

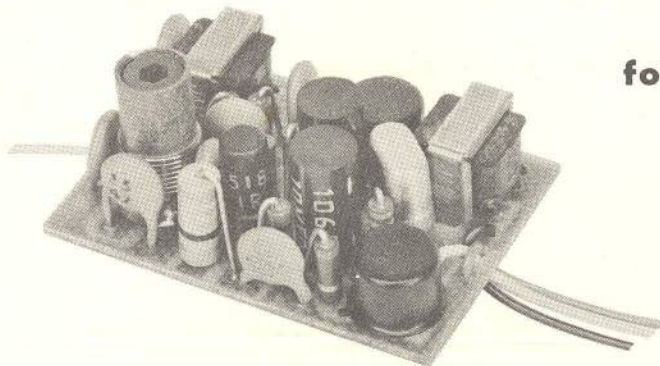
13400-12 SATICOY STREET, NORTH HOLLYWOOD, CALIFORNIA

# Operating Instructions

for the "HONEY BEE"

## RELAYLESS TONE RECEIVER

(MODEL CS - 511A)



### DESCRIPTION

Your CS-511A Relayless Tone Receiver is the smallest, lightest radio control unit presently available which can provide the maximum in performance. Application of latest transistor circuitry techniques provides maximum sensitivity, minimum current drain and utmost reliability in the smallest possible package. Elimination of the relay is an important step in the reduction of weight and vibration problems. The resulting simplified radio control system using this receiver, two pencil batteries, and a lightweight escapement, permits R/C operation of the smallest model airplane that you might desire.

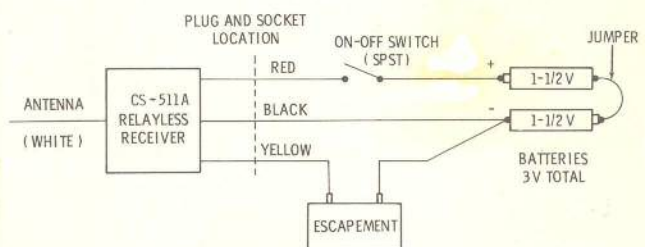
Exclusive SENSI-MATIC circuitry incorporated in your CS-511A receiver automatically adjusts circuit sensitivity to prevent overloading (swamping) at close distances yet provides tremendous operational range.

The CS-511A Receiver is basically a four-transistor circuit utilizing transformer coupling for maximum efficiency. Switching transistor circuits are used to actuate a single escapement directly without the use of an intermediate relay. Any 5 to 8 ohm escapement will work well with this receiver, with no escapement adjustments required. Power to operate both the receiver and escapement is obtained from a single 3-volt power supply, usually two pencils. This receiver is not designed to operate with motor control or cascaded escapements and all guarantees are null and void when the equipment is used in this manner.

An epoxy printed circuit board makes this unit virtually crash-proof when properly installed.

### SPECIFICATIONS

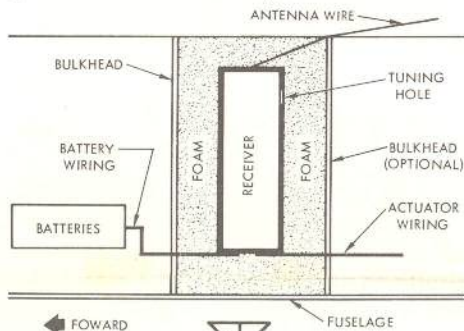
Sensitivity .....	Better than 1.5 microvolts for escapement operation
Operating Voltage .....	3.6 volts maximum 2.4 volts minimum
Recommended Batteries ....	Eveready E-90 or E-91 Alkaline Energizers
Loss Across Switching Transistor .....	0.35 volt
Idle Current .....	6 ma nominal (carrier off) 4 ma nominal (carrier on) at 70°F
Escapement Current .....	325 ma at 3 volts, with 8 ohm escapement
Audio Modulation Required .....	400 - 1000 cps, 650 cps optimum
Modulation Percentage Required .....	80 - 100%
Recommended Transmitter .....	CS-509 or CS-509A Tone Transmitter
Tuning Range .....	26.995 to 27.255 mc band (will cover approximately 25 to 30 mc)
Operating Temperature Range .....	0°F to +140°F
Dimensions .....	5/8 inch high 1-1/8 inch wide 1-5/8 inches long
Weight .....	5/8 ounce





## MOUNTING THE RECEIVER

Locate the receiver where it is least subject to crash damage and is still accessible for tuning. Foam plastic at least 1/2" thick provides good protection against impact shock. Either horizontal or vertical mounting (against a bulkhead) is satisfactory. Maximum crash protection can be obtained by completely surrounding the receiver with a thick layer of foam material. Always locate the receiver above and behind the batteries to reduce possible crash damage.



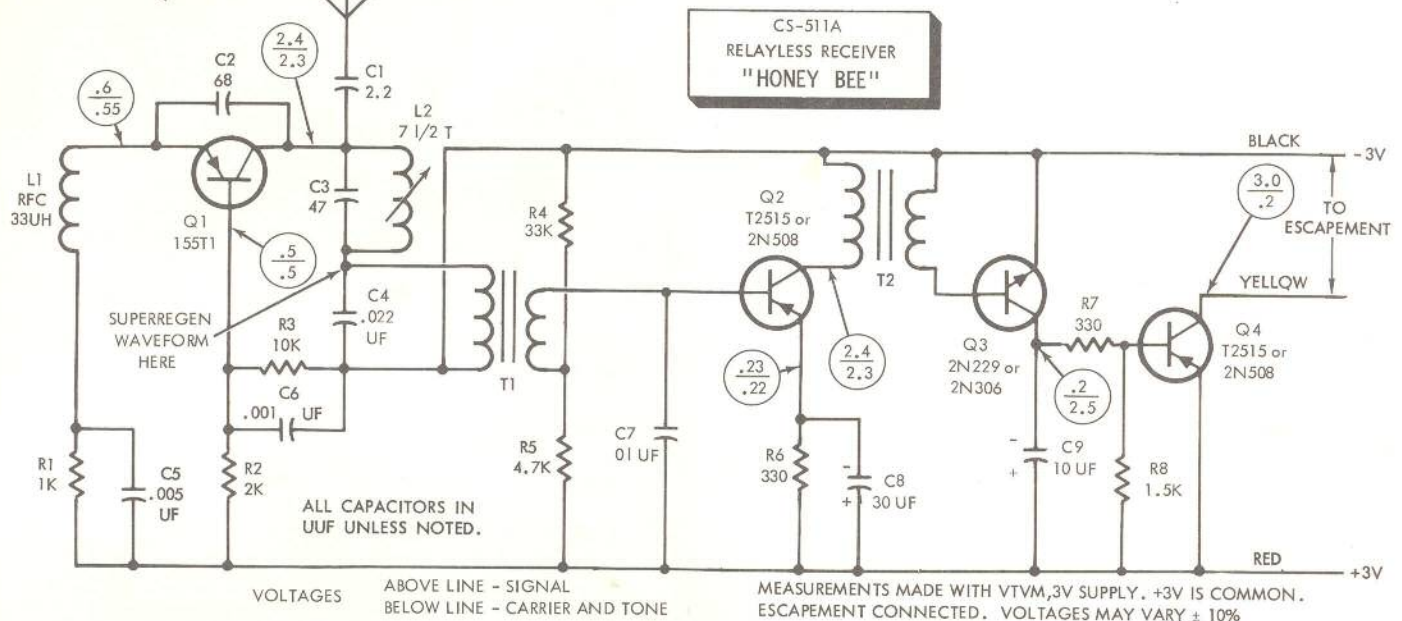
## WIRING

Plastic-insulated multi-strand wire is recommended for your wiring installation. Use nothing smaller than No. 26 or 24 gauge wire or voltage drop may be excessive. For antennas, No. 26 or 28 gauge insulated wire is recommended. Make all wiring as neat as possible, making sure that it does not interfere with and cannot become entangled in the servo, actuator or escapement mechanisms or associated linkages.

Use only rosin core solder for all joints. Beware of cold solder joints which can result in operational failures.

## WIRING DIAGRAM

The wiring diagram shows proper wire connections. Leads can be soldered directly through, or a plug and socket arrangement may be used for quick removal of the receiver if desired. Battery leads may be soldered directly to the batteries, or a battery holder may be used if space and weight permit.



## ANTENNA

Sensitivity of the C & S receivers is extremely high and a long antenna wire is not necessary. We recommend a total antenna length of from 12 to 30 inches, depending on the size of the airplane or vehicle. A horizontal insulated antenna wire is satisfactory for aircraft use. A short vertical section of music wire will be adequate for boats or cars. Naturally, sensitivity will be somewhat greater with longer antenna lengths, and if extreme distance is anticipated, the longest antenna possible should be utilized.

### CAUTION

Antenna must not be close to other wires in the equipment installation.

Most sensitive receivers are prone to overloading when the transmitter is operated at too close a range. One feature of the CS-511A Receiver is its ability to resist overloading, with no loss in sensitivity. We suggest that you acquaint yourself with the swamping characteristics of your particular receiver to determine if any separation distance is required.

In many cases, sufficient control range may be obtained without extending the transmitter antenna to its full length. This feature makes operation of a hand-held transmitter less cumbersome.

## BATTERIES

A 3-volt battery supply is required for optimum sensitivity and correct receiver operation. Always use the



largest batteries your airplane can safely carry. If pen-cells are used, we recommend Eveready E-91 Alkaline energizers for maximum life. For extremely small aircraft, use two of the new Eveready E-90 pen-cells for best results.

If desired, 3 nickel-cadmium button cells (3.6V) may be used without harm to the equipment. Sensitivity will be approximately the same with either 3 or 3.6 volts.

A close check must be made on battery voltage with the receiver on and the escapement actuated. Always replace batteries when the voltage under load drops to approximately 2.4 volts. Receiver sensitivity drops rapidly as the supply voltage decreases, and if flown with weak batteries, loss of range or failure of actuator operation may occur while in flight. A safe practice is to replace batteries before each flying session.

If the airplane is large enough to carry the weight, battery holders can be used. For smaller aircraft, we recommend soldering the wire leads directly to the batteries. In such a case, extreme care must be observed to avoid overheating the batteries when soldering. (Use rosin core solder only.) Carefully sand the battery terminals first, then apply only as much heat as necessary to obtain a good connection. Be sure to check the voltage under load after new batteries are installed.

#### BATTERY CHARACTERISTICS

Batteries are the source of most equipment troubles and should receive the most attention. In case of malfunction always suspect and check batteries first. Replace immediately if weak or questionable.

Always use fresh batteries. Units which have been in storage or on the shelf for some time may check OK at first, but can deteriorate rapidly in use.

As batteries are used, their voltage drops and the internal resistance increases rapidly. A combination of weak batteries and high internal resistance can sometimes cause receiver malfunction evidenced by a "lock-in" condition, loss of range, or failure to operate entirely.

When operating in cold weather, batteries lose their "zip" and often will not furnish sufficient voltage or current for proper operation. In this case, batteries rated above 3 volts may be required.

Certain makes of batteries are built with decorative end caps on the negative terminals. These caps are usually held in place only by the outer paper covering. Always remove these end caps and connect directly to the zinc end of the battery. Failure to do this will probably result in erratic or non-operation of equipment.

#### TUNING THE RECEIVER

Your receiver is factory-tuned to 26.995 megacycles. However, after installation in your airplane, car, or boat, it should be retuned. This is due to the fact that tuning is affected by antenna length and placement, and proximity to wiring and nearby metal objects. Check the tuning even though the receiver may appear to operate perfectly. It is important that tuning be checked before each flying session or after rough landings which may change the position of the coil tuning slug. Excessive vibration can also necessitate retuning.

#### NOTE

For non-slip tuning, we recommend that you remove the tuning slug from the antenna coil. Insert a single strand of a very small rubber band inside coil and reinstall slug. Do not force or slug may crack. Retune receiver.

To tune the receiver, we recommend that a transmitter without antenna be used for the initial adjustment. Starting with the transmitter near the receiver antenna, and audio signal held on, rotate the tuning coil slug with a plastic hex tuning wand obtainable at any radio supply house (General Cement #8282-7 or Walsco #2543) until the relay or escapement actuates. Tune for the middle of the actuation range. Then slowly move the transmitter farther away until the receiver does not respond. Retune receiver slightly until it actuates again. Continue this process until the transmitter no longer operates the receiver. This distance should be at least 6 to 10 feet or more, depending upon receiver antenna length and battery condition. Tuning should become sharper as the receiver-transmitter distance is increased.

#### IMPORTANT

1. Use lightest escapement rubber which will provide required power. Heavy rubber will affect range and possibly prevent escapement pull-in.
2. Some escapements, when used with relayless receivers, hold in after signal is released. To prevent this, insert one thickness of "Scotch" tape between magnet and clapper to prevent metal-to-metal contact.



### CAUTION

Do not touch the receiver or antenna when tuning or a false tune may result.

For safety, a range check of approximately 1000 feet

should be made with the transmitter antenna installed. Minor retuning may be required to obtain peak receiver operation. Once this is done the equipment is ready for use. However, be sure that correct operation is obtained every time a signal is sent. If not, check batteries, escapement and wiring thoroughly to determine the cause of any malfunction.

### WARRANTY

This equipment (except batteries and transistors) is warranted by C & S Electronics to be free of defects in material and workmanship for a period of ninety days. However, this guarantee is void should the manufacturer judge the defect to be caused by abuse, crashes, over-voltage, incorrect battery polarity or other misuse by the customer.

Repairs within warranty will be provided at no cost to the user except for transportation and insurance. Other repairs will be performed at a nominal service charge plus cost of parts. When damage occurs which is too extensive for repairs, unit replacement will be made at a cost to user equivalent to 65% of retail price of equipment.

In event of trouble return unit direct to the factory, NOT TO THE DEALER. Repairs are not priced for dealer discounts. Equipment will be serviced and returned within a few days.

When sending equipment to the factory for service or repairs, package it carefully, include detailed information on trouble, and name and address. Be sure to enclose cost of return postage and insurance. Equipment will not be serviced or returned without this remittance. When repairs are chargeable to customer, he will be notified as to cost so remittance can be made. No C.O.D.'s or credit on service.

In event of trouble do not hesitate to return equipment to the factory for service or checkup. The C & S service policy is to perform minor checkups and adjustments whenever possible without charge; in short, to see that our equipment continues to give maximum performance.

Please fill in the enclosed warranty form within 10 days and return it to the factory as a record of your equipment purchase. Warranty service will be performed only on equipment so covered.

ABOVE WARRANTY NOT APPLICABLE TO KITS

SEND ALL REPAIRS AND SERVICE TO:

C & S ELECTRONICS REPAIR STATION  
13400-12 SATICOY STREET  
NORTH HOLLYWOOD, CALIF.