C&S ELECTRONICS
13400-12 SATICOY STREET NORTH HOLLYWOOD, CALIFORNIA

Operating Instructions

for the *"Wren"*

RELAYLESS MULTI RECEIVER

(MODEL CS-513)

DESCRIPTION

Your CS-513 Relayless Multi Receiver is the smallest, lightest multi receiver available today. It is available in either 6 or 10-channel versions, both offering simultaneous reed action. Total size and weight of this equipment, even including operating batteries and Annco relayless servos, permits multi operation of even 1/2A airplanes.

The same equipment will serve admirably for model boat or automobile operation. For this application, an accessory "Relay-Pak" is available separately, and permits use of less expensive servos.

Exclusive SENSI-MATIC circuitry incorporated in your CS-513 receiver automatically adjusts circuit sensitivity to prevent overloading (swamping) at close distances yet provides tremendous operational range.

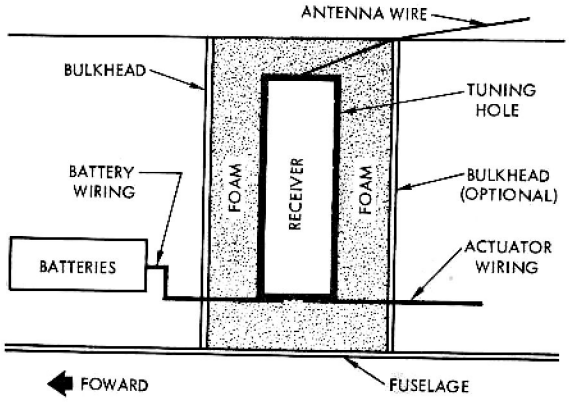
The CS-513 Multi Receiver is basically a four-transistor circuit utilizing a highly sensitive superregenerative detector as the first stage. Transformer coupling in the audio stages gives maximum gain and operating efficiency.

This receiver is available with either a 6-channel Medco or 10-channel New Haven reed bank. Both units are of the new high frequency type; sensitivity to vibration is reduced to a minimum.

For maximum compatibility with various transmitters, the audio tone range of the 6-channel reed bank is exactly the same as the 6 center reeds of the 10-channel bank. This means that a 10-channel transmitter, such as the C&S "Eagle", can be adjusted to work either version of the receiver. When employed with a 6-channel "Wren", the "RUDDER" and "TRIM" channels of the "Eagle" transmitter would not be used; the "AILERON" control would serve to operate the two low frequency reeds (rudder). Conversely, the 6-channel "Hawk" transmitter can provide operation of the 6-channel "Wren", or the 6 center reeds of the 10-channel receiver. NOTE: Slight "padding" of the transmitter audio tones may be necessary to properly tune all reeds on certain reed banks.

RECEIVER INSTALLATION

Locate the receiver in the aircraft (or vehicle) where it is least subject to crash damage and readily accessible for tuning. Maximum crash protection can be obtained by completely surrounding the receiver with a thick layer of foam rubber or plastic. Minimum thickness of 1/2" is satisfactory for padding of sides, top and rear; 3/4" minimum is recommended for bottom and front.



Specifications

Sensitivity	2 microvolts for reed operation
Operating Voltage	6.0 - 6.5 volts (works on servo pack)
Recommended Batteries	Five 1.25 volt nicads (series) 225 or 500 mah capacity
Idle Current	6 ma nominal (carrier off) 4 ma nominal (carrier on) at 70°F
Audio Tone Range	
6-channel	350-600 cycles
10-channel	325-650 cycles
Modulation Percentage Required	80-100%
Recommended Multi Transmitter	CS-510 "Eagle" or CS-512 "Hawk"
Tuning Range	26.995 to 27.255 mc band (will cover approximately 25 to 30 mc)
Operating Temperature Range	20°F to +120°F
Dimensions	1 inch high 1-1/2 inches wide 2-1/8 inches long
Weight	1-7/8 ounces

Always position receiver above and/or behind batteries to reduce possible crash damage. Vertical mounting of receiver against a bulkhead is recommended, bottom of receiver facing forward. Where this is impractical, horizontal mounting will be satisfactory, provided adequate padding is used. In any event, do not pack padding too tightly around receiver or vibration may affect receiver operation - receiver should "float" in its mounting.

ANTENNA

Sensitivity of the C&S receivers is very high and a long antenna wire is not necessary. We recommend a total antenna length of from 18 to 30 inches, depending on the size of the airplane or vehicle. A horizontal insulated antenna wire is satisfactory for aircraft use. This may either be externally mounted or installed in the fuselage during construction. In the latter case, do not use metallic paints when finishing the aircraft, or radio range will be drastically reduced. A short vertical section of music wire will be adequate for boats or cars. Naturally, sensitivity will be 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, or the resulting noise pick-up may cause erratic receiver operation.

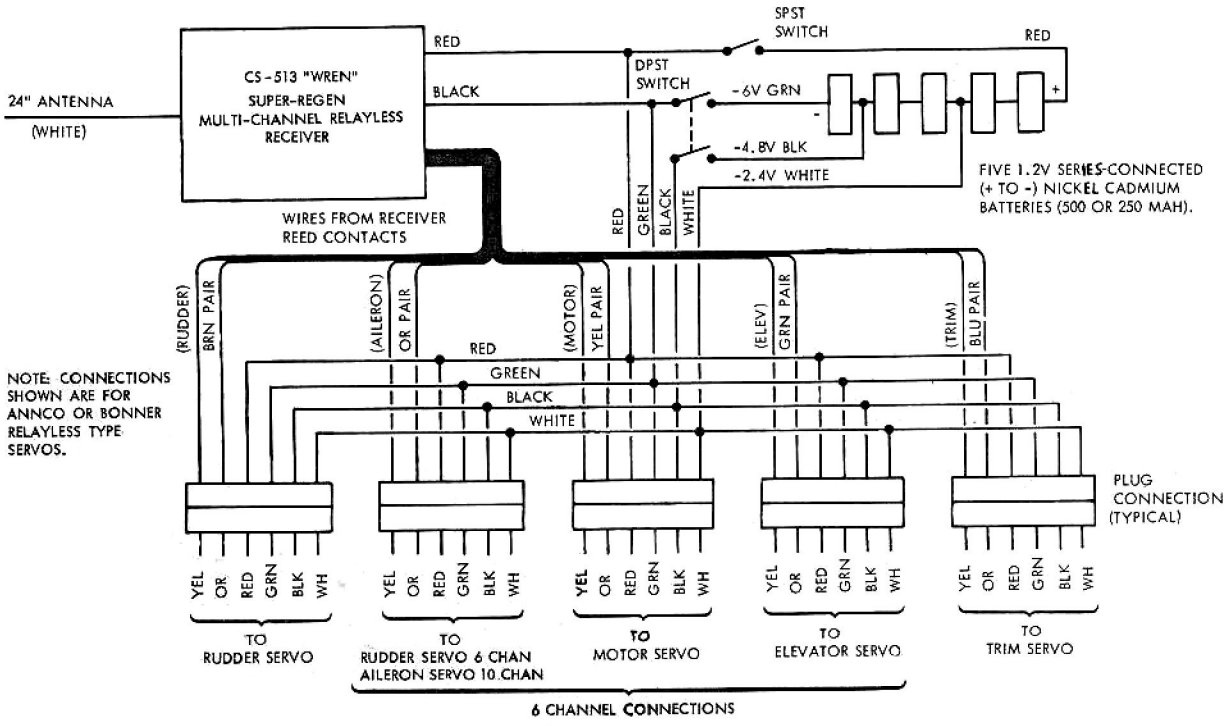
WIRING

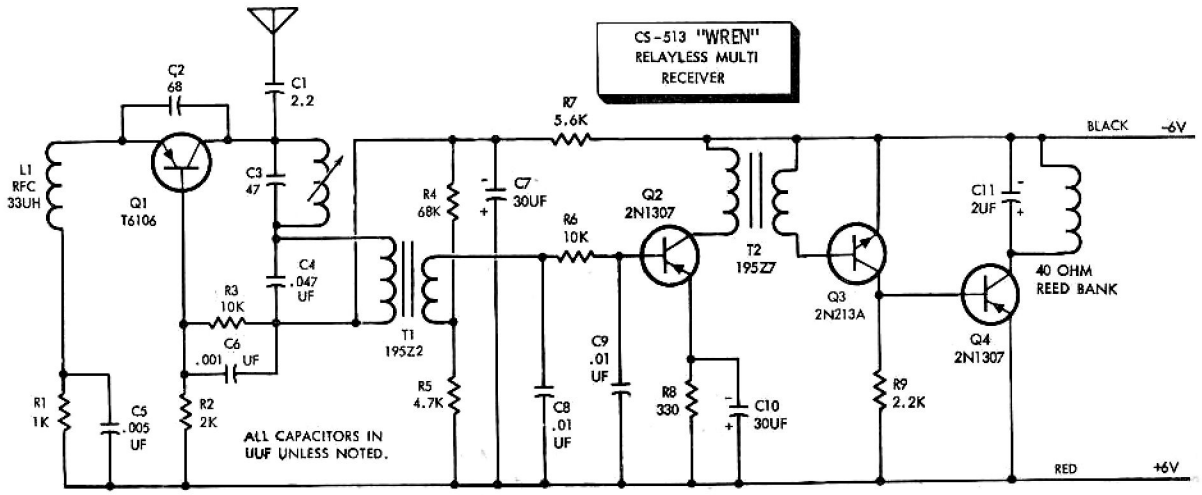
Plastic insulated 19-strand wire is recommended for your wiring installation. Use nothing smaller than No. 26 gauge wire, or voltage drop may be excessive. For antennas, No. 26 gauge insulated wire is satisfactory. Install all wiring as neatly as possible, making sure that it does not interfere with and cannot become entangled in the servos, escapement mechanisms, or associated linkages.

Use only high grade 60-40 rosin core solder for all connections. Beware of cold solder joints which can result in operational failures. Slide tight fitting sleeving over all connections for vibration protection.

WIRING DIAGRAMS

Proper wire connections for both the 6 and 10-channel units are shown below. Leads can be soldered directly





through, or a plug and socket arrangement used for quick removal and service of the various components.

The red and black wires from the receiver connect to the 6-volt power supply. Three (or five) wire pairs from the reed bank connect to the inputs of the various servos. Suggested control functions as follows match the tone selection of the C&S "Eagle" and "Hawk" transmitters.

6-channel

Rudder - Orange Pair Motor - Yellow Pair
Elevator - Green Pair

10-channel

Rudder - Brown Pair Motor - Yellow Pair
Aileron - Orange Pair Elevator - Green Pair
Trim - Blue Pair

After hook-up, if a servo runs in the wrong direction, reverse connections of the input color pair to that particular servo to change motor direction.

Other combinations of control functions can be used with other make transmitters if desired. Make sure audio tone range of the transmitter you use matches the new high frequency reed bank in the C&S receivers. Also verify that your transmitter has sufficient tone frequency and output R.F. stability to insure reliable operation.

BATTERIES

Both receiver models are designed to operate from a 6-volt supply, preferably the servo battery pack. Rechargeable nickel cadmium batteries, preferably 500 milliampere hour capacity, are in general use for this purpose. However, for smaller aircraft using low-drain servos, 225 mah batteries will operate satisfactorily, provided battery charge state is carefully watched. A good rule is to use the largest batteries your airplane can safely carry.

Nickel cadmium cells are rated at 1.2 volts each; several cells are series-connected to obtain the desired output voltage. After recharging, each cell may "top out" as high as 1.35 to 1.4 volts each. With a few minutes use this will drop to 1.2 - 1.25 volts where it remains virtually constant until charge is depleted. Upon depletion, battery voltages drop very rapidly, practically to zero.

No positive means is available to determine when either a fully charged or discharged state exists. For this reason, batteries must be charged at recommended rate for sufficient time to insure full charge. We suggest a full charge before each flying session. Also, use batteries sparingly to maintain some battery reserve and avoid danger of depletion during a flight session.

Nickel cadmium cells should be charged for about 12 hours at a rate approximately equal to one-tenth their rated capacity. For example, a 500 mah battery should be charged at 50 milliamperes.

TUNING THE RECEIVER

Antenna length and placement, receiver location, proximity of wiring, and metal objects, etc., all affect receiver RF tuning. After installation in your airplane, car or boat, check your receiver tuning as follows: NOTE: For non-slip vibration-proof tuning, we recommend that you remove the tuning slug from the coil. Coat tuning slug threads very lightly with a thin layer of rubber cement, dry thoroughly, then reinstall in coil.

For initial adjustment, use transmitter without antenna. Start with transmitter near the receiver antenna and activate a non-neutralizing command, such as motor control. Servo should be energized by this signal. Release command signal. Slowly increase distance between transmitter and receiver - continue keying at regular intervals.

When receiver no longer responds, rotate the tuning coil slug, accessible through hole in receiver case top, with a plastic hex tuning wand (GC #8282-7, Walsco #2543, or equivalent). Adjust slug until servo responds. Continue this process until maximum operating distance is obtained. This should be 10 - 15 feet or more, depending on antenna length and battery condition. Tuning should become sharper as receiver-transmitter distance is increased. Do not touch receiver, antenna or aircraft wiring while tuning, or a false tune may result.

Operational distances may vary considerably, depending upon surface over which test is made (pavement, grass, water), height of airplane above ground, humidity, etc. The same receiver could show response variations from 8 - 50 feet, depending on specific conditions. Learn the characteristics of your equipment, reestablish a minimum standard range check and be sure that your unit meets these standards before each flying session.

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.

Note: Do not be concerned about a slight "singing" in the Rx reeds when your Tx is turned off. This is normal in a super-regen multi receiver.

TUNING TRANSMITTER AUDIO TONES

Although C&S Transmitters and Receivers are carefully matched at the factory, there will be occasions when you will wish to tune the transmitter tones to the receiver reed.

Operate transmitter with antenna removed and receiver with servos disconnected. This will avoid possible servo damage which could occur if two adjacent reeds were accidentally driven together. Actuate one control lever on transmitter and observe action of corresponding reed in receiver. Rotate related control pot in transmitter clockwise (increase frequency) until the desired reed stops vibrating. Release control lever, then operate it again. Slowly turn pot counterclockwise (reduce frequency) until reed just starts to vibrate. Turn pot very slightly counterclockwise beyond this point - reed should now be tuned properly. Repeat same procedure for each control function.

REED CONTACT ADJUSTMENT

Reed contacts are factory set for correct gap and normally should require no adjustment. Individual reed screws permit adjustment of Medco reeds; adjustment of New Haven contacts is performed by carefully bending the contact finger in direction desired, following with a nudge in the opposite direction to normalize finger position. Use a flat wooden toothpick for bending, but never bend fingers beyond their normal range (to see point of contact) or they may be ruined. Normal contact spacing (New Haven) is 1/32" to 3/64". However, we must warn against all unnecessary tampering with reed contacts.

Never burnish, file or scratch contacts. If cleaning is required, use a coarse paper strip (which may be lightly moistened with solvent) or just a wood toothpick.

WARRANTY

This equipment (except vacuum tubes 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 charge of $3.00 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 name and address and 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 following 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.

SEND ALL REPAIRS AND SERVICE TO: C&S ELECTRONICS REPAIR STATION
13400-12 SATICOY STREET
NORTH HOLLYWOOD, CALIFORNIA

Litho in U.S.A.

Cut along dotted line and mail warranty to C & S Electronics Repair Station

C&S ELECTRONICS EQUIPMENT WARRANTY

Purchasers Name: _____

Address: _____

Equipment: _____

Purchased From: _____ Date of Purchase: _____

Address: _____