INSTRUCTIONS FOR OPERATION AND INSTALLATION CITIZEN-SHIP TYPE MTR "27" PRINTED CIRCUIT RECEIVER

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### INSTRUCTIONS FOR USE OF CITIZEN-SHIP MODEL MTR "27" RECEIVER.

# 1.0 DESCRIPTION OF RECEIVER:

Your CITIZEN-SHIP Type MTR "27" is a miniaturized, Transistorized, super sensitive receiver for use on the "examination free" 27.255 mc band in conjunction with CITIZEN-SHIP Transmitters FL, FLX, and LC.

The use of the subminiature IAG4 tube plus a transistor amplifier gives performance heretofore never achieved.

- (1) Sensitivity increased four times.
- (2) Greatly reduced battery power.
- (3) Five times increase in relay current change.
- (4) Instantaneous response excellent for pulsing.
- (5) Highest reliability.
- (6) Transparent protective cover.
- (7) Weight only 2 oz.

## 2.0 <u>TESTING EQUIPMENT NOT NECESSARY</u>:

The MTR "27" Receiver can be completely installed and operated without the use of any meter or other fancy radio gear. See Paragraph 8.1 for simplicity of necessary tuning. For complete tuning and checking, a meter that will read 0 to 1 or 1.5 M.A. is necessary (See enclosed Brochure describing special CITIZEN-SHIP Test Meter). In addition a meter to read 0 to 5 milliamperes is helpful to check relay current.

#### 3.0 MOUNTING:

The acetate protective cover must be attached to the receiver board with the enclosed selftapping screws. All tuning except the relay adjustment can be done with the cover installed.

3.1 The "crash-proof" mounting (Figure 2) is the method of mounting the set so that the components are stressed to best resist the shock of a crash. In Figure 2 the receiver is shown glued directly to the sponge rubber at the ends only where there is no printed wiring. If you wish to glue the receiver to the sponge more securely, place a spot of glue in the center of the circuit board so that it will anchor to the sponge there also. Do not glue the entire printed circuit board to the sponge as this makes very difficult any repairs to the receiver that might ever be necessary.

A 3/16 to 1/4" thick balsa sheet relieved to fit the soldered back of the receiver may be glued between the receiver and sponge to provide some additional support for the receiver base.

- 3.2 Rubber bands from the plywood mount around the receiver at each end can be used in place of the glue which allows the receiver to be more readily removed.
- 3.3 Although the vertical mounting is probably preferable, the receiver can also be mounted on sponge rubber in a horizontal position.
- 3.4 Since it is necessary to tune the receiver after installation it is recommended that an access space be provided on top of the fuselage. The easiest solution is to have the space under the center of the wing open. After tuning, the wing may be put in place.
- 3.5 The receiver and batteries must be mounted to give proper balance to the plane. Batteries should be mounted forward of the receiver. It is convenient to mount them on the front of the plywood board if vertical mounting is used.
- 3.6 For best results the antenna wire should not be wound in and around other wiring leads.

## 4.0 BATTERY VOLTAGES REQUIRED ARE:

- 4.1 "A" Battery should be either 1 or 2 pencells. (With plus terminals wired together) The total filament current is 40 M.A.
- 4.2 "B" Battery must be made up of two 22-1/2 Volt cells connected to make 45 Volts. One of the 22-1/2 Volt cells operates the transistor. Burgess Type U15 or Eveready Type 412 are recommended although Burgess Type Y15 or Eveready Type 505 may be used with good luck and at a lighter weight.

# 5.0 SOURCES OF BATTERIES:

Many hobby shops carry a complete line of batteries for Radio Control. If not available there, pen cells may be obtained in any Drug or Hardware store. The "B" or hearing aid batteries may be obtained from radio parts jobbers or hearing aid distributors and in some radio parts stores.

# 6.0 WIRING THE RECEIVER:

6.1 All batteries must be wired with polarity exactly as shown in wiring diagram (Fig. 4). Make special note that the -A lead is completely separate from the -B battery lead. It is recommended that the one or two pen cells for filament supply and two other pen cells for the escapement be mounted in battery boxes for ready changeability. The two 22-1/2 Volt "B" batteries may be mounted in battery boxes also or leads may be soldered directly to them.

- 6.2 Figure 4 shows wiring diagram of the batteries, escapement, and receiver with the colors of leads identified. Also a recommended arrangement of leads is shown for the plug and socket included with the set. Our test fixtures will be wired for this arrangement of leads in case the set is sent in for service with plug attached. It should be obvious that the socket has the same wiring arrangement as the plug. CAUTION: Do not wire socket according to numbers, but by color matching socket wires with plug wires.
- 6.3 The wiring diagram (Fig. 4) shows a Double Pole Single Throw Switch to open the filament power and simultaneously shut off any current flowing through the transistor.
- 6.4 Although the wiring diagram (Fig. 4) shows two closed circuit jacks which will accept phone plugs, neither is a necessity for the hook-up in your model. These are a convenience for inserting a meter to check the receiver. A meter plugged into jack #1 (Fig. 3A) reads the current flowing in the tube and a meter in jack #2 (Fig. 3B) reads the sum total of the tube current and the relay current. If jacks are not desired a meter can also be inserted by simply opening a lead.

## 7.0 ANTENNAE:

- 7.1 Several arrangements of antennae are possible. A stiff steel wire about 18" long may be cemented vertically at any convenient point and the antenna lead from the receiver soldered directly to this. A wire may be stretched from the receiver to the top of the rudder fin. The longer the antenna the more pick-up of signal is obtained, but the receiver will operate farther than the control is useful with only an 18" vertical antenna and its associated lead-in for an approximate total of 24".
- 7.2 Leave some slack in the antenna lead-in to the receiver, but do not wind this lead in and around other wiring as range might be reduced.

#### 8.0 TUNING AND ADJUSTING:

8.1 After the previous complete factory testing and tuning of your set only one simple adjustment need be made for you to obtain perfect operation. This is the setting of the S coil slug (Fig. 1, 2, 5) and can be done without a meter. Turn in (clockwise) until escapement pulls in, then back out until escapement releases. Turn out 1/4 turn farther so that there will be a factor of safety. Setting this S slug properly is very important at least once before each day of flying. For the modeler who wishes to fully understand the tuning of the set there follows very detailed step-by-step instructions for the complete adjusting procedure. A complete schematic circuit diagram (Fig. 7) of the receiver set. batteries, and

A complete schematic circuit diagram (Fig. 7) of the receiver set, batteries, and escapement is also included.

- 8.2 Looking at the top of the receiver identify T & S coils (Fig. 1, 2, and 5). The T coil adjusts the tuning and the S coil adjusts the sensitivity.
- 8.3 If the receiver is properly connected including the antenna, and the switch turned on, the plate current of the tube only as read by the meter plugged into jack #1 (Figure 4) may be anywhere between 0.2 M.A. and 0.7 M.A. (See Figure 3A). Turn out (counter-clockwise) the slug marked S until the meter reads a steady maximum plus two or three turns more. Turn on the CITIZEN-SHIP "27" Transmitter with the antenna plugged in and press the operate button. <u>CAUTION</u>: The following adjustments must be made with a non-metallic screw driver such as fiber or bakelite. Turn slug T in and out until plate current drops. Tune slug T for lowest value of tube plate current that shows a definite valley i.e., goes through a minimum as the slug is rotated in and out.
- 8.4 Next turn in (clockwise) slug S with the Transmitter turned off until the tube plate current falls. Back off the screw until the plate current remains steady at its highest value. This is the most sensitive setting but with no factor of safety. When flying the slug S should be set from 1/8 to 1/2 turn safe from this most sensitive setting. Backing off the slug too far reduces range.
- 8.5 It is possible that if the sensitivity control S is set too close, adjusting the tuning slug T may make the tube plate current go down and stay down. No minimum valley could be found under this condition. Simply turn out the slug S and proceed as above. The quench coil core is set at the factory at its most satisfactory setting and should not be readjusted.
- 8.6 The varying length of leads used on your meter may affect the sensitivity adjustment S. Make any final S adjustment (Par. 8.4) with the meter removed using the escapement as an indicator. As tube plate current goes down transistor current goes up and the relay pulls in operating the escapement.
- 8.7 After the tube plate current is operating properly (Off signal value 0.55 M.A. to 0.7 M.A.) and (On signal value 0.2 to 0.4) (Fig. 3A) the relay or transistor current will be 0 0.1 off signal and approximately 3 M.A. on signal. (Fig. 3B). Check with meter in jack #2 (Fig. 4).

### 9.0 RELAY OPERATION:

9.1 Since the current change through the relay is very great (0 - 3 M.A.) the relay setting is non-critical. The relay is properly set at the factory to pull in at 1.5 M.A. (actuate the escapement) and drop out at 1.0 M.A. (release the escapement). A slight correction in the spring tension is the only adjustment that might ever need to be made. 9.2 These values of relay pull-in and drop-out can be easily checked by wiring a 100,000 ohm potentiometer or volume control in series with the plus 22-1/2 Volt green lead (Fig. 4). Either send a signal or turn in slug S until relay current jumps up. Then turn potentiometer shaft to insert resistance which decreases current and the value may be observed at which the escapement operates - i.e., relay contacts open and close.

### 10.0 BATTERY LIFE:

- 10.1 To properly know the voltage of your batteries, it is desirable to have a multimeter that will read 1-1/2, 22-1/2 and 45 Volts for the receiver and 135 Volts for the Transmitter. All Voltages must be read with some load being placed on them such as the set being turned on. This meter, also including a 1-1/2 milliamp scale, is available and especially designed for this application. (See CITIZEN-SHIP Test Meter in enclosed brochure).
- 10.2 "A" batteries should be replaced at 1.1 volts with the set turned on.
- 10.3 "B" batteries (B-1 and B-2)(Fig. 4) can be used down to 17 volts each if they run down uniformly. Do not use one new cell and one old cell together unless the new cell is used in the B-2 position. Having the voltage of B-1 appreciably higher than B-2 causes the relay idle current to increase with no signal from Transmitter. This could cause the relay to hold in and not release when transmitter signal is shut off.

# 11.0 TESTING AND FLYING:

- 11.1 The above instructions have described not only how to make the radio receiver operate properly, but have mentioned the action of the escapement as a means of telling when the relay operates properly.
- 11.2 If the above instructions have been carefully followed and the transmitter operating properly (see Transmitter instructions) every time the operate button on the transmitter is pushed, the escapement should operate ONCE only. Check that the relay current is increasing as described in 9.1. If this action is correct, check relay setting and finally see that the escapement itself is not skipping or sticking.
  11.3 All these checks should be repeated on the ground WITH THE MOTOR RUNNING. If
- 11.3 All these checks should be repeated on the ground WITH THE MOTOR RUNNING. If the receiver is not suspended freely enough, vibration may make the relay chatter, or even vibrate the escapement and cause it to operate. Carefully check the T & S coil slugs to see whether they may have a tendency to rotate up or down from excessive vibration. (THIS IS IMPORTANT). If this happens either mount the receiver more loosely or put a drop of model airplane cement at the edge of the slugs and coil form. Be sure not to fill the screw driver slot with glue.
- 11.4 Practically all models are now using glow or diesel engines, but if ignition is used it may have the same effect as sending a signal from the transmitter - i.e., drive the tube plate current DOWN and operate the relay and escapement. A suppressor resistor of about 10,000 ohms in the spark plug lead will generally fix this, but it may be necessary to isolate the ignition system from the receiver.

12.0 IF ALL THE ABOVE CHECKS OUT, GO AHEAD AND FLY, HAVE FUN!

### WARRANTY

Your CITIZEN-SHIP Type MTR Receiver is warranted by the manufacturer to be free from defects in material and workmanship. However, the tube will not be replaced because of an open filament as factory testing of the set before shipment indicates it to be in good operating condition before shipment is made. The transistor is also known to be operative from testing of the set and we cannot guarantee it against damage by incorrect voltages.

Any receiver failing to operate within thirty days after date of purchase will be repaired or replaced free of charge upon being returned to the Factory. This warranty does not apply to failure of operation due to exhausted or improper batteries.

If your receiver is damaged in shipment, you should file a claim with the carrier immediately upon noting the damage.

This warranty does not apply if, in our judgement, the receiver has been tampered with or received abusive treatment beyond that encountered in normal usage.

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Fig 1



FIG 2





TUBE CURRENT

FIG 3A



FIG 3B



# RESISTOR CODE







RED

BLUE



FIG 6



Fig 7