

INSTRUCTIONS FOR USE AND INSTALLATION OF
MODEL AR
CITIZEN-SHIP RECEIVER

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WARRANTY

RECEIVER INSTRUCTIONS

1.0 GENERAL:-

The type AR receiver is a modification of the famous CR receiver, both of which operate on the original 465 megacycle Citizens band in conjunction with the type CC transmitter.

The most apparent difference in the AR from its predecessor, the CR, is that it has no antenna below the base thereby reducing the size of the fuselage required. The AR receiver may be successfully mounted in a fuselage only 2-1/2 inches wide inside and the vertical height required is approximately the same. It is 4 inches long. Other less obvious modifications are discussed in succeeding paragraphs.

Another tremendous advantage of the AR is that it can be tuned or adjusted by the modeler either at home or in the field. It is NOT necessary to return to the factory for retuning. See Section 6.0 for tuning instructions.

2.0 MOUNTING:-

2.1 Recommended mounting is by means of #16 rubber bands through the loops of the Fahnstock clips on both ends of the base. (Figure 2). Holes HH (Figure 1) are provided if the modeler wishes to put an extension (preferably bakelite) onto the chassis to allow mounting with sponge rubber blocks. Also additional rubber bands may be threaded through holes HH for additional support in the event of a crash. Cement a piece of sponge rubber to the bulkhead or any structure in FRONT of the receiver. In case of crash landing, receiver will be cushioned by this rubber.

We strongly recommend bringing wires directly to the Fahnstock clips and not to insert any additional plug and socket in these leads. If these Fahnstock clips are soldered shut or cut off, our fixtures cannot test the receiver and the Warranty is void.

A suggested arrangement of mounting the receiver under the wing mount with batteries accessible through a hatch in the bottom is illustrated in Figure 3.

2.2 ANTENNA

It is almost certain that the modeler will wonder why no provision is made for connecting an antenna. An antenna is not needed as will become apparent when the unit is tried out. A technical discussion of the reasons are beyond the scope of these instructions except to say that this equipment is in the ultra high frequency band and the associated wiring provided in connecting up the batteries and actuator provides all the signal pickup that the receiver can accept.

3.0 RECOMMENDED BATTERIES:-

Voltage required are 6 to 7-1/2 volts on the filament or "A" batteries and 60 or 67-1/2 volts on the plate or "B" batteries.

3.1 Filament or "A" batteries recommended in the order of their preference.

	<u>Total Weight</u>
1. 5 Pen Light 1-1/2 V. cells	3-1/4 oz.
2. 4 Type 1-1/2 V. #1 Burgess Flashlight batteries (or equivalent)	6 oz.
3. 4 Pen light 1-1/2 V. cells	2-3/4 oz.

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

1. 2-Burgess hearing aid batteries Type U20E 30 volts each (or equivalent)	3 oz.
2. 1-Eveready #457 "B" battery 67-1/2 volts or Burgess K45	7-1/2 oz.

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 4-1/2 oz.

3.4 Group (a) Minimum battery weight possible:	<u>Weight</u>
4 pen light cells	2-3/4 oz.
2 Burgess Type U20 hearing aid batteries	3oz.
Receiver weight	<u>4-1/2 oz.</u>
Total-----	10-1/4 oz.

(b) Recommended battery complements:	
5 Pen light 1-1/2 V. cells	3-1/2 oz.
2 Burgess U20 hearing aid batteries	3 oz.
Receiver weight	<u>4-1/2 oz.</u>
Total-----	11.00 oz.

(c) Same as (b) with 67-1/2 volt "B" batteries.

3.5 The theoretical life of the pen light cells in Group (a) is 45 minutes but it is difficult to get absolutely fresh batteries and after a 15 minute flight they must be rested for a like period. (Useful life on the "A" batteries for the Citizen-Ship receiver is when their voltage has fallen to 4.5 volts WITH THE RECEIVER TURNED ON. This will be discussed later), see paragraph 8.2.

3.6 Group (b) or (c) is recommended as 5 pen cells will give nearly double the life of 4. Regarding "B" batteries, if the plane will carry it, use an Eveready #457 or Burgess K45. These add an additional 4-1/2 oz. to the Battery complement but give an extra 7-1/2 Volts over a pair of U20 hearing aid batteries assuming new batteries. Also they have convenient snap fasteners to make connection.

The only trouble with the U20 hearing aid batteries is the fact that they may lie on a dealer's shelf a long time before you get them and may be low in voltage. If fresh hearing aid "B" batteries can be

obtained greater life will be obtained with the AR receiver than any other make because of the low idling current. Life in use is practically the shelf life of the batteries.

4.0 SOURCES OF BATTERIES:-

- 4.1 Pen cells and flashlight batteries may be obtained from your Hobby Dealer or any drug or hardware store.
- 4.2 The Hearing Aid or 67-1/2 Volt "B" batteries may be obtained from Radio Party Jobbers or Hearing Aid Distributors. There are generally jobbers of these types in towns of 40,000 or more.

5.0 WIRING THE RECEIVER:-

- 5.1 After the battery complement has been decided upon for the size of plane, the receiver should be hung in place and the battery locations laid out to give the ship the correct balance. (The assumption is made that the flyer has some knowledge of free flight planes. Plane should balance at 50% of cord for ship with lifting rail, 33-1/2 to 40% from leading edge with non-lifting tail). It is recommended that the filament or "A" batteries be mounted in battery boxes as shown in Figure 4, and in the location in the ship approximately as shown in Figure 3. Figure 4 shows the arrangement of batteries in the battery boxes and the wiring to obtain 6 volts. Plus and minus 6 volts is also indicated. If 5 pen cells are used, simply add one more battery in series.
- 5.2 Figure 5 illustrates a box suitable for holding the U20E hearing aid batteries and shows how they should be inserted to get 60 volts. The box and batteries may then be glued in place or held with rubber bands to obtain balance of plane. Since these batteries should last several months, leads may be soldered direct. If the 67-1/2 volt type 457 "B" battery is used, snap fasteners are provided and terminals are marked.
- 5.3 The wires from both the "A" batteries and "B" batteries should go to the similarly designated connections on the receiver. Top view (Figure 1 and 6). It will be noticed that one terminal (Fahnestock clip) of the receiver is marked "Common". Since it is difficult to put more than one wire in a Fahnestock clip, these wires should be connected at another point as shown in the overall wiring diagram Figure 6. This diagram shows the escapement wiring also and it is convenient to complete this and wire up the escapement (or whatever control mechanism is to be used) so that it may be used as an indicator of the relay in the receiver opening and closing. When the relay in the receiver closed, it will actuate the escapement or control mechanism. Figure 7 shows an alternate wiring using two of the filament batteries to operate the escapement. Since this arrangement will run these two cells down more rapidly, their voltage must be checked frequently.
- 5.4 The wiring diagram also shows a single pole single throw switch for turning the filament on and off and a closed circuit jack in the plus B lead. This jack is essential in checking the operation of the receiver and is put in for the purpose of inserting a 1.5 milliamperemeter in series with the "B" batteries to check the plate

current change. It is not necessary or desirable to have a switch to open the "B" lead or escapement lead.

- 5.5 It is almost a necessity to have a D. C. milliammeter or separate D. C. meters that will read the following currents and voltages accurately: 0-1.5 milliamperes, 0-6.0 volts and for use with the transmitter, (see transmitter instructions) 0-150 volts. A special meter has been designed for this application and is advertised on the enclosed flyer.
- 5.6 It is suggested that the "A" leads be connected to the receiver first and the filament switch turned on. A faint glow can be seen in the tube. Check the filament voltage at the receiver with a meter that will read 6 volts D. C. It should read between 4.5 and 6.5 volts depending on the freshness of the batteries. Now connect the plus B lead and plug in the 1.5 milliammeter. It should read between 0.25 and 0.30 milliamperes. (See Figure 8). When receiver is first turned on, plate current may rise and fall once or twice before settling down. This may operate relay. This action may differ from one receiver to the next, but is normal. Will not occur after tube is fully heated up. Same action may occur when receiver is shut off.
- 5.7 Next turn on the transmitter and REMOVE THE ANTENNA. (See paragraph 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 plate current of the receiver should jump from 0.25 or 0.30 m. a. to 0.9 to 1.3 m. a., (Figure 8) and the relay should close. The reason for removing the antenna is the fact that the receiver is so sensitive the strong signal would paralyze it at such close range.

When the antenna is removed from the transmitter, effective range is reduced to about one foot. It should be possible to check out a receiver on the ground with the transmitter sitting beside the plane with the antenna removed without interfering with another plane which is being flown.

- 5.8 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 of a mile in the air. With the ship sitting on the ground, it will work about 1000 feet away.

6.0 ADJUSTMENTS:- (Please read Warranty).

- 6.1 Your receiver is carefully tested, tuned, and adjusted at the factory and should operate perfectly as received. However, since tuning and adjusting is so simple, if the receiver gets out of adjustment due to a crash or other causes, it can be adjusted by the modeler using the CC Transmitter as a source of signal.

In order to properly tune for sensitivity and adjust the relay it

is necessary to have a 1-1/2 m. a. meter (see enclosed brochure), and a 500,000 ohm volume control or potentiometer as used in a radio set, and an all bakelite tuning screw driver.

Connect up and turn on the receiver (may be in the airplane), and plug in the meter. Turn the core marked "Idling Adjustment" (see Figure 1) in or out slightly with the bakelite screwdriver to set the plate current as indicated on the meter to 0.25 m. a. to 0.30 m. a. Two such points may be found, but the adjustment nearest the factory setting of the core should be most sensitive. An alternate method which may be used if your meter will not accurately read 0.25 m. a. is to turn the core in or out until the occasional peaks of plate current trigger the relay (see relay setting) and then turn core in opposite direction to just prevent this. The set will be extremely sensitive under this condition.

Turn on the Transmitter and remove the antenna or else have a helper walk away about 250 yards with the antenna plugged in and adjust the tuning screw (see Figure 1) for maximum plate current rise (see Figure 8) at MAXIMUM DISTANCE. Since maximum rise in plate current is the same with weak or strong signals, simply tuning for maximum with the transmitter close by does not assure best tuning.

Tuning may change the idling adjustment up or down and the core may need resetting. The receiver should now be in tune and sensitive.

- 6.2 The relay may lose adjustment in a hard crash and should be set to pull in about 0.5 m. a. and drop out at 0.4 m. a. (see Figure 8). The screw on top adjusts the spring tension and the setting of the two contacts the differential in pull in and drop out. Be sure the armature does not hit the pole piece on the pull in.
- 6.3 To check the relay operation, or to further adjust it proceed as follows. Obtain a volume control such as used in a radio set with a value of 500,000 ohms. Wire it in series with the plus B lead. (Figure 9). With all the resistance out, turn on the receiver and transmitter and cause the plate current to rise to its maximum of 1.0 m. a. or more (re-read 5.7). With both receiver and transmitter still turned on, turn the volume control to introduce resistance and the plate current will decrease.

The exact value at which the relay drops out can be observed by the action of the escapement or any other indicator across the contacts. Reversing the direction of rotation of the volume control will again increase the current, and the exact value at which the relay pulls in can be observed. These values should be between 0.35 and 0.45 for the drop out and 0.45 and 0.55 for the pull in.

7.0 INTERFERENCE FROM ENGINE:-

Since glo plugs are being used almost exclusively, no paragraph on ignition interference is included in these instructions. If you propose to use ignition and have trouble, write the factory for help.

8.0 END USE OF BATTERIES:-

- 8.1 It is obvious that when batteries are run down, the receiver (and trans-

mitter) will stop working, but if this happened during a flight it might result in a lost or damaged plane. It is therefore essential that batteries be checked BEFORE EVERY FLIGHT with an accurate meter.

- 8.2 The "A" batteries should be discarded when the voltage across all four or five (if used) cells drops to 4.5 volts with the RECEIVER TURNED ON. In fact, when lower than 4.75, a long flight should not be attempted as they may pass out during the flight.
- 8.3 The life of the "B" batteries is difficult to evaluate in terms of voltage. It will be noticed that as the voltage drops both the no signal current and the "transmitter on" current, as read on the 1.5 m.a. meter, will gradually decline. (Sensitivity and range will likewise be reduced). When the "transmitter on" current cannot be made to go above 0.70 or 0.80 m.a. (move about with the transmitter to get maximum reading), the "B" batteries should be changed. The voltage of the "B" batteries when this occurs will be approximately 40 to 45 volts.

9.0 TESTING AND FLYING:-

- 9.1 The above instructions have described only how to make the radio operate satisfactorily. Since the modeler may use one of the many types of escapements as a means of operating the control surfaces, instructions on the use of these devices are packed with those units.
- 9.2 If the above instructions and those pertaining to the transmitter have been carefully followed, the relay should close whenever the transmitter "Operate Switch" is pushed. (Do not forget that the receiver may fail to operate if the transmitter is too close with the antenna plugged in.)
- 9.3 If the escapement is correctly wired as shown in Figure 6 or Figure 7. everytime the transmitter "Operate Switch" is pushed, it should operate ONCE. If it jumps or skips, do not fly. If inserting the 1.5 m.a. shows that the plate current is rising to its proper value, the escapement needs adjustment. (See instructions for that unit.)
- 9.4 Everything may operate correctly when the motor is not running, but the escapement may skip when the motor is running. This may be the result of several factors. The escapement may skip because of direct vibration, or the relay may be vibrating because the receiver is not mounted in sufficiently flexible mounting. If holding the relay closed with the fingers still allows skipping with the motor running, it has to be the escapement itself vibrating. Also, make sure all wiring connections are solid and vibration proof.
- 9.5 If everything works properly with the motor running, go ahead and fly. Our personal experience indicates the Citizen-Ship radio is probably the most reliable part of all the components which constitute a radio controlled model airplane.

WARRANTY

Your CITIZEN-SHIP receiver is warranted by the manufacturer to be free from defects in material and workmanship. 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.

This Warranty does not include simple readjustments in tuning or relay adjustment as described in Section 6. The modeler is expected to make them himself and if returned for this type of adjustment our minimum charge of \$2.50 will be billed. If your receiver is damaged in shipment, you should file 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, including burning out the tube filament by accidental contact or incorrect connection to the "B" batteries.

CITIZEN-SHIP RADIO CORPORATION
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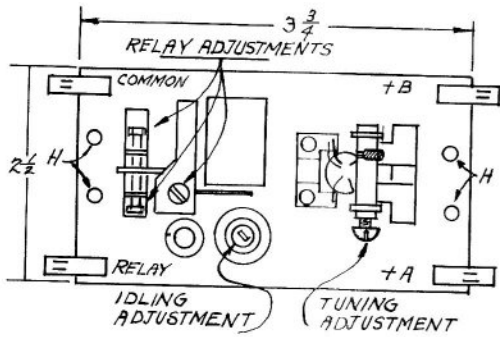


Fig 1

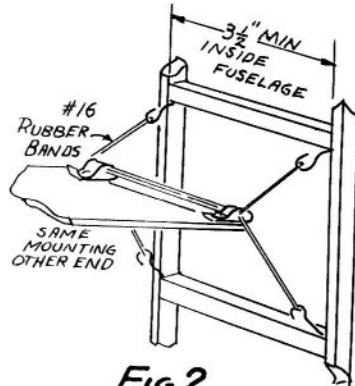
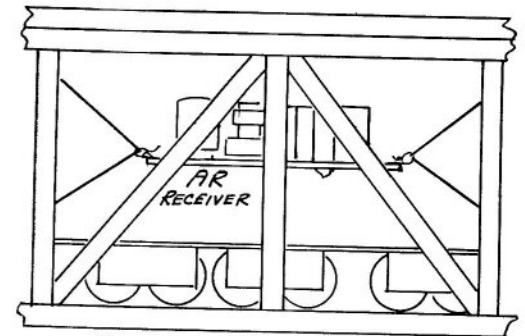


Fig 2



HATCH FOR ACCESS TO BATTERIES.

Fig 3

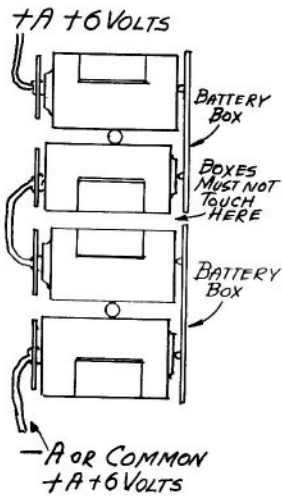


Fig 4

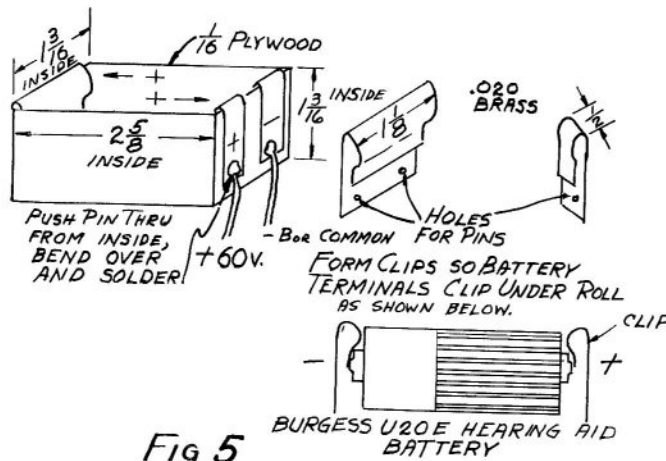


Fig 5

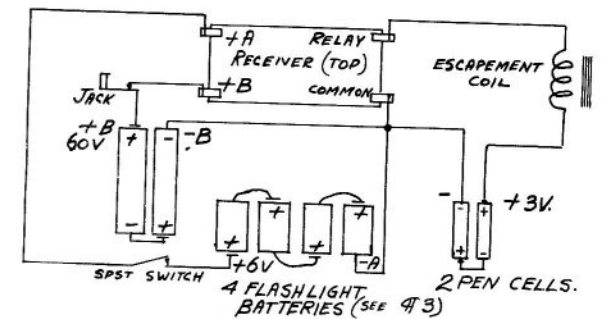


Fig 6

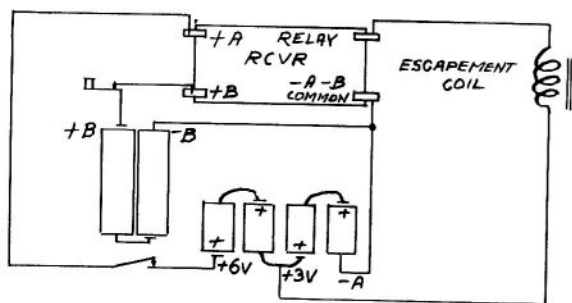


Fig 7

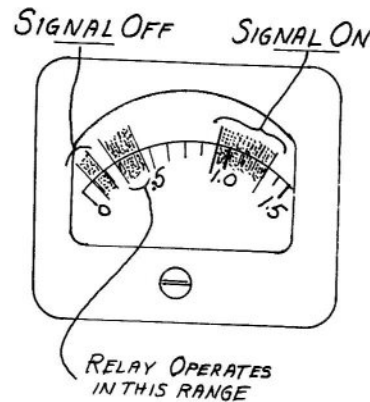


Fig 8

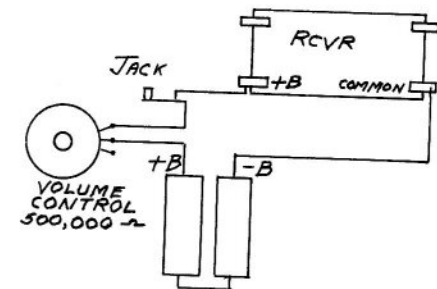


Fig 9