#6070 SWITCHER KIT $9.95

RAND MANUFACTURING CO., INC.

8909 HUBBELL AVE., DETROIT, MICH. 48228

This is a relayless switcher kit for use on 3.0 to 3.6 volt supply and uses a non-center tapped battery. It is designed for use with the RAND GG PAK, which uses a Mitsumi 3 Volt motor. If used with other actuators, make certain that the maximum pulsing current at 6 cps does not exceed 500 m.a. or the transistors will be damaged. If used with a 1.5 volt motor, as in the RAND LR-3, HR-1 and HR-2 actuators, a 1.8 ohm resistor ½ watt must be installed in series with the motor. This resistor will slightly reduce the power of the actuator, but still leaves more than enough power for GG flying and is included in the kit.

It is good practice to keep all wires neatly twisted, and the motor wires should be as short as possible. We recommend the use of RAND Double-Sided Mounting Tape (#1006, 1007) for easy installation of the completed switcher onto the bottom of an LR-3. A portion of the black frame shrouding the motor may be removed so that it will form a more compact unit.

The success of this kit depends on your soldering ability, and is not for novices. Do not use acid fluxes. Resin-cored solder is included in the kit.

ASSEMBLY INSTRUCTIONS

Refer to drawing No. 1 for the hole numbers, No. 2 for component positions and No. 3 for side view of switcher. Note how the transistors are stacked. After each component is soldered into the circuit, clip off the leads as close as possible to the board.

Note the identification of the transistor leads in drawing No. 4 and how the resistors are installed, with the body tight to the board on drawing No. 5.

1. Install transistor 2N3569 in holes #2. Collector; #1, Base; #6, Emitter. Pull it tight to the board.
2. Install transistor 2N3569 in holes #31. Collector; #32, Base; #34, Emitter. Pull it tight to the board.
3. Install transistor 2N4354 in holes #4. Collector; #10, Base; #5, Emitter. Pull it tight to the board.
4. Install transistor 2N4354 in holes #28. Collector; #27, Base; #26, Emitter. Pull it tight to the board.
5. Install transistor 2N4257 in holes #33. Collector; #29, Base; #22, Emitter. Stand this one ¼" above the board.
6. Install transistor 2N4275 in holes #9. Collector; #8, Base; #7. Emitter. Stand this one up off the board ¼".
7. Bend one end of each resistor as in drawing No. 5.
8. Install the 47 ohm resistor (YELLOW, VIOLET, BLACK) with the long lead in hole #21 and the body down in hole #11.
9. Install the 100 ohm resistor (BROWN, BLACK, BROWN) with the long lead in hole #17 and the body down in hole #18.
10. Install the 22 ohm resistor (RED, RED, BLACK) with the long lead in hole #13 and the body down in hole #12.
11. Cut a 4" length of WHITE wire and solder into hole 3.
12. Cut a 4" length of BLACK wire and solder into hole 30. Neatly twist these two wires together for later connection to the actuator motor.
13. Cut an 8" length of RED wire and solder into hole 23.
14. Cut an 8" length of WHITE wire and solder into hole 19.
15. Cut an 8" length of BLACK wire and solder into hole 14. Twist these three wires together and solder to the 4 pin connector as shown in Diagram 6. *Do not* forget the sleeving.
16. Bend the tags of the switch as shown in diagram 7.

17. Cut *two* 6'' lengths of RED wire and solder one to each paired tags on the switch.
18. Cut a 12'' length of BLACK wire and twist together with the RED switch wire to form a harness, with the switch mid-way along its length.
19. Take one end of this harness and solder to the switcher board as follows: RED wire to hole 24.
20. Solder the BLACK wire to hole 15.
21. Take the other end and solder it to the 3 pin male battery connector as shown in diagram 8. *Do not forget the sleeving.*
22. Using a fine sanding disc, a fine cut file, or a sheet of emery cloth on a flat surface, flatten out the surplus solder and wire ends on the circuit board.
23. Take a stiff brush dipped in lacquer thinner and brush the surplus flux and solder particles from the circuit board.
24. Carefully examine the whole assembly for correct component placing, and the circuit board for cold soldered joints and bridged lands.

NOTE:

Holes 16, 20 and 25 are used to connect into a high rate elevator decoder as on a Dual Pak, and are *not* used with a plain GG switcher. (This unit is available in kit or assembled form to give a Dual Pak set-up.)

INSTALLATION

Solder the short BLACK and WHITE wires to the motor terminals, shortening them, if possible.

Contact glue or use RAND Double-Sided Mounting Tape (#1006, 1007) to hold the switcher onto the actuator base, or close by it.

If your receiver has a relay, remove it or disconnect it from the circuitry of the receiver. Usually, one side of the relay coil is connected to the negative land, the other leg to the output transistor.

Solder a WHITE wire to the land connecting the output transistor to the relay.

Then take the receiver power supply leads, and twist the three to form a neat harness, and connect to the receiver plug. See diagram 9.

Next, the single battery power supply is connected. A minimum capacity of 3.6 volt, 600 m.a./hr. is recommended, and the RAND #6061 Battery Pack is ideal. Connect the 3 pin socket as shown in diagram 10.

The other 3 pin plug is for connection to your charger.

#6070 SWITCHER KIT CHECK LIST:

1 Printed circuit board
2 Transistors, 2N3569 NPN
2 Transistors, 2N4354 PNP
1 Transistor, 2N4257 PNP
1 Transistor, 2N4275 NPN
1 Resistor, 100 ohm
1 Resistor, 47 ohm
1 Resistor, 22 ohm
1 Resistor, 1.8 ohm
1 Switch
5 plugs and sockets
Wire, solder and sleeving

SERVICING

All of the components in this kit have been checked against our standards. Switchers can be returned to us for repair for a minimum handling charge of $5.00. Components extra.

SUBSTITUTIONS FOR KITS #6070 & 6074

NOTE THESE CHANGES ON YOUR INSTRUCTION SHEETS BEFORE ASSEMBLING KITS.

RESISTORS:

47 OHM (yellow, violet, black)
AND
22 OHM (red, red, black)

} BOTH Replaced by 15 OHM (brown, green, black)

TRANSISTORS:

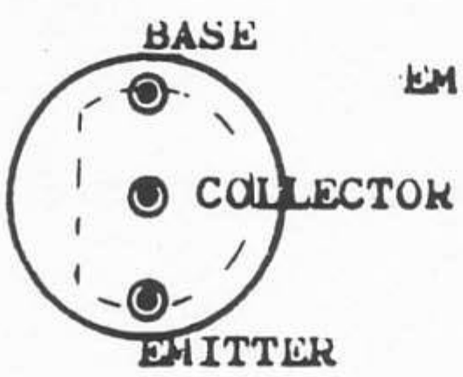
2N3569 may be replaced by SE6021 with the same leg connections.

2N4257 may be replaced by 2N5355 (or D29A5) with leg modifications.

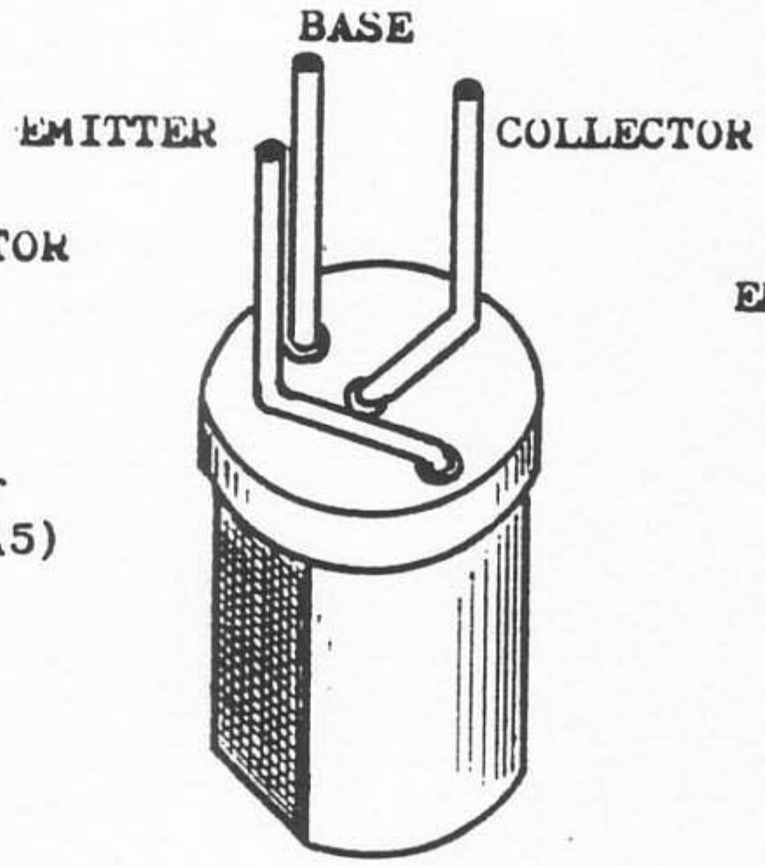
2N4275 may be replaced by 2N3414 with leg modifications.

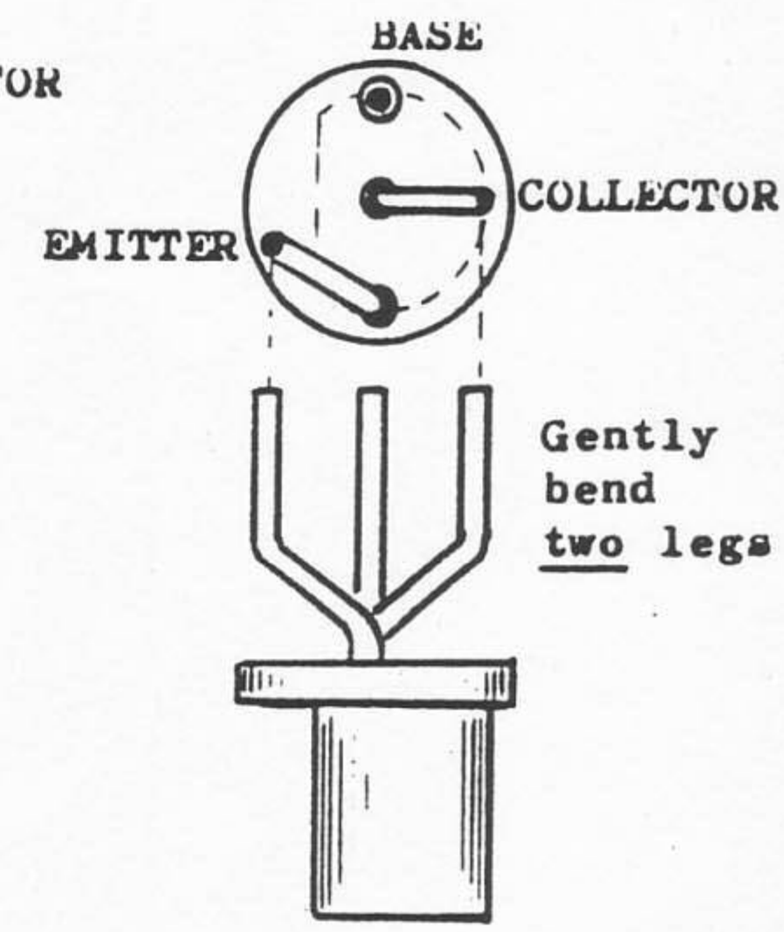
Transistor 2N5355 (or D29A5) and 2N3414 each have inline leg configurations, that require bending two of their legs to fit into the original circuit board holes. (The transistors may already be bent.)

Leg layout for 2N4354, SE6021



Leg layout for 2N5355(or D29A5) and 2N3414.





Gently bend two legs

NOW Manufactured By

RAND manufacturing co., inc.

8909 HUBBELL AVENUE
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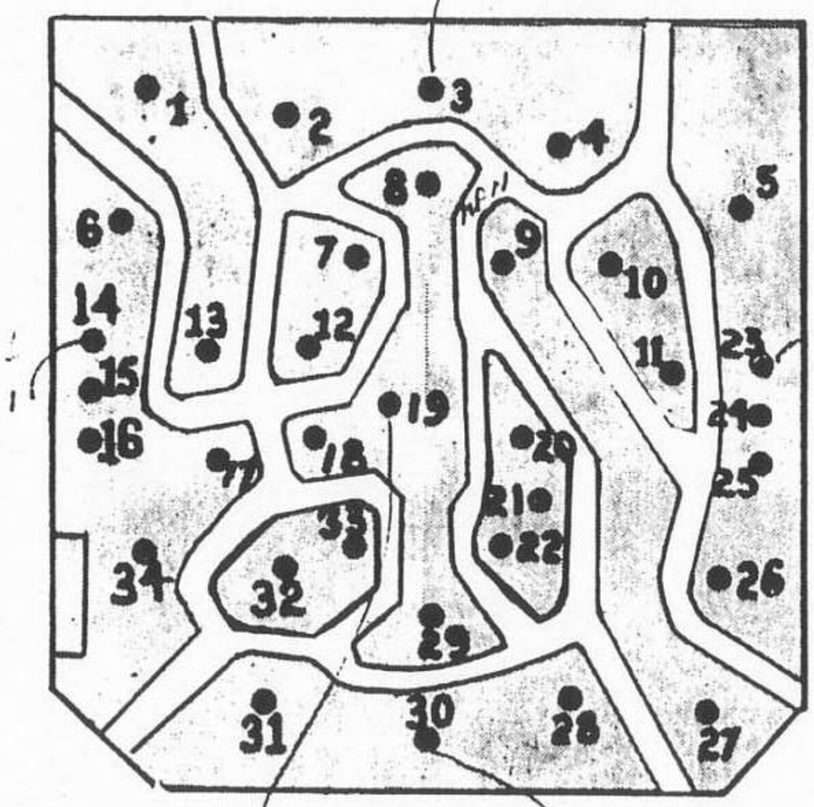
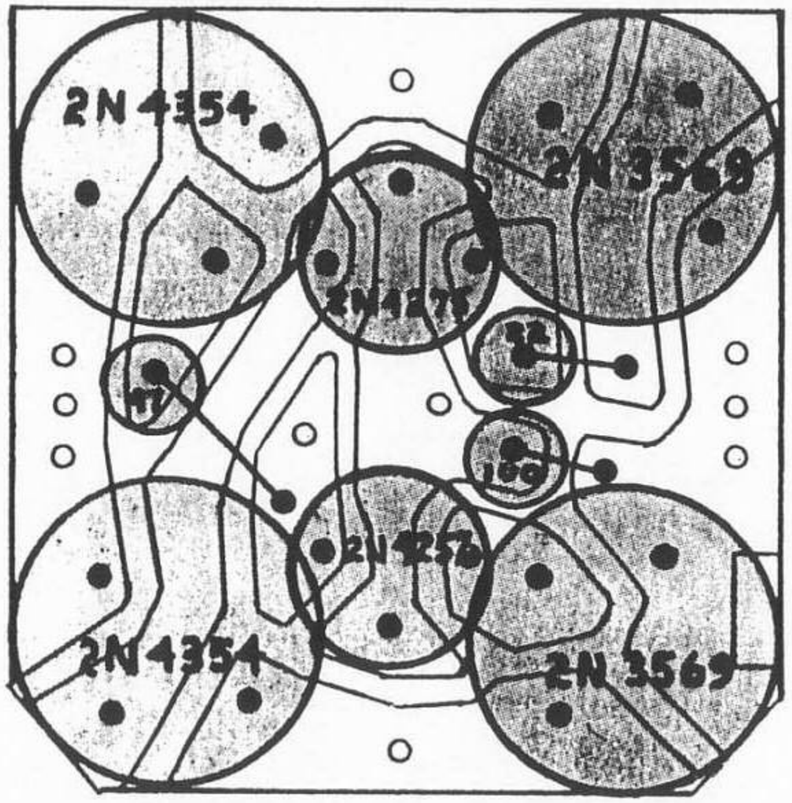
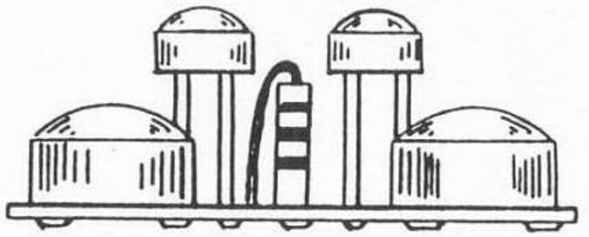
DIAGRAM FOR #[illegible]70 SWITCHER KIT



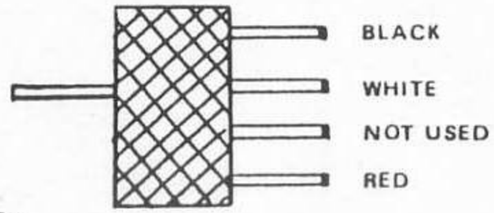
1 CIRCUIT SIDE



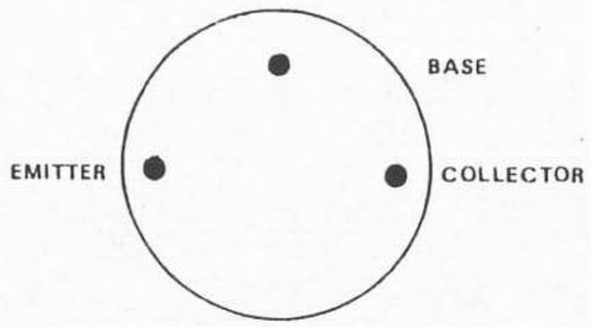
2 COMPONENT SIDE



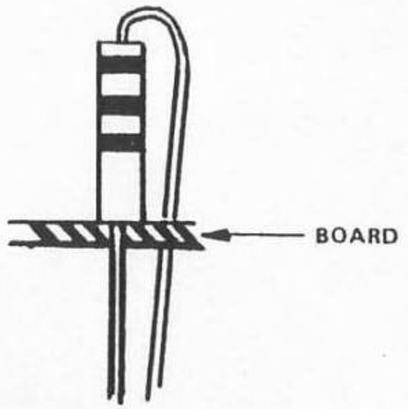
3 APPROXIMATE SIDE VIEW OF ASSEMBLED SWITCHER



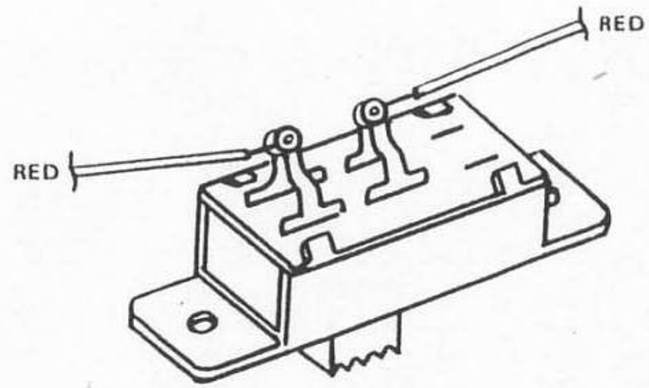
6 RECEIVER SOCKET



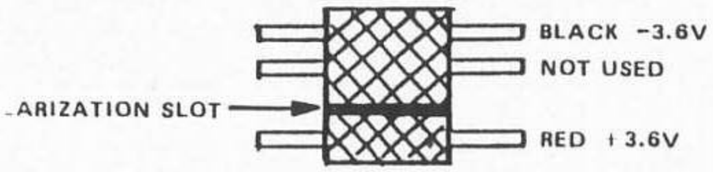
4 TRANSISTOR LEADS LOOKING ALONG WIRES



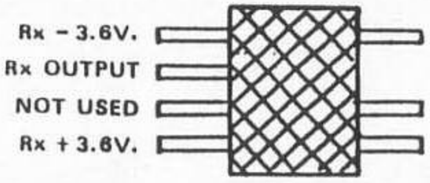
5 BEND RESISTOR WIRES



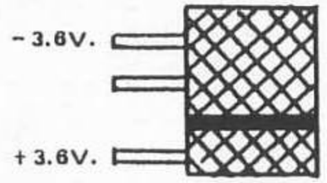
7 SWITCH



8 BATTERY AND CHARGING PLUG

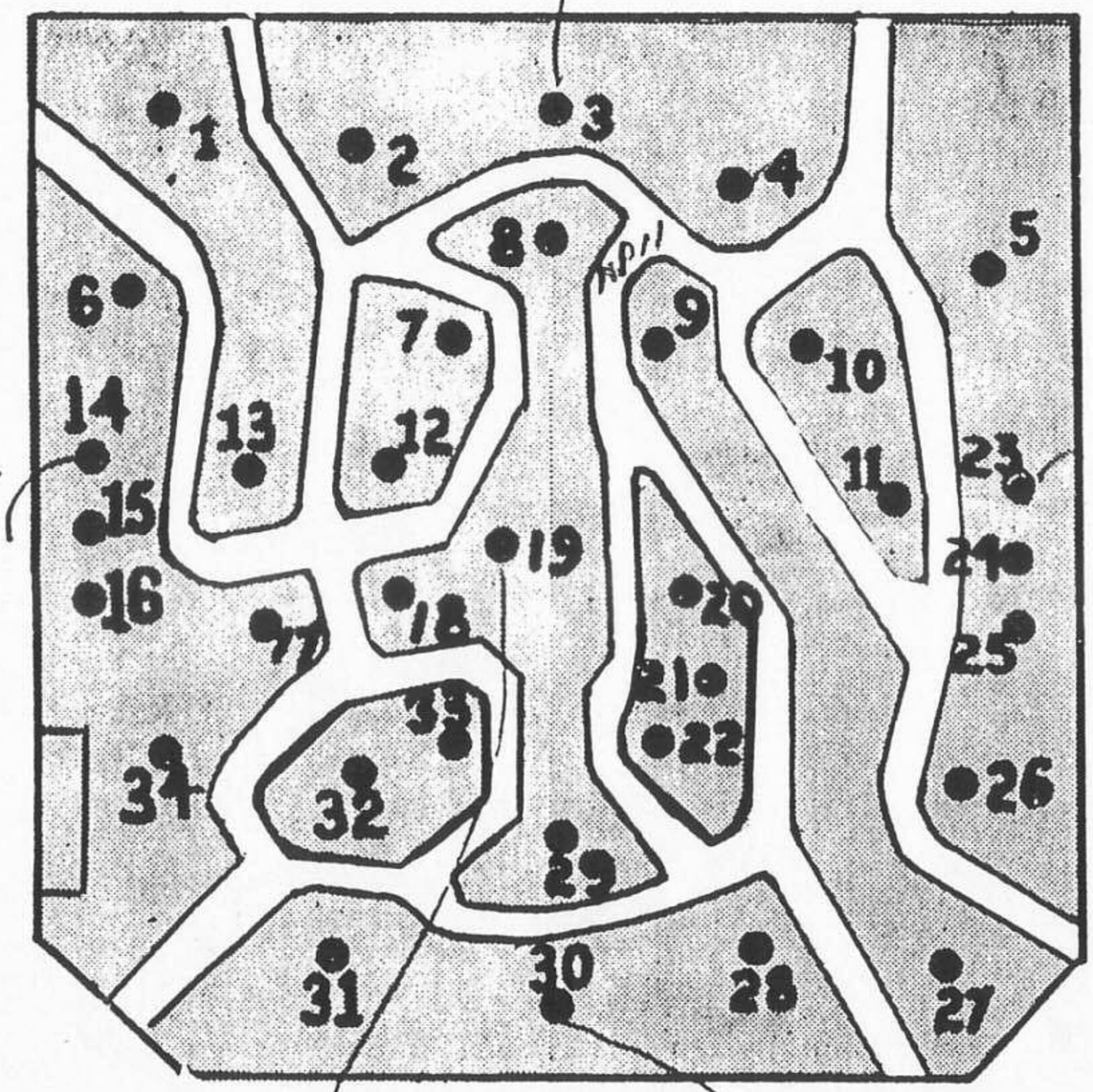


9 RECEIVER PLUG

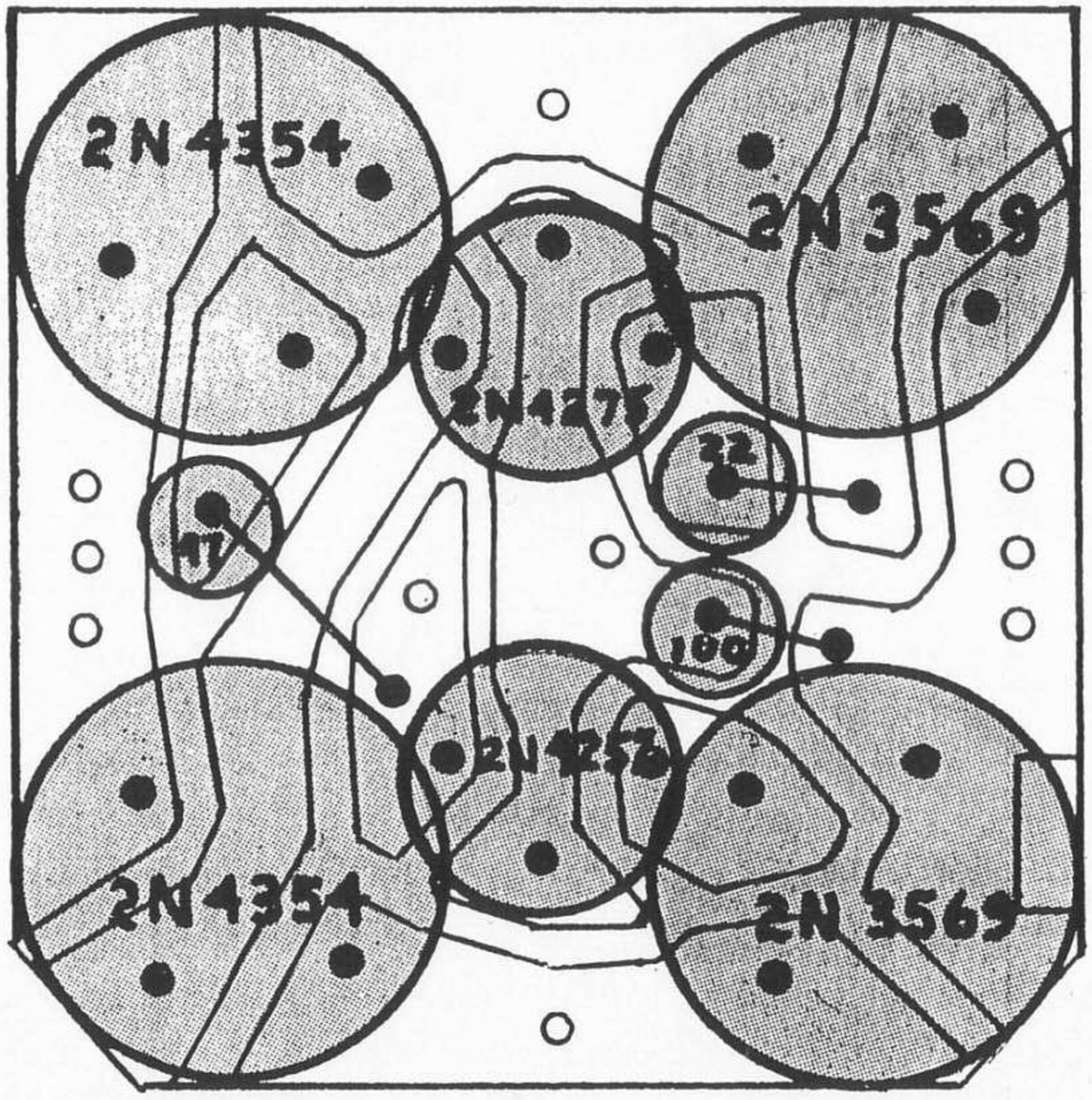


10 BATTERY SOCKET

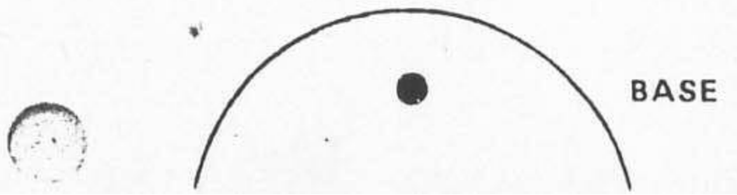
DIAGRAM FOR #6070 SWITCHER KIT



1 CIRCUIT SIDE



2 COMPONENT SIDE



Receiver Modifications for Use with the RAND GG PAK and DUAL PAK

The following suggestions are offered to the modeler as a guide in the adaptation of receivers for relayless operation of the RAND pulse systems. We have tried all of these changes but cannot guarantee that every receiver will respond satisfactorily. In many instances, variations in suggested values will have to be tried.

Not all receivers available today are of equal ability to faithfully reproduce pulse signals. Some are limited in range, some are limited in noise rejection, some are temperature sensitive and some distort the signal at increased pulse rates.

We are offering the following notes as suggestions only. We are unable to accept responsibility for the performance of any particular receiver.

There are three areas requiring modification for relayless operation. However, not all will apply to all receivers.

I. Provision for operation for 3V receivers on 3.6V.
II. Decoupling of superregen receivers from the power supply.
III. Correcting the distortion of the output wave shape or signal.

Explanation for I:

Some superhet receivers will not work well at 3.6V. They were designed for 3V. A resistor in series with the negative lead and a 3V Zener diode (IN703) across the receiver will cure the trouble. A simpler method is to install a silicon diode in series with the negative (such as #SD05 or IN456A). This type of diode should have a forward voltage drop of about .4V @ 25° C. This will reduce the receiver voltage to about 3.1V, which is generally satisfactory. A low cost, general purpose silicon diode can be used. Some receivers, such as the Min-X, SH-1 and 1200, have this diode built in. It is in series with the green lead.

Explanation for III:

A word of explanation about the signal wave shape. The desired output wave shape is a square shape that looks like this:

One of the basic problems in receiver design is that of removing the audio tone component. Generally, it is done with a large capacitor at the output to ground or at the output stage base to ground.

For rudder only operation, the capacitor is chosen large enough to completely remove all traces of audio. This usually has the effect of distorting the square edge of the desired pulse width shape. In rudder operation, this distortion can be easily compensated for with trim and causes little trouble. As this distortion remains constant in width as the rate is increased or decreased, it causes an interaction in GG systems.

The filtered wave shape looks like this:

We are suggesting the reduction of the output capacitor size to reduce the interaction to an acceptable level or eliminate it. The shape will look like this:

RAND

Ace R/C Inc.
HIGGINSVILLE, MO 64037

Form #2623

CHART OF MODIFICATIONS TO RECEIVERS

Receiver	Operation for 3 V Receivers on 3.6 V.	Decoupling of Superregen Receivers	Correcting Distortion of Output Waveshape	Misc. Notes
Min-x 1200 Superhet	Connect negative to green wire.		No modification required.	
Min-x SH1 Superhet	Connect negative to green wire		No modification required.	
Min-x Capri Superregen		470 OHM res. in negative line. 20 MFD cap. across line.	No modification required.	
Controlaire SH100 Relay	Will operate at 3.6 V. Some require dropping voltage as Explanation I. (other side)		Replace 70 MFD with 20 MFD capacitor.	
Controlaire SH100 Relayless	Will operate at 3.6 V. Some require dropping voltage as Explanation I. (other side)		Replace 70 MFD with 10 MFD capacitor.	
Controlaire 4 Relay Superregen		330 OHM res. in negative line. 70 MFD cap. across the line.	No modification required.	
Controlaire 5 Relayless Superregen		330 OHM res. in negative line. 30 MFD cap. across the line.	No modification required.	Footnote 1
Citizenship SSH Relayless Superhet	Connect negative to black wire.		Remove 90 MFD cap. from output and replace with 5 to 15.	Footnote 2
F & M Vanguard Relay Superhet	Connect negative to brown wire. Will operate at 3.6 V. Some require dropping voltage as Explanation I. (other side)		No modification required.	Footnote 3

Footnotes:

1 - Audio filter time constant modification is required. Replace 15 MFD capacitor with 3 MFD, and 100 OHM resistor with 470 OHM. Makes circuit identical to Controlaire 4 receiver.

2 - Dual capacitor with proper value is available from Citizenship.

3 - Load is between emitter and negative instead of the familiar collector to positive. As a result, the 100 OHM resistor in the RAND switcher must be disabled by clipping the lead at the top of the 100 OHM resistor. Put a 100 OHM resistor in the receiver in place of the relay. A 30 MFD capacitor must be added in parallel to the load resistor.