

INSTRUCTIONS

Citizen-Skip →

MOTOR DRIVEN
ACTUATOR
(SERVO)

P R E F A C E

CITIZEN-SHIP Actuators are available either built-up or in kit form. There are four types to cover all popular controlling action methods for single and dual-channel equipment including full Multi-control. They are all three volt operational models using the popular Mighty Midget Motor.

The Actuator Kit includes all FOUR printed circuit switching discs so that any one of the types can be made, or at a future date can be converted to another model.

Mechanical assembly instructions are in the last section, and the wiring and circuit must be obtained from the technical data discussing the wiring of each individual type actuator and the corresponding Wiring Diagram.

If a built-up actuator is purchased

and the modeler wishes to convert it to another design at a later date a package of 4 switching discs is available separately for that purpose.

CITIZEN-SHIP RADIO CORP.

INSTRUCTIONS FOR INSTALLATION AND OPERATION OF CITIZEN-SHIP ACTUATORS

CITIZEN-SHIP Motor Driven Actuators, commonly called servos, are used to move the control surfaces of model aircraft or boats on command from a transmitted radio signal and are normally actuated by a relay or relays in the radio receiver located in the plane or boat. These relays usually have two contacts: Normally Open (N.O.), and Normally Closed (N.C.). The relay armature moves between these two contacts and is the common connection.

Motor driven actuators serve the same purpose and may be used in place of, or in conjunction with the well known device called an "escape-ment," also manufactured by CITIZEN-SHIP, and are particularly applicable where the load is heavy, such as elevators or ailerons in large models,

where weight or wind resistance would prevent the limited power available from an escapement from properly functioning.

In addition, Model HRH, not currently duplicated in any existing escapement is especially designed for use in multi-channel equipment such as CITIZEN-SHIP MSR-8 and MST-8 radio gear and is not sequential, i.e. goes directly right or left or up or down on command.

NOMENCLATURE:

All CITIZEN-SHIP radio control systems for model control are of the on-off category whether they be on-off carrier such as the FL and CC-1, or on-off tone such as the REX and MST-8. This is accomplished by either pushing a button or moving a stick and holding it—thereby getting ON—or releasing the button or stick—thereby obtaining OFF.

Our nomenclature or numbers of

the actuators are therefore based on:
H for "hold" (Signal on).

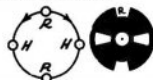
R for "release" (Signal off).

The action of CITIZEN-SHIP actuators depends on a printed circuit disc which does the switching required and by simply changing this disc and the wiring hookup, four basic different varieties of actuators can be obtained. (Two variations can be obtained with one of the discs as described below, actually giving five variations.)

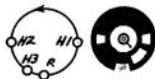
The four varieties are as follows:



HRH*



2R2H



1R3H



3R

* By omitting one wire connection this unit has an infinite number of positions and is commonly called "trimmable."

The HRH:

This unit is generally used with multichannel equipment and requires two relays to operate it.

The release position (R) is the center or neutral and closing (H) one of the two relays makes it rotate clockwise a certain angular distance and stop until the relay is opened (R) then it returns to center. The other relay action rotates it in the opposite direction.

This servo requires only seven wires for the complete hook-up instead of the normal eight for other makes. With the additional wire eliminated, a seven pin plug may be used giving a much cleaner overall installation. In addition it has an extra added advantage. By wiring this servo (See Fig. 1) so that relay #2 gives down elevator, relay #1 will allow up elevator to be signalled even though the down elevator relay is closed, stuck,

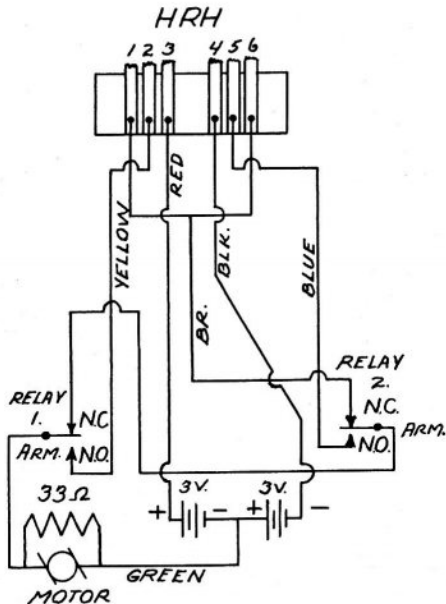


Fig. 1—Wiring Diagram—HRH

etc. This may well save an airplane from an early grave. Omitting brown wire connection to the #2 relay prevents the unit from returning to center and it will stay at the point it reached with either one of the relays closed. This connection is called "trimmable." (See wiring diagram for this unit.)

The 2R2H

This unit resembles the PSN CITIZEN-SHIP Escapement in that it has two "release" positions 180° apart and two "hold" positions 180° apart and 90° from the "release" positions. This is the favorite type of many modelers and is normally used with single channel equipment for rudder only on either a boat or plane, but can be used for motor control if two control positions, high and low, are desired. Rudder control on dual channel with this type is also popular. (See wiring diagram for this unit. FIG. 2.)

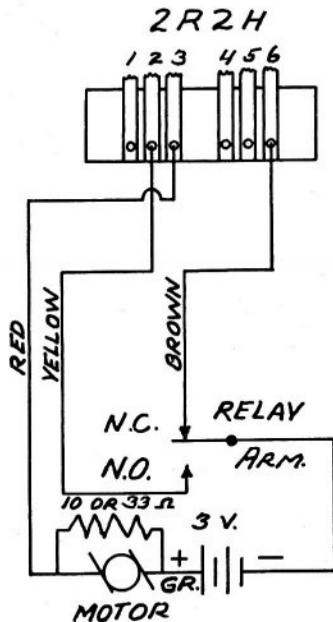


Fig. 2—Wiring Diagram—2R2H

The 1R3H

The IR3H has only one "release" position to which it returns when the signal is off. The first "hold" position is 90° from the starting point, and the second 270°, making the first two "hold" positions 180° apart as required for rudder or elevator operation. The third position is almost back to the starting point (approximate neutral) and closes a set of contacts which will operate an auxiliary device such as an escapement for motor speed control, etc. Without these contacts connected you have primarily operation exactly as our CITIZENSHIP SE Selective Escapement. Motor driven actuators or servos cannot be operated from this third position.

CITIZEN-SHIP Model PSN escapement with attached Control Valve from CITIZEN-SHIP Model MSC can be used for motor control. Also an air

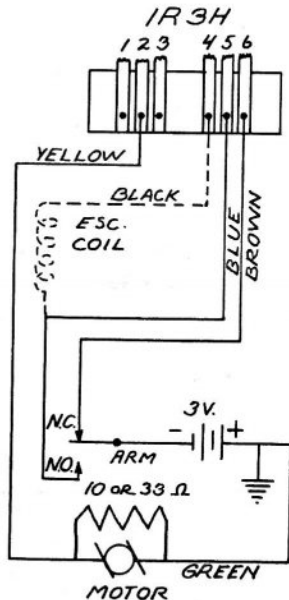


Fig. 3—Wiring Diagram—IR3H

intake throttle or exhaust baffle now available on modern glo engine may be positioned with the Model PSN escapement.

The three H positions are obtained by pushing the transmitter button momentarily, releasing and holding the required number to get the position desired. For instance, one push and hold, right rudder; two pushes and hold, left rudder; three pushes and hold, actuate auxiliary control.

This unit is also well suited for use on the elevator with CITIZEN-SHIP RER and REX dual channel equipment for operating the elevator plus motor speed. See wiring diagram for this unit. FIG. 3.

The 3R

This unit has no useful "hold" position. Each time the transmitter button is pushed and released it advances 120° and stops.

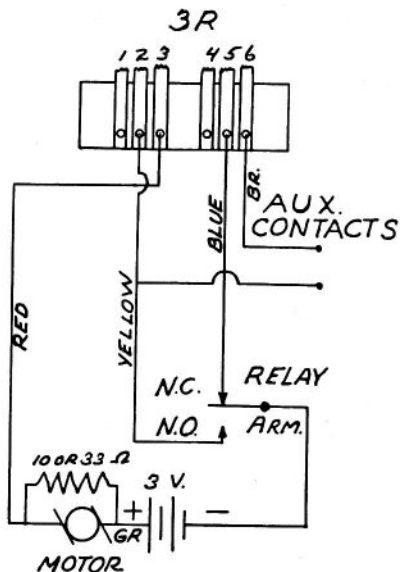


Fig. 4—Wiring Diagram—3R

It is especially designed for high, medium, and low motor speed through the use of an air intake throttle or exhaust baffle or can be used to obtain three speeds in a boat by control of the electric drive motor. This actuator can be energized directly from one relay on CITIZEN-SHIP RER or MSR-8 receivers.

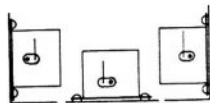
Notice the auxiliary contacts from connections #2 and #6. These are closed at only one of the three 120° "release" positions and may be used for any extra gimmick you desire. Horns or whistles may be sounded upon command. A battery can be installed in the circuit to keep the glow plug hot while in low motor speed. These are only two of the most obvious ideas. See wiring diagram for this unit. FIG. 4.

MOUNTING IN THE PLANE

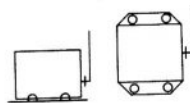
Actuator mounting can be in any of

three positions depending on room available, desired rotation, etc.—the three being with threaded power shaft and bell crank at top, right or left and each of these positions can have two or three different altitudes. See Fig. 5.

Top Position



Right



Left

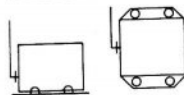


Fig. 5—Mounting Positions

This makes the servo very flexible in mounting and all that is necessary is to turn the bell crank to the neutral position after mounting and lock with washer and nut. Neutral is obviously a bell crank position perpendicular to the direction of the push rod. See Fig. 6. An eyelet is soldered in the outer of two holes in the bell crank and it

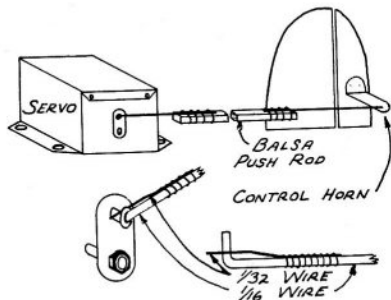


Fig. 6—Servo with Linkage Assembly

may be transferred to the inner hole if less travel is desired.

The rotation of the motor or power shaft of the actuator is translated into linear or angular motion by means of a push rod. Recommended hook-up for the push rod is illustrated. See Fig. 6.

DIRECTION OF ROTATION

Models 2R2H and 3R may be run in either direction by simply changing battery polarity. The starting or release position on Model HRH may be changed 180° by reversing red and black wires at batteries or at #3 and 4 contacts. See Fig. 1. Readjustment of the contact strip will be necessary with this change.

Model 1R3H can be run only one direction (counter clockwise).

INSTRUCTIONS AND NOTES FOR ASSEMBLY OF CITIZEN-SHIP MOTOR DRIVEN ACTUATORS

MODELS, HRH, 1R3H, 2R2H, and 3R.

This actuator, when properly constructed, will offer to the owner an ultra-reliable servo mechanism which will deliver a surplus of power with a very minimum of battery drain. Unpack the kit carefully and check each part against the parts list, acquainting yourself with each part in so doing. If you wish to understand the actual switching operation of the contacts and the printed circuit disc you choose, now is a good time to compare these with the corresponding wiring diagrams. This may help later in the adjustment of the contact strip. Two of the models, HRH and 1R3H, have somewhat of a critical adjustment. With models 2R2H and 3R the

contacts should strike the printed disc in a line which will bisect the disc, but this adjustment is very broad. See Adjustments for further adjusting notes on models HRH and 1R3H. Follow assembly illustrations closely. **Refer to Figures 7, 8, 9, 10.**

1. Remove large gear from motor assembly in order to replace $1/16$ " wire shaft and pulley with proper shaft and drive gear. Shaft with pulley is not used.
2. Place $1/2$ " long Gear Spacer on new $1/16$ " Shaft and insert shaft through motor bearings from the rear of motor. Slip large gear on protruding shaft and tighten set screw leaving just a touch of end play. Remove motor brush nuts and lock on solder lugs turning the long portion with small hole up. See Figures 7 and 8.
3. Push chosen switching disc on drive shaft from the threaded end

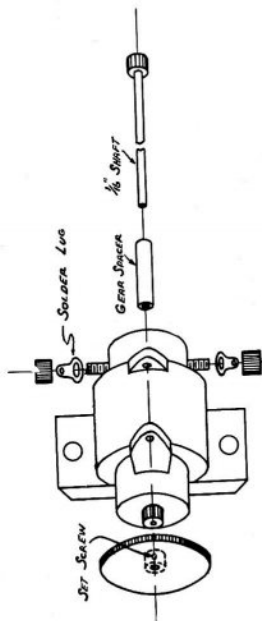


Fig. 7—Assembly Illustration

until the gear and the plain bakelite side of the discs are back-to-back flat against each other.

4. Insert drive gear assembly through proper hole in servo case. Place back bearing strip on drive shaft and mount this strip to case using the two bearing spacers as supports. See Figure 8. This gear should spin freely and be parallel to the back of the servo case.
5. Mount motor using paper motor shims if necessary to give proper gear mesh. Gears should not bind but have a minimum of clearance between them. See FIG. 9.
6. Place contact strip in position, see FIG. 9, using insulator strip to prevent eyelets from shorting to case and attach to case with furnished self-tapping screws. Center contacts with printed disc and tighten screws. See FIG. 10.

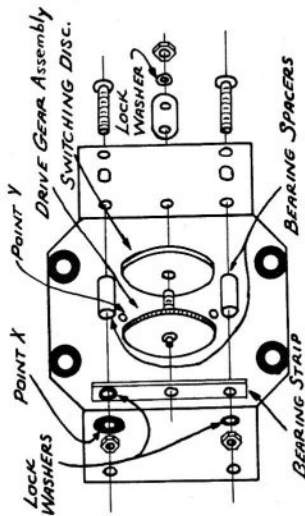


Fig. 8—Assembly Illustration

7. Insert all grommets in proper holes.
8. Wire actuator according to corresponding wiring diagram running leads through grommet at Point X or they may be brought out through the notch in the side of case cover. If leads are brought out the side bend small fish paper wiring strap around wires and attach to motor mounting screw at Point Y.
9. Screw bell crank on drive shaft adding lockwasher and locking nut. Lock well after mounting position is determined and rotational adjustment is complete. This horn may be soldered to drive shaft if so desired. However, keep in mind that this will complicate any further disassembly of the actuator.
10. Check operation before mounting

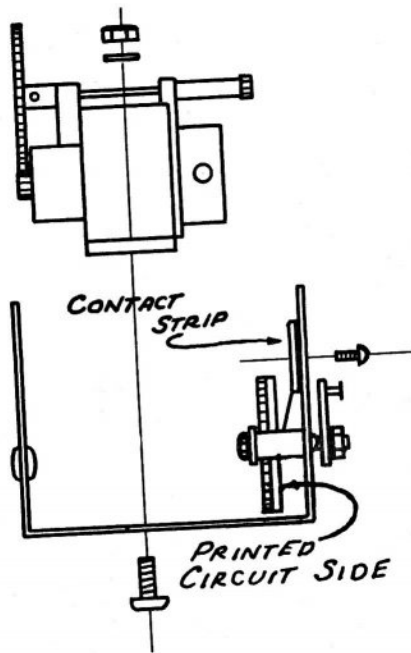


Fig. 9—Assembly Illustration

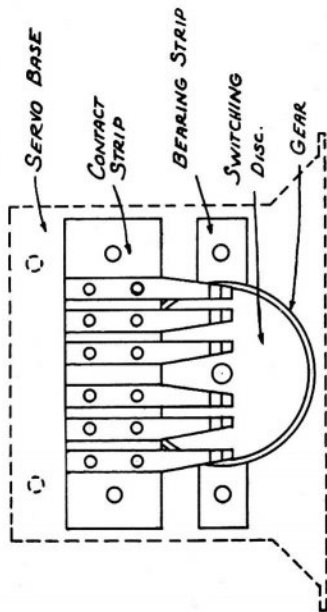


Fig. 10—Contact and Switching Alignment

in plane or boat. Attach servo cover.

ADJUSTMENTS:

Model HRH:

The adjustment of the contact strip for this servo determines the width of the centering neutral action. This centering can be made very accurate and will not change once it is set. Begin testing with contact strip as low as adjustment slots will allow, moving upward until the centering is practically the same from either direction. Having contact strip too far up will cause a neutral hunting action or even short batteries when neutralizing contacts 1 and 6 will not open.

Model 1R3H

Some trial and error adjustment may have to be made to get the auxiliary contacts closed at the degree of rotation of third stop position. Begin

with contact strip in the center of adjustment and raise or lower until proper operation is obtained. When not concerned with the third stop the adjustment is not critical, but the contacts should strike the printed disc in a line which bisects the disc as closely as possible.

USE OF 33 OR 10 OHM RESISTOR

All actuator kits are furnished with two resistors, one of which should always be connected directly across the two motor terminals. This resistor has two purposes—to help prevent relay contacts from burning and to reduce the amount of coasting of the Servo motor in models 2R2H, 1R3H, and 3R. Due to slightly varying amounts of motor torque and also differences in overall drag of gearing and switching, this choice must be made by you to obtain proper operation with the lowest amount of battery drain. Begin

testing using new, fresh batteries giving a full 3 volts. Place 33 ohm resistor (orange, orange, black) across servo motor and observe operation. This resistor limits coasting the least of the two but also has a lower drain on batteries. If any problems with coasting on either "release" or "hold" positions are evident, replace 33 ohm resistor with 10 ohm resistor (brown, black, black) and they will be corrected. With Model HRH always use the 33 ohm resistor (orange, orange, black) across servo motor as shown in diagram.

CITIZEN-SHIP RADIO CORP.

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PARTS PRICE LIST

1 Servo Base and Cover.....	\$3.00
1 Mighty Midget Motor.....	2.95
2 Solder Lugs, each.....	.10
1 1/16" Shaft and Gear Assembly.....	.75
1 Gear Spacer25
1 Drive Shaft and Gear Assembly.....	1.25
4 Printed Circuit Switching Discs.....	2.00
1 Bearing Strip50
2 Bearing Strip Spacer, each.....	.25
1 Contact Strip with 6 contacts eye- letted to strip.....	1.75
1 Insulator Strip25
1 Bell Crank50
2 Paper Motor Shim, each.....	.25
1 10 ohm Resistor25
1 33 ohm Resistor25
5 Grommets, each20
1 Screw and Washer Set (20 pieces), per set75
1 Wiring Strap25
Wire 1 ft. each of 7 colors.....	.75
Instruction Booklet (replacements).....	.50
Solder	