

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:



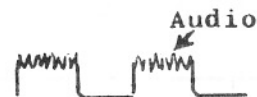
One of the basic problems in receiver design is that of removing the audio tone component. Generally, it is done with a large capacitor at the output to ground or at the output stage base to ground.

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 
MANUFACTURING CO., INC.

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 SH 1 Superhet	Connect negative to green wire.	_____	No modification required.	
Min-X Capri Superregen	_____	470 OHM resistor in negative line. 20 MFD capacitor across the line.	No modification required.	
Controlaire SH 100 Relay	Will operate at 3.6 V. Some will require dropping the voltage as per Explanation I. (other side)	_____	Replace 70 MFD with 20 MFD capacitor.	
Controlaire SH 100 Relayless	Will operate at 3.6 V. Some will require dropping the voltage as per Explanation I. (other side)	_____	Replace 70 MFD with 10 MFD capacitor.	
Controlaire 4 Relay Superregen	_____	330 OHM resistor in the negative line. 70 MFD capacitor across the line.	No modification required.	
Controlaire 5 Relayless Superregen	_____	330 OHM resistor in the negative line. 30 MFD capacitor across the line.	No modification required.	Footnote 1
Citizenship SSH Relayless Superhet	Connect negative to black wire.	_____	Remove 90 MFD capacitor from the output and replace with 5 to 15 MFD.	Footnote 2
F & M Vanguard Relay Superhet	Connect negative to brown wire. Will operate at 3.6 V. Some will require dropping the voltage as per 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.