

INSTRUCTIONS FOR INSTALLATION AND OPERATION OF  
MODEL TC 465  
CITIZEN-SHIP RECEIVER

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## INSTRUCTIONS FOR USE OF CITIZEN-SHIP MODEL TC RECEIVER

### 1.0 DESCRIPTION OF RECEIVER:

Your CITIZEN-SHIP Model TC Receiver is a transistorized, miniaturized, super-sensitive and ultra-reliable receiver for use on the examination free 465 mc Citizen's Band in conjunction with the CITIZEN-SHIP CC or CC-1 Transmitter. The use of the transistor as an amplifier gives greatly improved performance with a smaller, lighter unit.

### 2.0 MOUNTING:

- 2.1 The crash-proof mounting (Figure 2) is the method of mounting the receiver so that the components are stressed to best resist the shock of a crash. In Figure 2, the metal box is shown glued directly to the sponge rubber. It can also be held down with rubber bands over the ends so long as they do not touch the components of the set. The receiver can be removed by simply taking out the four self-tapping screws. In the event that repair service is ever needed, the receiver may be sent in with plug and less metal box. Be careful to attach wires to plug in the exact order shown and from the proper end. (See Figure 4).
- 2.2 Although the vertical mounting is probably preferable, the receiver can also be mounted on sponge rubber in a horizontal position.
- 2.3 Since it may be necessary to adjust the receiver for sensitivity 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 into place.
- 2.4 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.

### 3.0 BATTERY VOLTAGES REQUIRED:

"A" or filament - - - - - 6 to 7-1/2 Volts.

"B" or plate and transistor - - - - - 45 Volts. (See Par. 3.2)

3.1 "A" batteries recommended in the order of their preference are:

	Total Weight
(a) 5 pen light 1-1/2 Volt Cells - - - - -	2-1/2 oz.
(b) 4 Type 1-1/2 Volt Medium Cells #1 Burgess - - - - -	6 oz.
(c) 4 pen light 1-1/2 Volt Cells - - - - -	2 oz.

See Figure 3 for connecting "A" batteries in series.

3.2 Plate or "B" batteries recommended may be either:

(a) Two 22-1/2 Volt hearing aid batteries - - - - -	2-1/2 oz.
(Burgess Type U15 or Eveready #412)	
(b) Two 22-1/2 Volt hearing aid batteries - - - - -	1-1/2 oz.
(Burgess Type Y15 or Eveready #505)	

"B" battery must be made up of two 22-1/2 Volt cells connected to make 45 Volts.

3.3 The choice of batteries depends on the size of the plane and its weight carrying ability, and how often the operator is willing to change batteries. The receiver weighs only 3 ounces.

### 4.0 SOURCES OF BATTERIES:

Many hobby shops carry a complete line of batteries for Radio Control. If not available there, flashlight 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.

### 5.0 WIRING THE RECEIVER:

- 5.1 All batteries must be wired with polarity exactly as shown in wiring diagram. (Figure 4). Make special note that the -A lead is completely separate from the -B lead. Batteries may be either mounted in battery boxes for ready changeability or leads may be soldered directly to them.
- 5.2 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.
- 5.3 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.
- 5.4 Two closed circuit jacks are shown in the wiring diagram (Fig. 4). These are a convenience for inserting meters to check the receiver. A meter plugged into Jack #1 reads the current flowing in the tube (Fig. 5A) and a meter in Jack #2 reads the current flowing through the relay (Fig. 5B). If jacks are not desired a meter can also be inserted by simply opening a lead.

- 5.5 It is suggested that the "A" leads be connected to the receiver first. With the switch turned on a faint glow can be seen in the tube and the filament voltage at the set should read between 7.5 and 4.5 Volts depending on the freshness of the batteries. Now connect the "B" battery leads and plug an 0-1 or 0-1.5 M.A. meter into Jack #1 (Fig. 4). It should read between 0.15 and 0.30 milliamperes (Fig. 5A). When the receiver is first turned on the plate current may rise and fall once or twice before settling down. This is normal during the warm-up period of the tube. If the tube idle is proper as stated the relay idle current, Jack #2, should be close to zero M.A. (Figure 5B).
- 5.6 Next turn on the transmitter and remove the antenna (See Par. regarding installing batteries in transmitter). Allow a minute for the filament of the transmitter tube to warm up. Hold the transmitter close to the fuselage near the receiver and press the operating button. The current at Jack #1 should increase to 0.8 M.A. (Fig. 5A) or slightly less and the relay current should increase to approximately 4.0 M.A. operating the escapement. The reason for removing the antenna is the fact that the receiver is so sensitive that the strong signal would paralyze it at such close range. When the antenna is removed from the transmitter effective range is reduced to about two feet.
- 5.7 Now insert the antenna and walk about 20 feet away and point the antenna AWAY from the ship. Approximately the same jump in plate current should occur. At greater distances and when the plane is flying, the antenna should be pointed at the ship. Actual flying tests have proved that the receiver will be operated at 1/2 mile in the air. With the ship sitting on the ground, it will work about 1000 feet away.
- 5.8 You have probably noted that nothing has been said yet about an antenna for the TC Receiver. In an airplane the wiring serves as an antenna at such a high frequency as 465 mc and no improvement can be obtained by addition of an antenna. In a boat, however, the set is somewhat shielded by the water if mounted in the hull, so provision is made for an external antenna. Packed with the receiver is a stand-off insulator and a length of 72 ohm twin lead transmission line. Also two eyelets are provided next to the copper coil (wide flat single turn coil). Take any size copper wire (about 18 gauge) and make a square loop as shown (Figure 7). Strip one end of the 72 ohm twin lead and solder the wires into the eyelet holes along with the loop. Now prepare an antenna of stiff copper wire (size unimportant) by cutting two pieces to the length of one-half the folded dipole length of the transmitter antenna - approximately 5-3/4" for each piece. Solder one end of each to the insulated lugs of the standoff terminal provided. See Figure 7. These pieces may be bent into a square or circle to make the antenna non-directional, but the ends MUST NOT TOUCH. Solder the other ends of the 72 ohm twin lead to the antenna at the solder lugs. The twin lead may be shortened or left as long as provided and curled up. This antenna in a boat should be as high as possible.

## 6.0 TUNING AND ADJUSTING:

- 6.1 After the previous complete factory testing and tuning of your set, only one simple adjustment need be made or at least checked for you to obtain perfect operation. This is the setting of the trimmer condenser attached directly to the base (Sensitivity adjustment Figure 1). Turning in clockwise reduces tube idle and turning out raises current flow. Set the adjusting screw to where the meter in Jack #1 (Fig. 4) reading tube current only shows 0.15 to 0.3 M.A. (Fig. 5A). The higher value gives better receiver range but too high a setting will cause the relay idle current to increase with no transmitter signal. (Fig. 5B). The relay current should rise only with a signal from the transmitter. The current change through the relay should be from 0 to 4 M.A. Set the trimmer with some factor of safety on the 0 relay idle. This adjustment should be made before each day of flying at the very least. After some experience adjusting the sensitivity control with a meter in the circuits you may want to make this adjustment without using a meter. Simply turn out the control until the relay and escapement pull in. Then turn in until the relay and escapement release - plus a fraction of a turn for safety. Always set the sensitivity control (Fig. 1) without a signal being sent from the transmitter.
- 6.2 Only a slight correction in the tuning or frequency adjustment (Fig. 1) will ever need to be made. This can be adjusted with the transmitter sending a signal with the antenna removed. Set tuning screw for best rise in receiver tube plate current (Jack #1, Fig. 4), and for greatest distance between transmitter and receiver. The quench coil core is set at the factory at its most satisfactory setting and should not be readjusted.

## 7.0 RELAY OPERATION:

- 7.1 Since the current change through the relay is very great (0-4 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.

7.2 The values of relay pull-in and drop-out can be easily checked if you feel it necessary by wiring a 100,000 ohm potentiometer or volume control in series with the meter in Jack #2. (Fig. 4). Either send a signal from the transmitter or turn out sensitivity control (Fig. 1) until relay current increases. 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.

#### 8.0 BATTERY LIFE:

- 8.1 To properly know the voltage of your batteries, it is desirable to have a multimeter that will read 6 - 22-1/2 Volts and 45 Volts for the receiver and 6 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 which also includes a 1-1/2 milliampere scale is available and especially designed for this application (See CITIZEN-SHIP Test Meter in enclosed Brochure).
- 8.2 "A" batteries should be replaced at 4.5 Volts with the set turned on. Five pen cells give nearly double the life of four, and will last for dozens of flights.
- 8.3 The "B" battery must be replaced when the voltage reaches 36 Volts with a signal being sent from the transmitter. Sensitivity will begin to decline when the "B" voltage reaches 40 Volts especially if the "A" voltage is low. If you are not satisfied with this useful battery life, a 30 Volt battery may be substituted for the 22-1/2 Volt cell shown as B-2. This will give greatly increased "B" battery life. DO NOT change the voltage of cell B-1 to any higher value than 22-1/2 Volts as this could do permanent damage to the transistor.

#### 9.0 TESTING AND FLYING:

- 9.1 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.
- 9.2 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 7.1. If this action is correct, check relay setting and finally see that the escapement itself is not skipping or sticking.
- 9.3 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.
- 9.4 Practically all models are now using glow or diesel engines, but if ignition is used it may cause improper operation. A suppressor resistor of approximately 10,000 ohms in the spark plug lead will usually fix this, but it may be necessary to isolate the ignition system from the receiver.

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

#### WARRANTY

Your CITIZEN-SHIP Model TC 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 voltage.

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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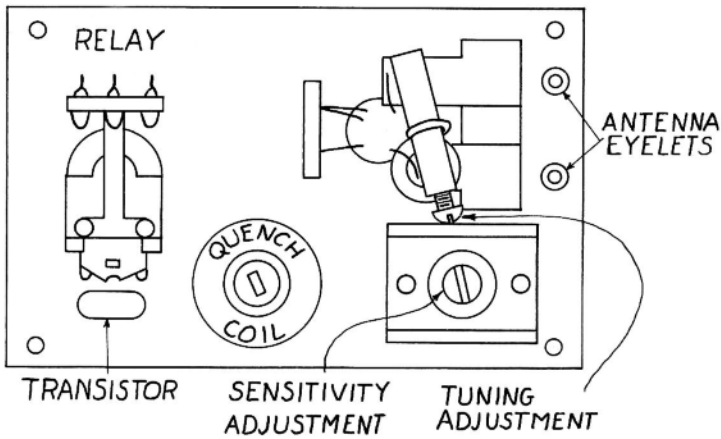


FIG. 1

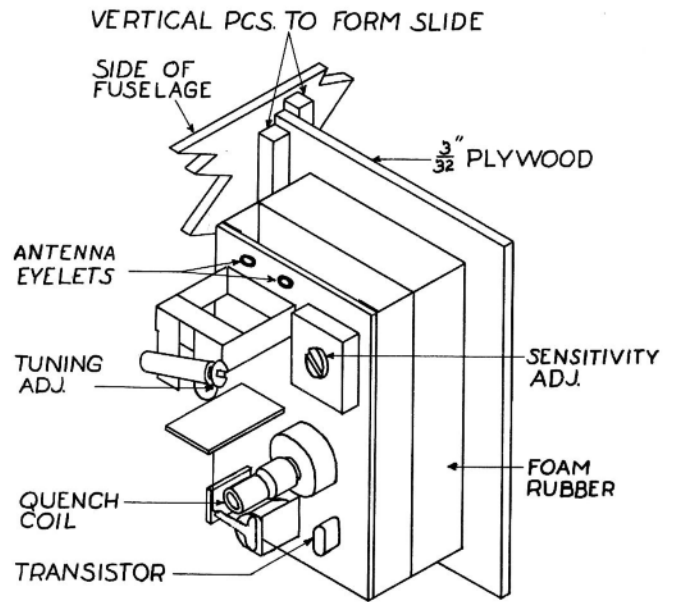


FIG. 2

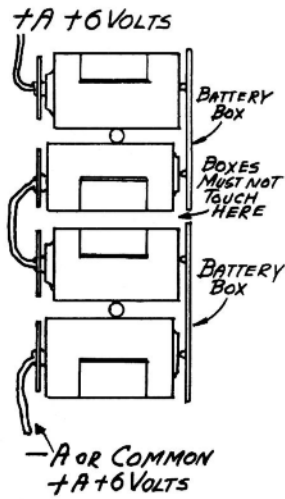


Fig 3

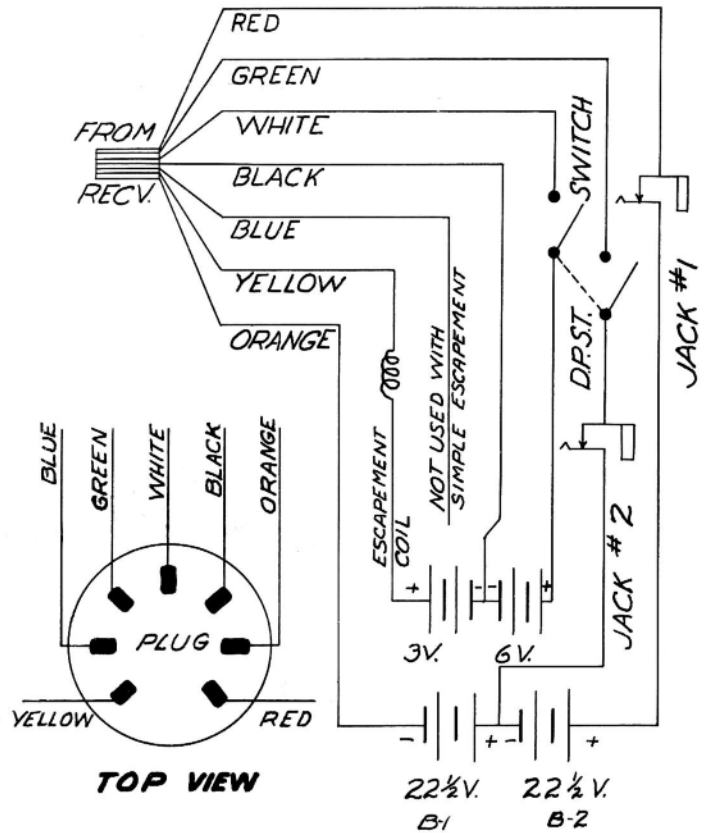
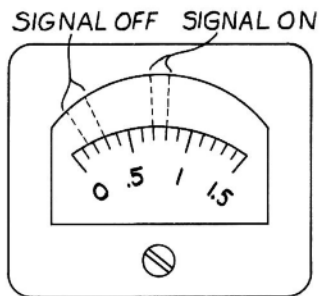
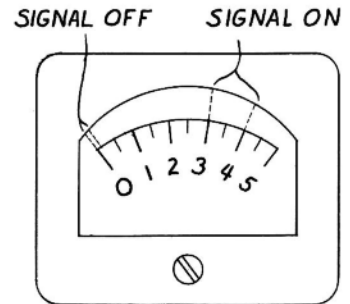


FIG. 4



TUBE CURRENT  
AS READ ON JACK #1

FIG. 5A



RELAY CURRENT  
AS READ ON JACK #2

FIG. 5B

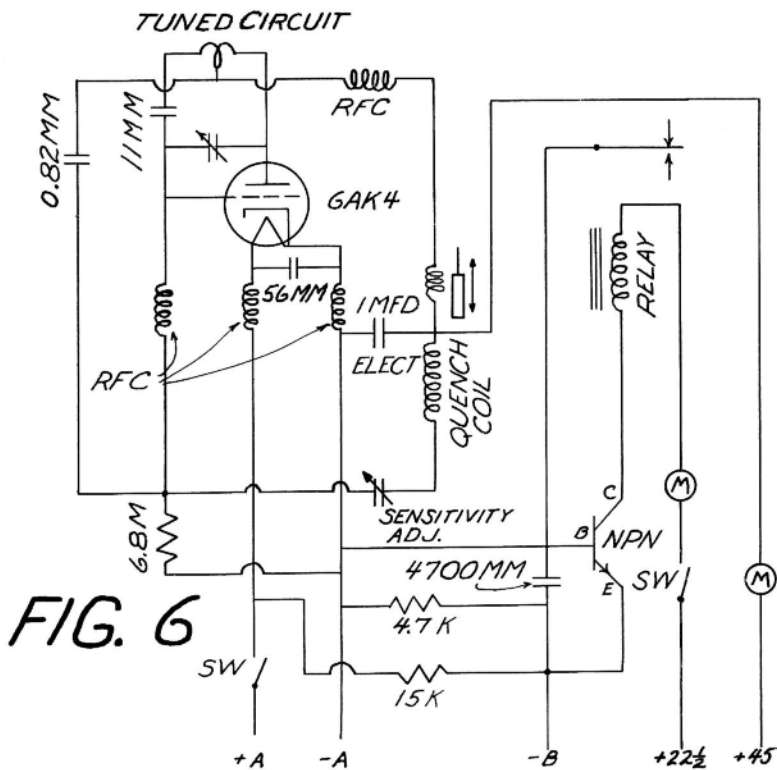


FIG. 6

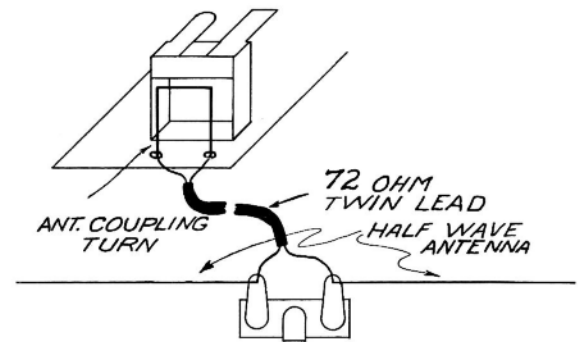


FIG. 7