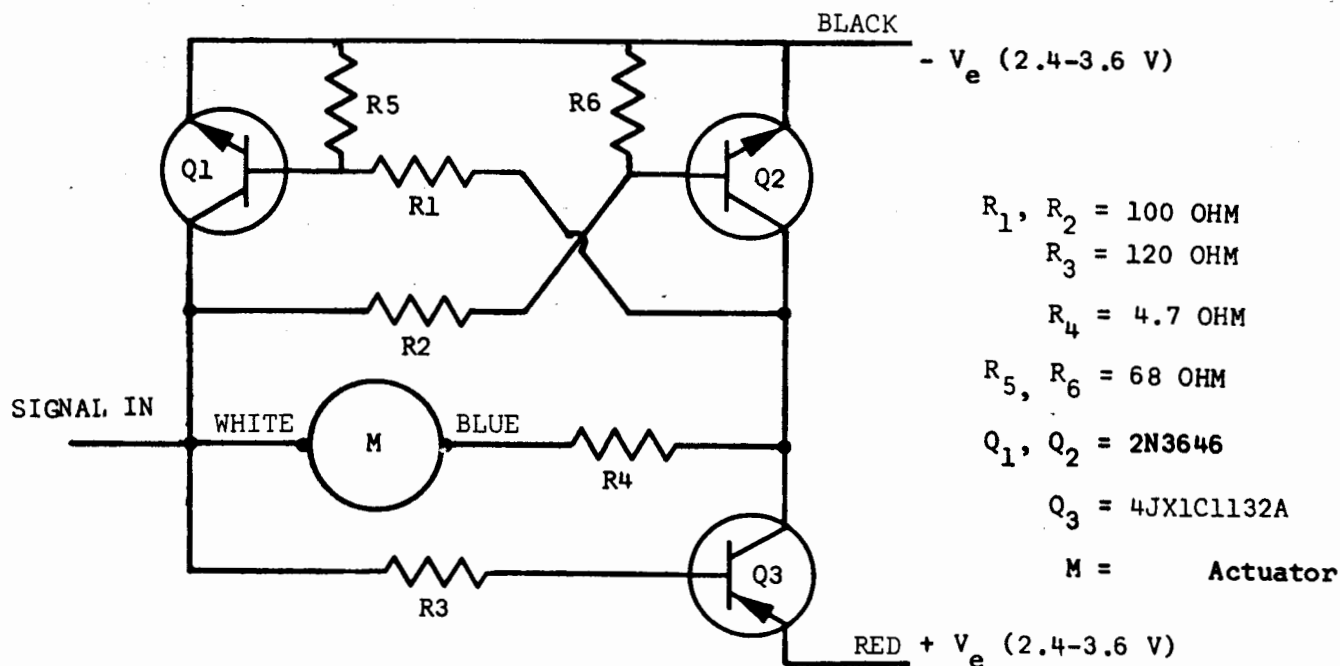
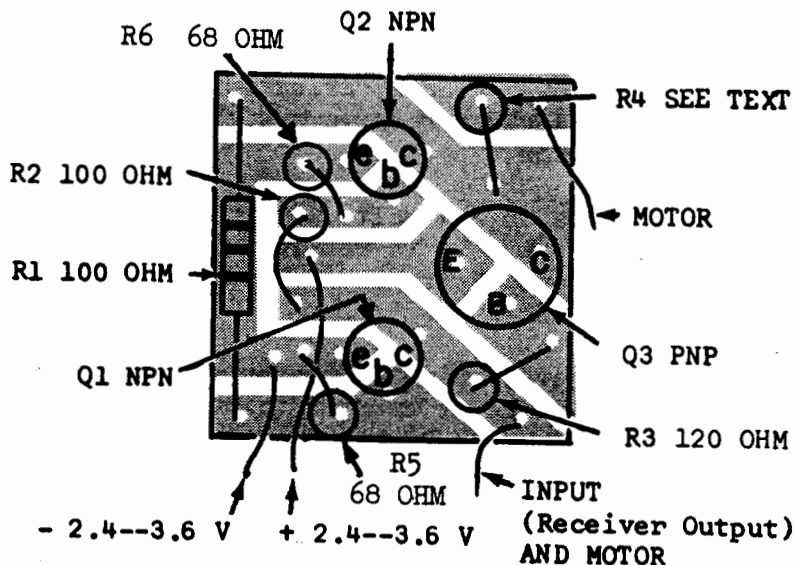
Solder 19 strand #26 hookup into the four positions required on the PC board using wire that is long enough to effect the hookup in your model.

Double check all solder connections on the PC base. Clean the printed circuit board. Isopropyl alcohol makes an excellent cleaning agent. If you wish you can spray the printed circuit board with clear Krylon or paint with clear dope to prevent any high resistance shorts and to prevent the copper from tarnishing.

Insert the four wires through a rubber grommet (a servo mounting grommet is ideal). Mount the AOS-M in an Ace PB#1 plastic box, which measures 1 x 1 x 3/4. You can make half moon cut outs in both the bottom and the lid to accept the grommet. Use foam rubber or polyurethan padding in the box to prevent the switcher from rattling about.

The completed unit may be mounted anywhere in the airplane near the receiver and actuator. It can be hard mounted, or foam can be used if desired for shock mounting.

Your Add On Switcher--Motor type will give you faultless operations if you have it wired correctly. It gets rid of your relay problems once and for all.



The circuit for the AOS-M has been improved by Gerald Perkins. With some variation in the motors as used and with the variation in the arc-suppressor choke that is used, the circuit now, with the inclusion of two components that were not in the original article in Grid Leaks, seems to have overcome most of the objections.

The secret in using the switcher with the Rand is to use 3.6 volts and adjust the R4 resistor to some acceptable value of less than 10 ohms -- 3 ohms works very well with the Rand as it has been tested. Those who wish to use a 4.8 volt supply may be in for trouble with certain transistors because they risk exceeding the collector dissipation rating of the transistors.

By carefully adjusting R4 to something around 10 ohms (by putting a pot in temporarily, finding a suitable value, then replacing with exactly the same value as measured, of a fixed resistor) will work in most circuits using complementary transistors of the 2N1300 series by TI or the Fairchild PNP-NPN combinations. When using inexpensive brand transistors, R4 may have to be removed entirely to get sufficient power from the motor, and this is risky business, and if you do this you are on your own. The modification now employed in the circuit will help users who have relayless receivers with some leakage (incomplete cutoff) in the output transistor.

If you decide to try to operate on 2.4 volts with the Rand -- try disconnecting the arc-suppression network. It is fairly quiet and will work with many receivers, especially superregen. Next, try 3.0 volts with fresh alkaline energizers and change batteries often.

With pulse type actuators -- every time the motor reverses direction, there is a momentary but very high surge of current through the circuit. Diodes of the proper rating across the brushes would help protect the output transistors, but the circuit performance would necessarily be compromised.

The AOS-M is an attempt to provide a simple, lightweight device for small aircraft. If it is operated conservatively, it should be the next thing to goof-proof and should require no further diodes nor components than those now specified.

If you are using receiver voltages over 3.6, tap down on your battery pack and get the actuator/switcher voltage specified and let the rest of the pack "float" much like a 6-volt reed receiver.

If the AOS-M is used as it was intended to be when designed -- something to provide a simple and lightweight device for small aircraft -- it will furnish you countless hours of proportional pleasure.

