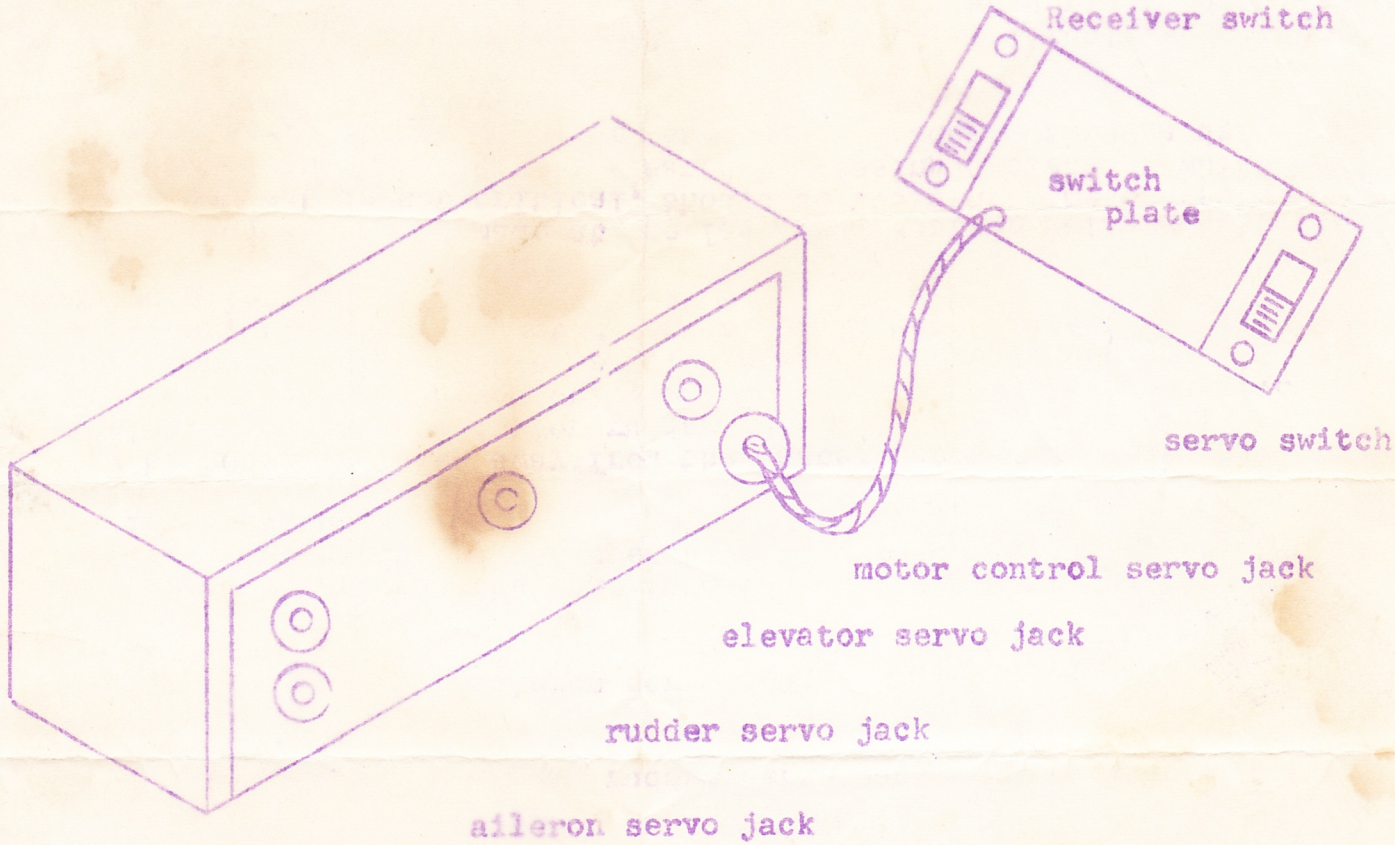
MASTER DECODER



The Master Decoder performs the same function as the electrical circuit in the Multiplex. The circuitry and operation is the same (see Master Multiplex instructions).

Servos may be added or taken away from the Master Decoder without changing its operation. You may use it for rudder only (Class I) by using the rudder and motor control servos only, or you can use the elevator servo as a fully proportional throttle servo. The Master can be used for Class II by using rudder, elevator and motor servos, or it may be used for Class III with coupled ailerons.

Optimum relay adjustment is made at the factory. Further relay adjustment, altho the adjustment is not critical, should be avoided. The contacts rarely require cleaning but may be cleaned by passing a piece of white bond paper between them. Do not dig in to the Master Decoder unless a definite malfunction is found and proven.

Install the Master Decoder in your model by wrapping it lightly in 1/2 in. plastic foam material and place it in the fuselage in an upright position (standing on one of the small ends) with the base facing the front of your model. This will assure maximum resistance to vibration and best shock resistance.

Your new Crescent "Multiplex" Multiple Proportional Servo pack comes to you completely wired and tested ready to install and operate in your favorite model. This unit is designed for use with the Glass City "Crescent" 6 volt single channel all transistor receiver, the Min-X Convertible single channel 6 volt receiver or the Min-X compact 6 volt receiver. The Crescent receiver or the Min-X convertible receiver are equipped with plugs wired correctly to operate the servo pack without changes. The Min-X compact receiver and all other receivers must be wired per the wiring diagram enclosed with the servo pack. Receivers that require a "B" battery must be wired with a seperate switch as shown on the wiring diagram.

Battery power is obtained from the Crescent battery pack and is completely wired and precharged at the factory for immediate operation. Just plug it in to the power plug in the servo pack.

If you wish to make your own battery pack, follow the instructions and recommendations in the battery instruction sheet.

Satisfactory operation of the Crescent servo pack cannot be guaranteed if it is used with a pulser other than the Glass City Mark II Universal Pulser or Glass City's Crescent Pulsmitter.

Install the "Servo Pack" as shown in Fig. 1 & 2 by bolting it to a plywood plate or merely bolting it to the side of the fuselage. Connect the rudder and elevator pushrods and adjust for exact center. Connect the motor control push rod and check for retard throttle position. Plug in your receiver and your servo battery pack. Turn on your transmitter and pulser. Turn on both switches in the servo pack. If the receiver is tuned to the transmitter frequency, it should start operating immediately. Observe the center and right and left movements of the rudder and adjust accordingly. (See adjustments per the adjustment sheet.) Once you have made the proper adjustments, you are ready to operate. The control surfaces must be absolutely free of binding or drag. No amount of resistence in the surfaces or linkage can be tolerated.

When installing the Multiplex, compress the two sponge rubber supports approximately 1/2 inch overall from their free standing position. This will insure freedom from front and back movement of the pack and consequent trim changes in flight yet will still allow the full benifit of the torsional vibration absorbing characteristics of this mounting method. The Multiplex is sensitive to vibration and must be mounted as shown and have sufficient freedom of movement to operate satisfactorily.

Use 1/8 dia. dowel or 1/4 square hard balsa for push rods as shown in Fig. 3. The keepers should be bent to make a light contact with the servo rods. Do not allow any bind whatsoever in the pushrod linkage. The 1/4 square hard balsa is self supporting up to approximately 24 inches in length. When using dowel, piano wire or hard 1/4 square over 24 inches in length, the pushrod must have some support in the center to avoid bending or buckling of pushrods at high speed or during violent maneuvers.

Many kits are available that will work well with the dual system. We would recommend beginning with a stable type model such as the Live Wire Champion. You will find that you can do a great many maneuvers with this type model and it will be inherently stable enough to fly hands off. After you have used the dual system for a period of time and are certain of the feel of the

system, then is the time to go to a high performance full stunt type model complete with coupled ailerons.

ADJUSTMENT, MAINTENANCE AND TROUBLE SHOOTING

Proper tension of the elastic centering bands is made at the factory. Observe the operation of the unit, and when replacement is necessary duplicate the original adjustments as closely as possible.

Rudder centering band - tension should be adjusted so that the go-around function of the servo will work rapidly and positively even at or near the end point of the servo battery life. The pulse width adjustments should be made with the cradle stop screws in the Crescent Mark II pulser or Pulsmitter per the pulser instruction sheet to obtain a pulse pattern for the rudder servo as described.

Elevator centering band - tension should be adjusted to bring the servo back to center. Excessive tension will limit the elevator servo travel and slow down the servo response. Too little tension will allow the elevator servo to wander and not return to center when the motor control or fail safe is operated.

The control function of the servos is as follows:

RUDDER - Push for right and pull for left
ELEVATOR - Push for down and pull for up
MOTOR CONTROL - Push for high and pull for low

The function of the ELEVATOR & MOTOR CONTROL ONLY servos may be reversed by reversing the two wires to the motor poles of the servo you wish to change.

The servo motors should be very lightly lubricated about once a month for normal operation. Use a good quality light oil, such as "3 in 1". Apply the oil very sparingly to all bearing points in the motor and clacker assembly.

The following are some hints to proper trouble shooting. Note: These instructions are for use with the Crescent or Min-X receiver and may not be true if used with other receivers.

With the Multiplex now installed in your model, we will make the preliminary adjustments to prepare it for flight.

We will begin with the rudder neutral and left and right adjustment. Turn on your transmitter and pulser and adjust the pulser for medium speed (about 10 pps.). Now turn on your Multiplex. If your transmitter and the receiver are turned to the same frequency, it should start pulsing immediately. Observe the action of the rudder servo and the elevator servo.

The rudder servo should oscillate with approximately 1/4 inch of movement and have an average position of exact center. The elevator servo should also begin oscillating at twice the rudder frequency and with a smaller amount of wiggle, approximately 1/16 inch. At this point you should speed up or slow down your pulser with the trim control on the side to obtain neutral position of the elevator servo. Do not attempt to readjust the elevator trim. It has been preset at the factory in it's best operating position.

With the rudder servo and elevator servo operating in neutral position, move the control stick on the pulser into left position and adjust the stop screw on the cradle so that the average position of the oscillation is approximately

45° to 50° to the left. Now move the control stick forward and speed up the pulser and move the control stick backward and slow down the pulse. The servo should show an average position the same in extreme high as in maximum low speeds, and the servo should show no tendency to go on around and bump the motor control contacts. If the servo does go around, the pulse speed in low (or up elevator) is too slow or you have gone too far with this adjustment. Repeat this adjustment for right rudder position.

The elevator adjustment is very simple. Set the trim control in your pulser at the speed that will allow neutral operation of the Multiplex elevator servo. Now move the control stick forward to increase the pulse speed and the servo should go toward down position. If you do not get enough down movement, you must adjust your pulser control stick stop by rotating the speed control pot in the pulser in the forward direction. The elevator servo should move from lock to lock with full control stick movement.

Now pull back on the control stick and observe the up elevator position. This can be adjusted by rotating the eccentric plastic stop in the back control stick position in the pulser. As explained in a previous paragraph, the most important thing to watch in up elevator position is not to allow too slow a pulse speed and allow the rudder servo to go around and bump the motor control contacts.

Motor control and fail safe should require no adjustment. Upon mmving the lever switch on the pulser to the rearward position (no signal) the rudder servo will go around into neutral position, the elevator will go to neutral position and the motor control will retard. Upon moving the lever switch in the forward position (full signal) the rudder servo will go into neutral, the elevator will go into neutral and the motor servo will advance. You can position the motor servo at any spot by "blipping" the lever switch.

Do not cut the excess wire on the switch leads. Wrap the wire around the switch body and tape. This will stop any tendency for vibration to break the switch lead wires at the switch terminals.

Upon loss of signal due to out of range, transmitter failure, etc. both control servos will neutralize and the motor servo will retard.

SET UP AND ADJUSTMENT

In the original set up of receiver, servo pack and batteries, the rudder servo favors right or left position. CHECK 1st. Swamping of the receiver - collapse the transmitter antenna and move a few feet away from the receiver. 2nd. Check your pulser for equal percentage of off and on signal when control stick is in the center. Adjust if necessary. 3rd. Improper receiver relay adjustment. Increase or decrease the relay spring tension and/or armature clearance.

On an initial set up, you may have to center your pulser in relation to the Multiplex. This may be done most easily by loosening the motor screws in the Crescent Universal Pulser and sliding the motor in the direction that will neutralize and center the Multiplex. In some cases the motor mount holes may have to be enlarged slightly to allow adequate movement. Excessive movement is not normal. If excessive movement is required, check for other defects.

Problem: Right and left control on the pulser is too sensitive (control stick movement restricted too much). Control stick travel and sensitivity are

controlled in the Crescent Pulser by changing the diameter of the wiping circle generated by the rotation of the wiper against the split plate. To change the diameter, disassemble the two halves of the cradle and heat the wiper with a hot soldering iron at the point where it is soldered to the motor shaft. When the solder is loosened, move the wiper in or out to change sensitivity to that which you desire. The larger the circle, the less sensitive the control.

Problem: Insufficient elevator travel in one or both directions. The Multiplex requires a rather broad speed change to get good elevator action. This is desirable as it reduces the sensitivity to control stick movement and eliminates the tendency to "hunt" when flying. The best solution is to adjust your pulser to allow for a very broad speed range as described in the instruction text.

Problem: Not enough speed in the pulser for down elevator action. Use 4 Eveready E 94 Energizers to power your pulser. This combination will give you 6 volts on the pulser motor and will give more than ample speed and very good life. The E 94 cells are the same diameter as a standard D cell, but are only half as long. Four of these cells fit the battery box in the Crescent Pulser perfectly. If they are not available from your local supply house, you can order them directly from us.

Problem: Erratic action of the servos in the Multiplex. In most cases, erratic action can be traced back to the pulser or transmitter rather than the servo pack. The pulser should be disassembled, cleaned and relubricated periodically. In older model pulsers without the relay, use a very small amount of very light oil, such as sewing machine oil, as a lubricant on the wiper plate and pick up wiper. On the newer pulsers with the relay, a small quantity of finely powdered graphite has been found to be best. This graphite is available at most auto supply stores in small tubes for about 25 cents.

Problem: When flying, the rudder begins to favor right or left position and becomes erratic. One side of servo batteries has run down. Time to recharge. The servo pack should operate continuously for 60 minutes minimum before evidence of battery weakness should show. Our tests have shown satisfactory operation in excess of 120 minutes on one charge.

Problem: Go-Around function of rudder servo does not work. Check for freedom of pushrod and control surfaces. You must have absolutely free working controls. No amount of binding or resistance can be tolerated. Excessive tension on the drag brake on the clacker assembly can also limit rudder servo operation. Check servo batteries. Check for excess tension of the centering band.

Problem: Elevator servo becomes erratic. Increase the tension on the drag brake on the clacker behind the rudder servo. The clacker requires a very small amount of drag, but it <u>must</u> have some drag.

The elevator trim control is a most usefull feature when flying. Set it for slight up trim on take off, and your model will climb out practically by itself, adjust if for neutral for normal flying when in the air or crank it into down to hold your model inverted hands off. Trim a little up for your landing approach and slow down your approach speed to make a perfect landing.

Ailerons can be added by electrically coupling them with the rudder servo as shown in the wiring diagram. Control surface size and movement for rudder and elevator will be approximately as shown in your kit. Ailerons for proportional control should be slightly smaller for smooth operation.

SPECIFICATION

Size - 3 7/3 in. long x 3 in. high x 1 7/3 in. wide
Weight - 10 oz. (all up weight with receiver and batts. 21 oz.)
Battery Drain - 3 servo pack pulsing - 320 milliamperes RMS
In fail safe - 310 milliamperes
3 servo pack + aileron servo pulsing - 435 milliamperes RMS
In fail safe - 340 milliamperes

Minimum Battery required - 4 Burgess CD9 900 MAH ni-cad
Note: Never use more than 3 volts with this unit.

Case - .040 thick 6061 alloy aluminum heat treated for maximum strength, finished in high luster translucent green protective coating.

Cover - .020 thick 3003 alloy aluminum with same finish

Mounting - Special two point torsional mounting in shock and vibration absorbant foam material. This mount will dampen even the most severe vibration.

Special Features - Completely wired and tested, fail safe, true non-interacting simultaneous proportional control. Control stick action for closest assimilation to full scale flight.

RECEIVER TUNING AND RANGE TESTING
(Crescent, Min-X and most other all transistor receivers)

Turn on your pulser and transmitter and your multiplex. Have a friend hold your transmitter. Set the transmitter pulse for neutral position of all controls. Insert the tuning wand in the receiver slug and start walking away from the transmitter. Walk until the multiplex stops pulsing. Now retune the receiver until it starts working again. Next, rotate the tuning slug in one direction until the multiplex stops pulsing, now turn it in the opposite direction. it will start pulsing again. Keep turning until the multiplex stops pulsing again. Now turn the slug to the exact center position between both positions where pulsing stops. Repeat this procedure until you are at a distance where you have no adjustment left. This will be your best point for maximum range.

Receiver Plug for Ins. or Crescent Receivers

Use 7 pin miniature plug. Receiver socket is closest to end of case (front).

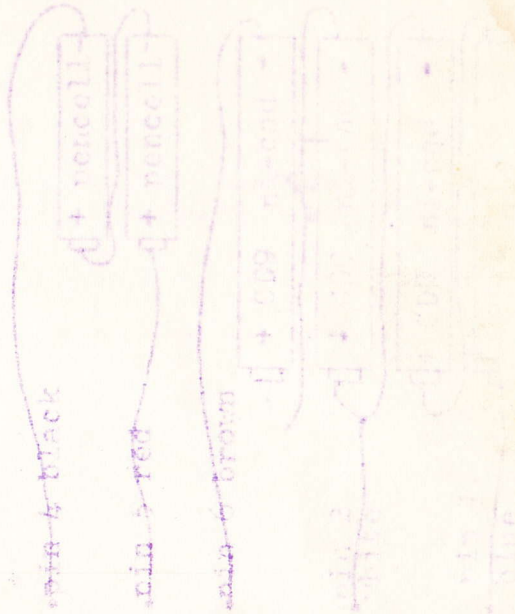
Pin No. 1 White - relay armature
" " 2 Yellow - relay normally closed contact
" " 3 Black - receiver 3 volt
" " 4 Green - Test (not used with Multiplex)
" " 5 Red - receiver 3 volt +
" " 6 not used
" " 7 Blue - relay normally open contact

Servo Battery Plug for the Multiplex

Use 7 pin miniature plug.

Pin No. 1 Blue - servo 2.6 volt +
" " 2 White - servo common 2.6 volt + and -
" " 3 not used
" " 4 Black - receiver 3 volt -
" " 5 Red - receiver 3 volt +
" " 6 Brown - servo 2.6 volts -
" " 7 not used

Caution - Do not use servo batteries with less than the 900 M.A.H. capacity of the Burgess CD9.



Multiplex wiring for receivers using A & B batteries.

Receiver Plug

Use 7 pin miniature plug. Receiver socket is closest to end of case (front)

Pin No. 1 White - relay armature
" " 2 Yellow - relay normally closed contact
" " 3 not used
" " 4 not used
" " 5 not used
" " 6 not used
" " 7 Blue - relay normally open contact

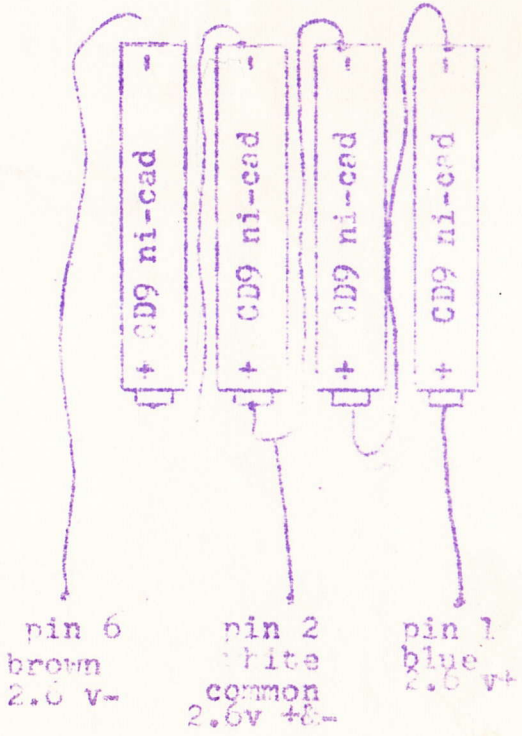
Note: Use a seperate DPDT switch and wire per your receiver instruction sheet to turn receiver on and off.

Servo Plug

For receivers requiring A & B batteries

Use 7 pin miniature plug.

Pin No. 1 Blue - servo 2.6 volt +
2 White - common 2.6 volt + & - center tap
3 not used
4 not used
5 not used
6 Brown - 2.6 volts -
7 not used

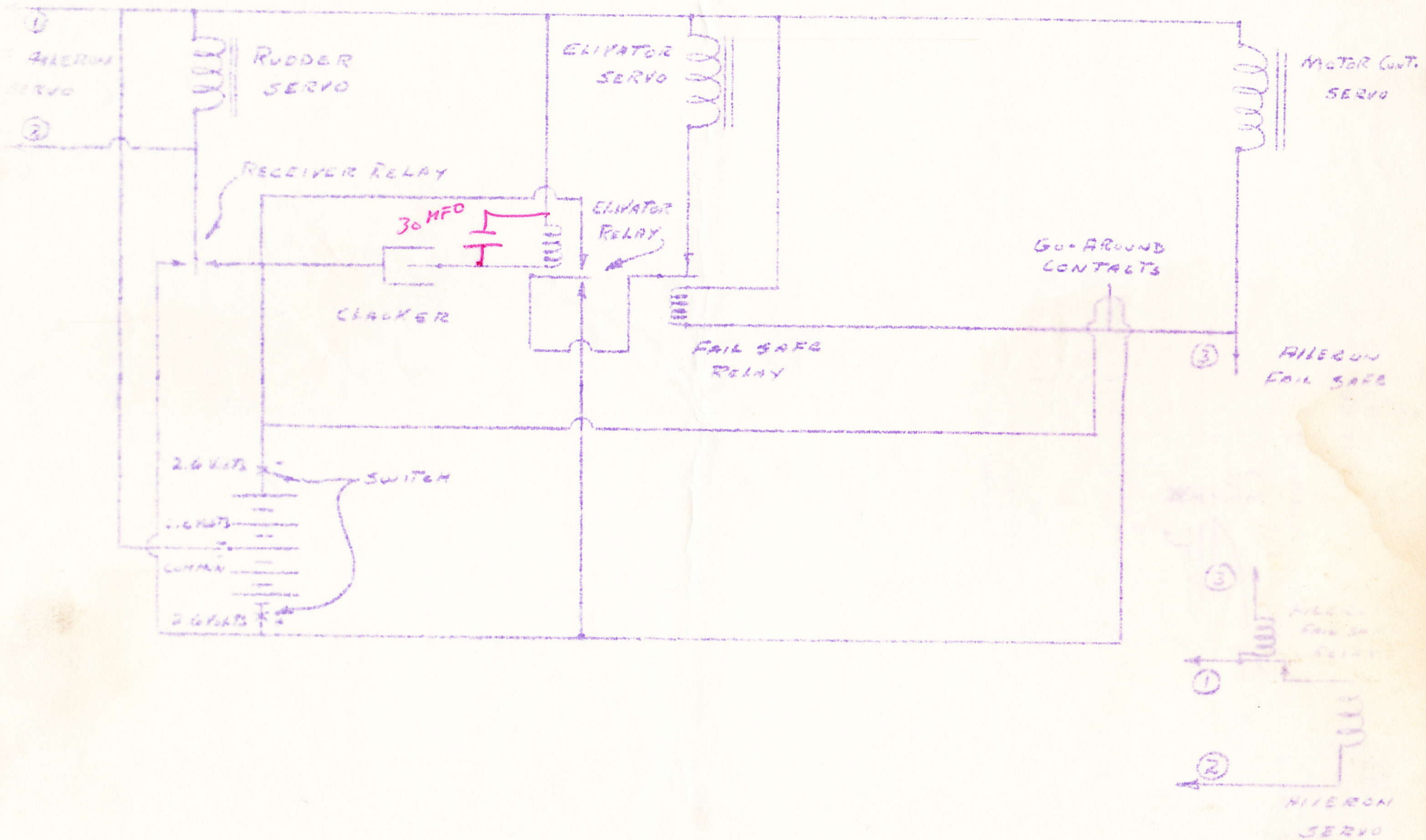


Caution - Do not use servo batteries with less than the 900 m.A.H. capacity of the Burgess CD9.

Glass City Model Electronics Tel. Bend.

MULTIPLEX WIRING DIAGRAM

RECEIVER CIRCUIT & PLUGS OMITTED FOR CLARITY



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MULTIPLEX INSTALLATION INSTRUCTIONS

Fig. 1

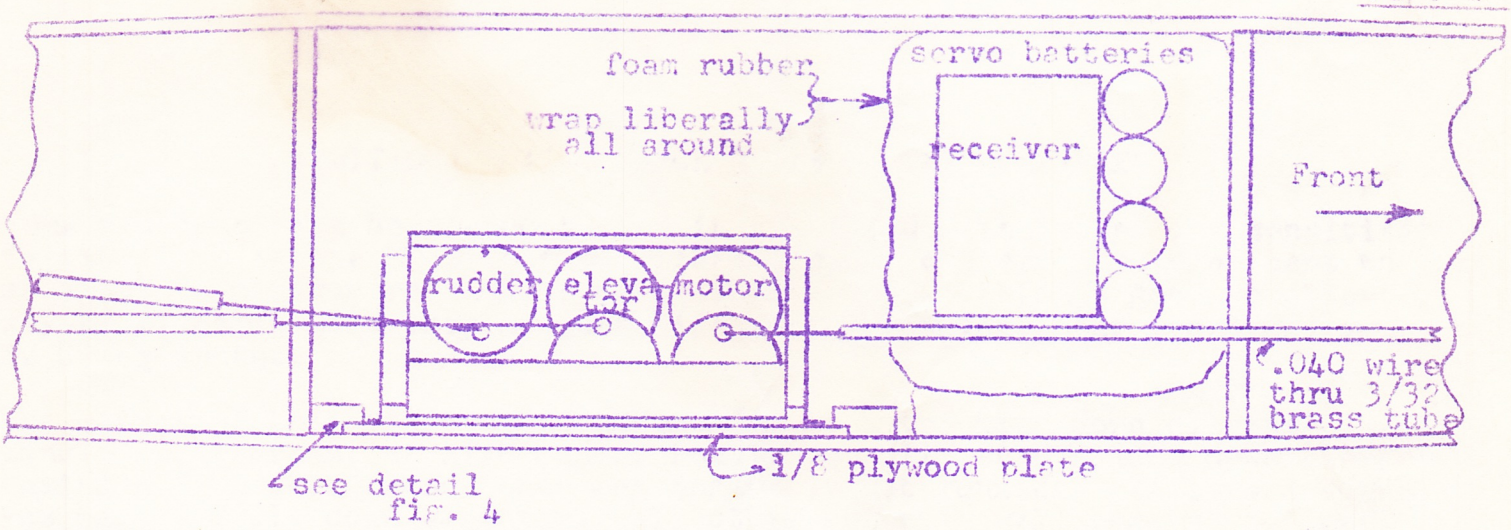


Fig. 2

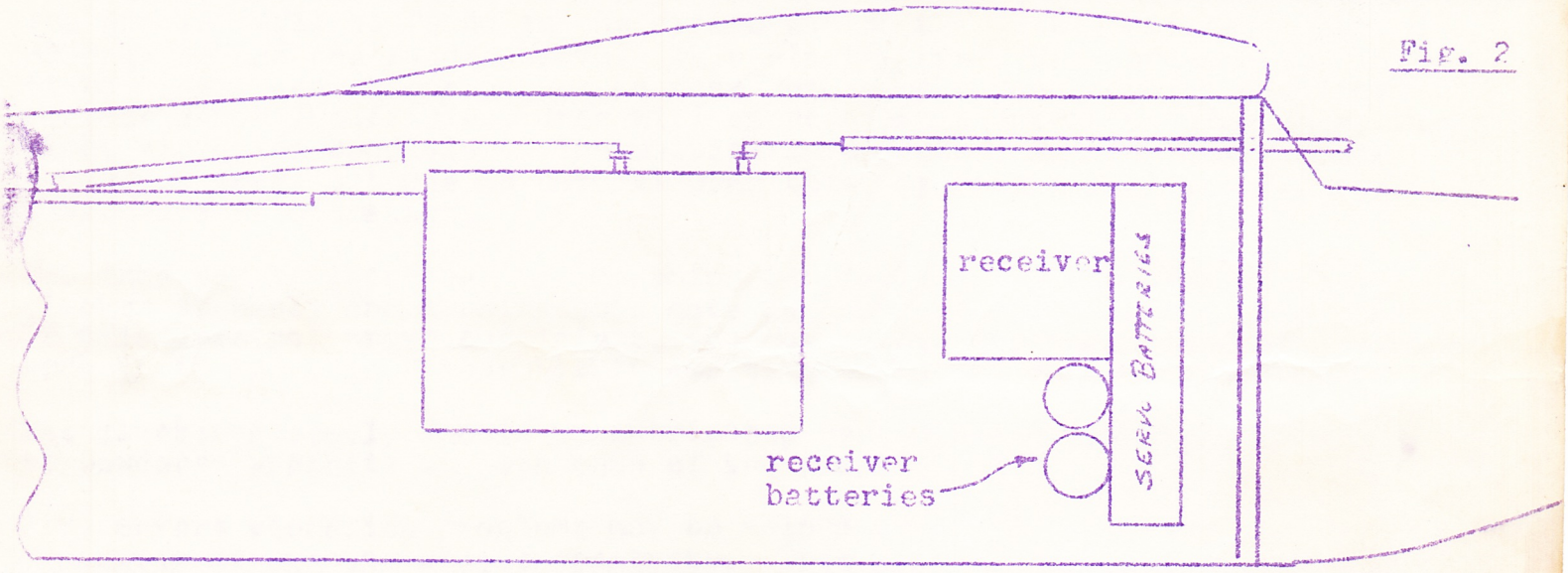


Fig. 3

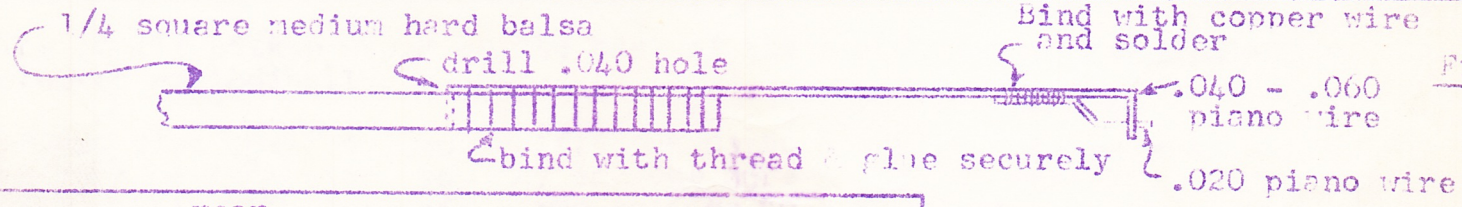
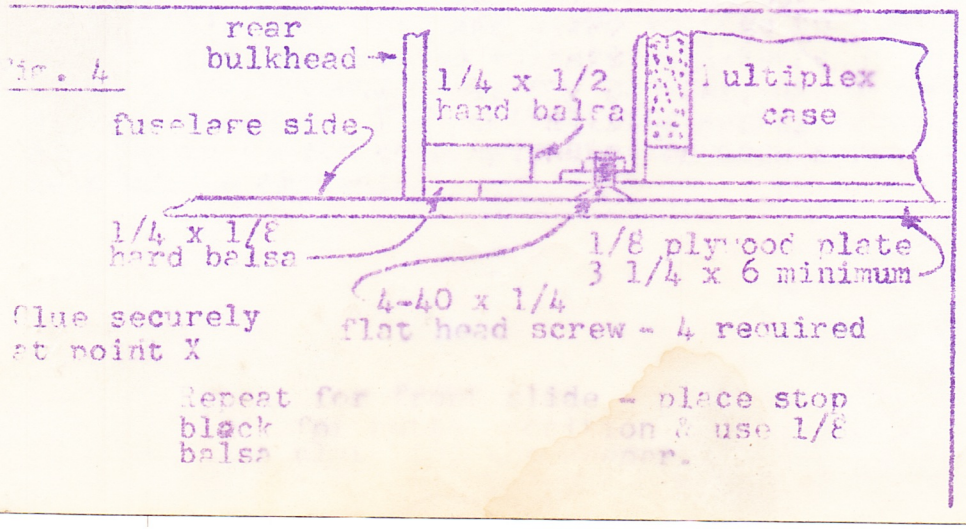
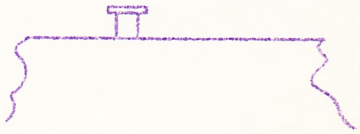


Fig. 4





Note: Low wing installations are same except the pack is inverted.

ADDITIONAL MAINTENANCE NOTES ON THE MULTIPLEX

Some problems have been encountered in the field with increasing sensitivity to vibration in the "Multiplex". Vibration, of course, should be kept to an absolute minimum regardless of equipment used. This is good practice any time, as it will increase the life of your engine, your model and your R. C. equipment.

The effect of this vibration problem will be a creeping down elevator condition; that is, at high engine rpm., you will get a slight down elevator position from that preset when the engine is not running. In severe cases, you may get full down elevator. All other controls will remain the same.

The problem will be found in the drag brake on the little horseshoe shaped clacker behind the rudder servo. This clacker has a drag brake built in to it to create enough resistance to move ent to make good contact with the contact arm. Insufficient drag will cause erratic operation even under very light vibration condition. The multiplex is factory set for the correct amount of drag, but due to natural wear this may become ineffective after some hours of operation.

The drag may be increased by loosening the lock nut on the back of the clacker assembly and turning both nuts in a couple of turns and relocking it. If this does not prove sufficient, you may remove the spring and bend more arch in it and then reassemble it and tighten to the correct adjustment.

The clacker assembly should be lubricated periodically with a small amount of powdered graphite at both ends of the shaft.

Very severe vibration problems may be helped by adding a 25 mfd at 6 volt capacitor across the clacker contacts. This will eliminate most vibration problems, but will produce some slight interaction of controls especially in down elevator. The positive (+) side of the capacitor should be connected to the motor side of the clacker contacts.

The little pickup wiper on the back of the elevator servo should also be cleaned periodically.

If you find that you lack sufficient servo power to operate your controls to your satisfaction, you may add one more ni-cad to each side of the battery pack. This will increase servo voltage to 3.6 and give you 50% more servo power. The increase in voltage will increase overall battery drain and will require more frequent battery charges, and a reduced number of flights between charges. The neutralizing spring tension of the rudder servo must also be increased to compensate for more servo power. The elevator servo need not be changed.