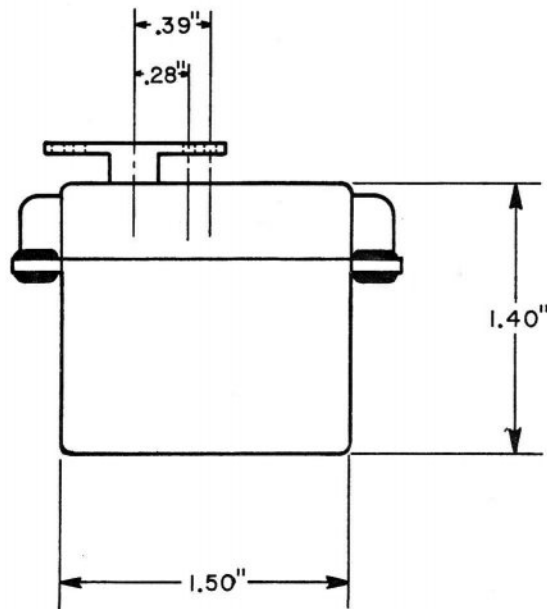
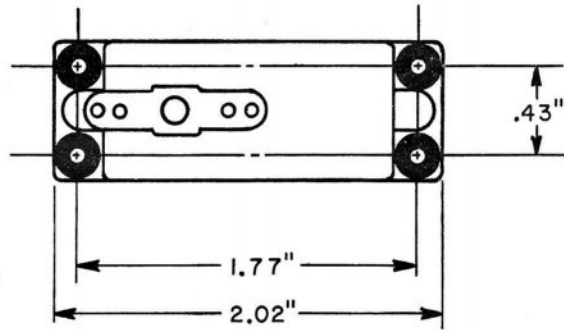
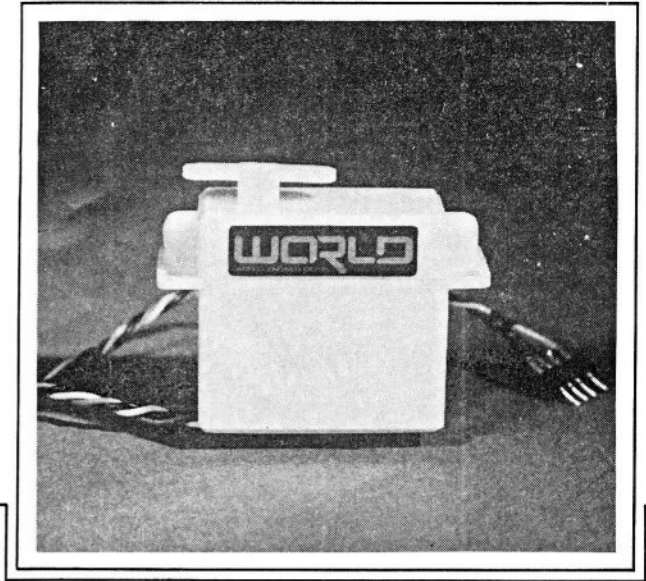


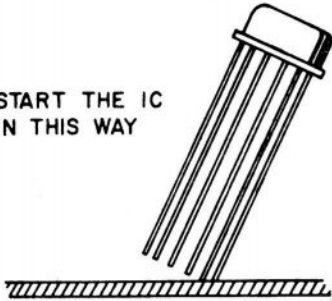
WORLD ENGINES DIGITAL S-9, S-10 SERVO



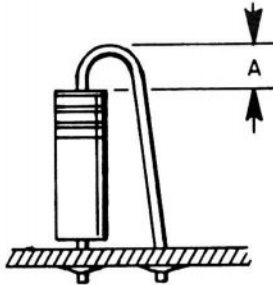
BEGIN

[] Note 1. Install IC, Part No. WE3141. The sketch shows the recommended procedure for getting one lead started and then progressively the balance of the leads into the holes. Press the IC down gently until it is in contact with the board. After you have pressed the IC down, recheck the tab to see that it is in the right position. Solder the IC and clip the leads.

START THE IC
IN THIS WAY



[] 47K (yellow, violet, orange)

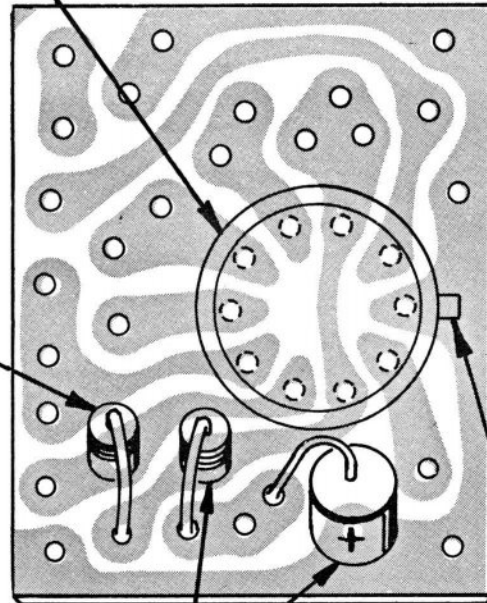
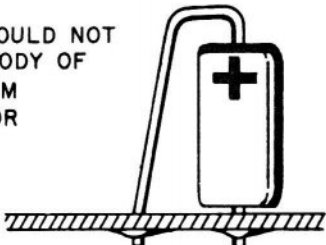


Dimension "A" about .050" - Bend wire over by hand - no pliers.

[] 3.3K (orange, orange, red)

[] 15 mfd 15v. Tantalum + end up (red end is plus; also marked +).

LEAD SHOULD NOT
TOUCH BODY OF
TANTALUM
CAPACITOR



POSITION OF ORIENTATION TAB

[] .22 mfd blue capacitor

[] 47K (yellow, violet, orange)

[] 4.7 mfd tantalum cap. plus end up. Do not solder plus (+) lead yet.

[] 33 ohm, 1/8 watt (brown, black, black). Do not solder top lead yet.

[] Bend capacitor and resistor leads towards each other and solder.

[] 100K (brown, black, yellow)

[] .22 Disc capacitor blue

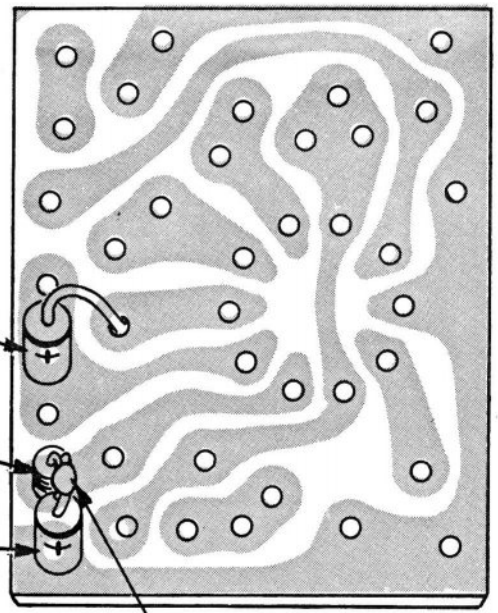
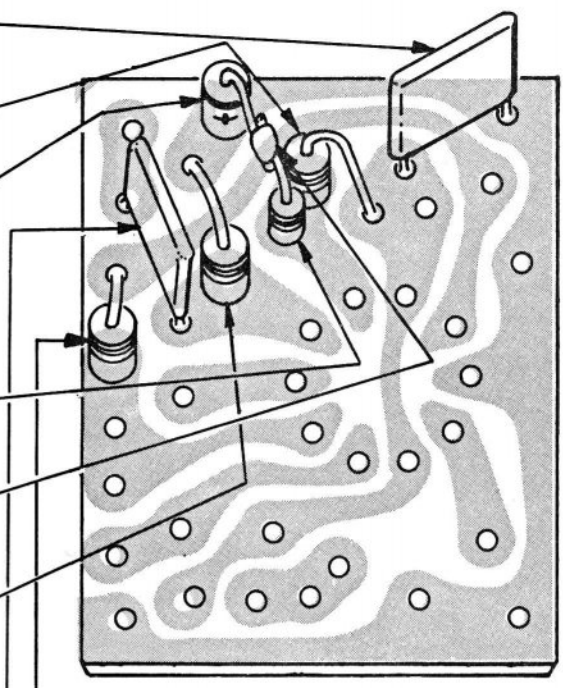
[] 100 K (brown, black, yellow)

[] .47 mfd tantalum cap. plus end up

[] 33 ohm, 1/8 watt (brown, black, black). do not solder top lead yet.

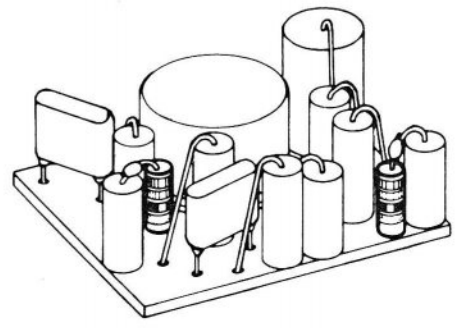
[] 4.7 mfd tantalum cap. plus end up

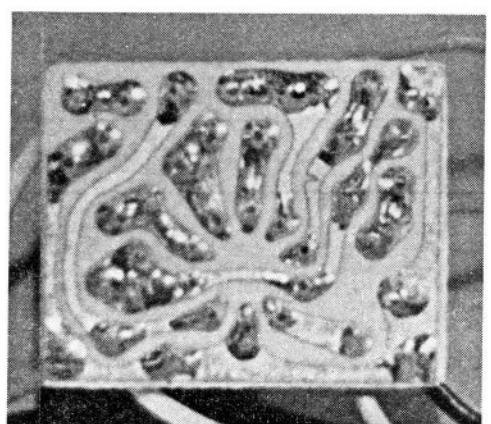
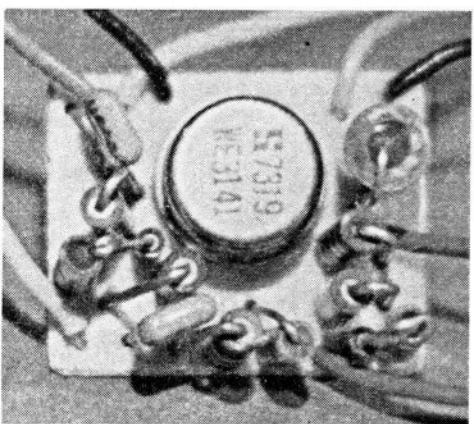
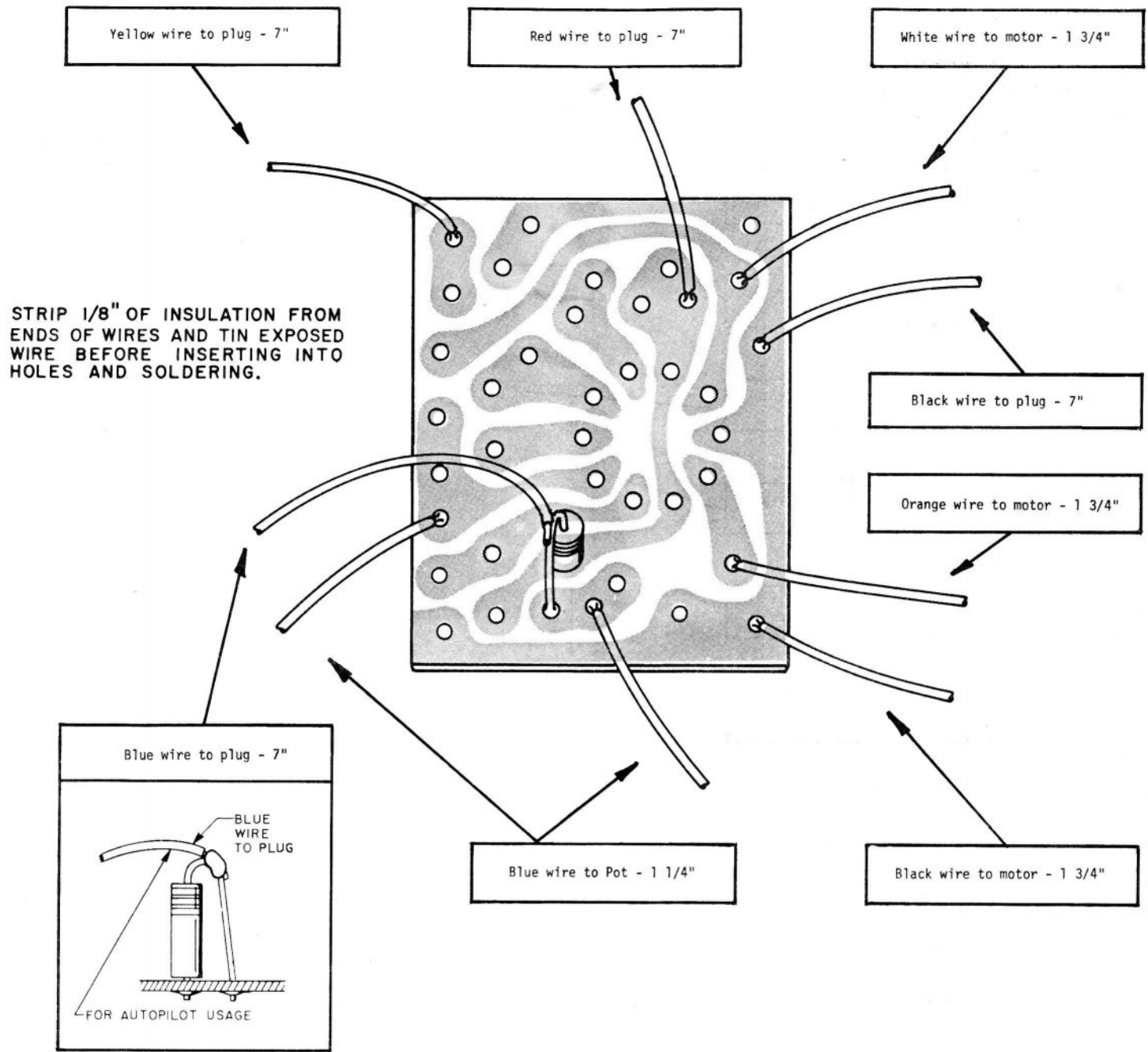
[] Bend capacitor and resistor leads towards each other and solder.



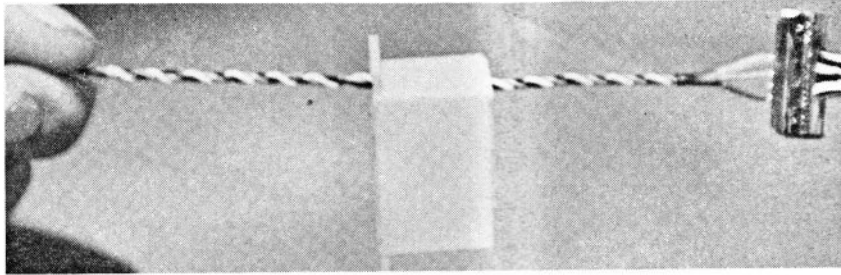
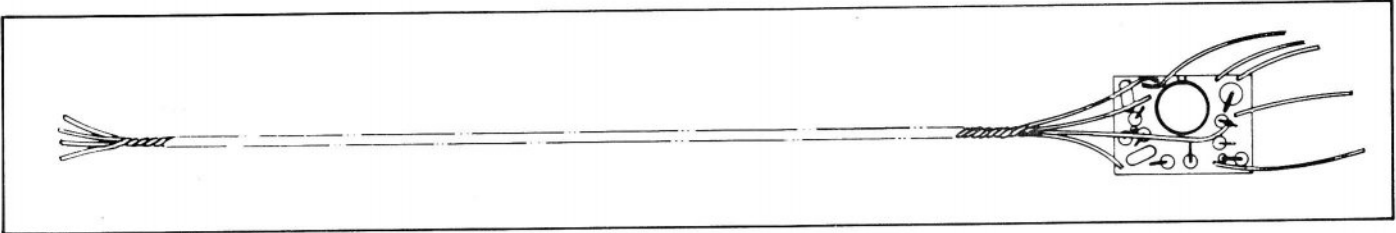
AT THIS POINT ALL THE COMPONENTS HAVE BEEN INSTALLED. THE BOARD SHOULD LOOK LIKE THE DIAGRAM TO THE RIGHT. THE 1/8 WATT RESISTORS HAVE BEEN ACCENTUATED FOR CLARITY.

CONTINUE WITH FINAL WIRING AND ASSEMBLY ON SUCCEEDING PAGES.

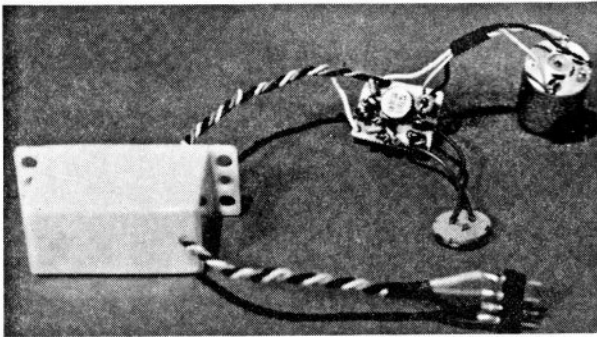




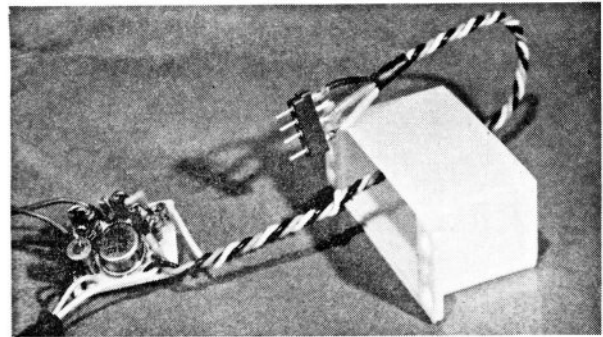
[] Gather these wires together and twist into a braided wire rope. You can use a hand drill and hook. See photo.



THIS PHOTO SHOWS THE TWISTING OF THE WIRES FROM THE BOARD TO THE CONNECTOR. THE PAPER CLIP ON THE RIGHT IS SOLDERED TO A SHAFT WHICH IS HELD IN A HAND DRILL. THIS STEP CAN BE DONE MANUALLY.

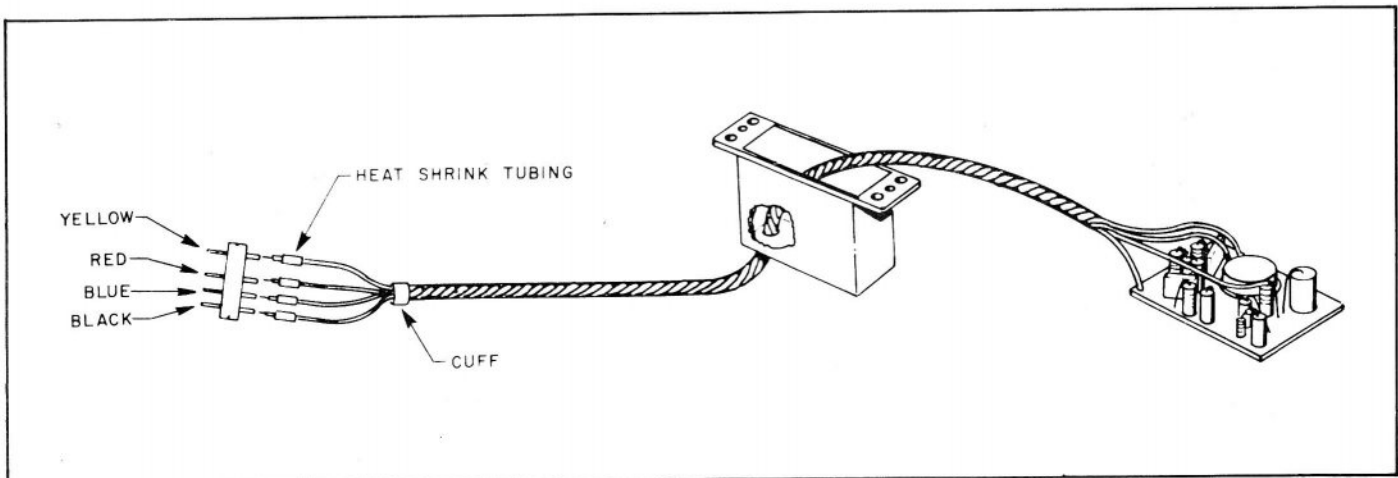


THIS PHOTO SHOWS THE WIRING FROM THE SERVO BOARD TO THE MOTOR, THE POT, AND THE CONNECTOR.

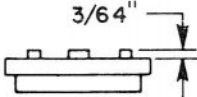


THE SERVO CASE BOTTOM MUST BE THREADED ONTO THE WIRE ROPE BEFORE THE CONNECTOR IS SOLDERED TO THE WIRES.

[] Pass cable through servo bottom. Then, pass cuff and heat shrink tubing over wires. Strip, tin and solder wires to male plug. Run tubing over soldered connections for insulation and shrink in place over small flame.



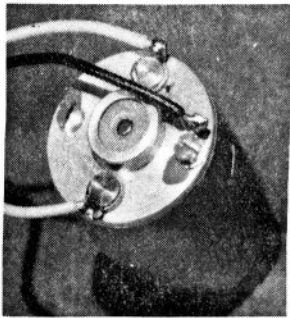
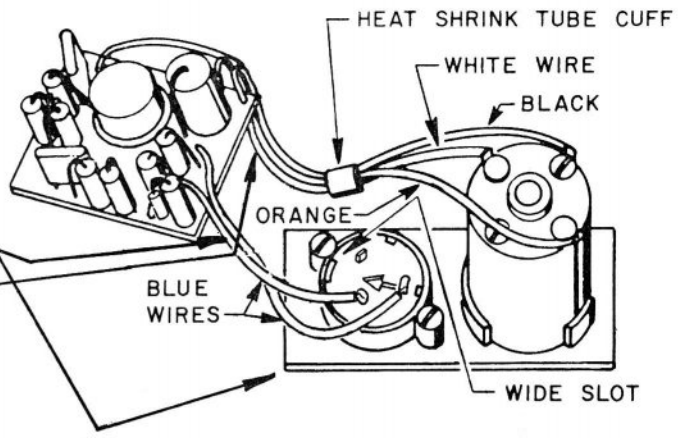
[] Cut Pot Lugs.
Tin with solder.



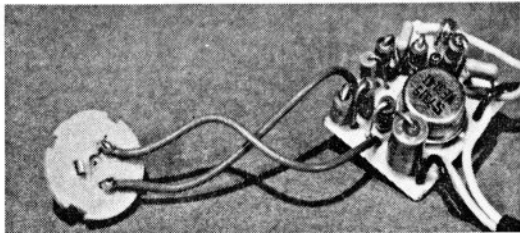
[] Inspect servo case midsection and with with razor blade or sharp knife, trim off any flash that might hinder gear movement or case assembly.

[] Strip and tin the 2 blue wires from the board and solder to the pot. Position the connection with respect to wide slot.

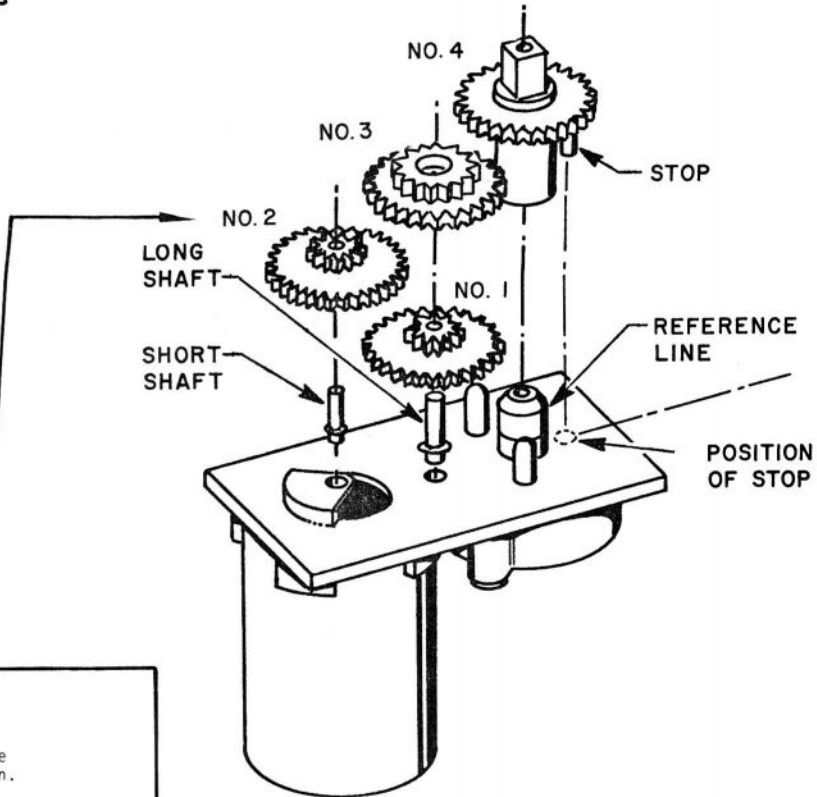
[] Pass the heat shrink tubing cuff over the motor wires black, white, and orange and solder these to the motor as follows:
The black goes to ground. This is the solder tab that is under a screw head. The orange wire goes to the staked terminal marked with red dye. The white wire goes to the other staked lug.



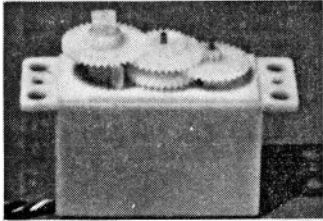
WIRING TO THE MOTOR. NOTICE THAT THE BLACK WIRE IS CONNECTED TO THE MOTOR, TO THE SOLDER TERMINAL WHICH IS HELD DOWN BY ONE OF THE MOTOR SCREWS. THIS IS THE GROUND WIRE. THE ORANGE WIRE IS THE LOWER WIRE IN THE PHOTO AND THE WHITE WIRE IS THE TOP WIRE IN THE PHOTO.



THIS PHOTO SHOWS THE WIRING FROM THE BOARD TO THE POT ELEMENT.

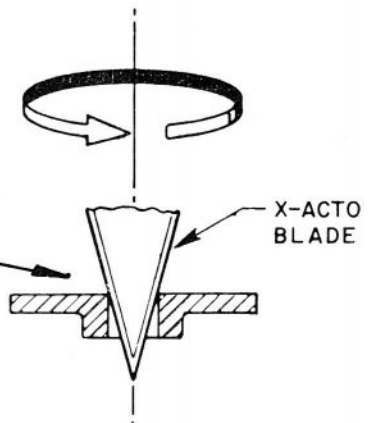


[] Carefully remove gears and servo arms from tree. Trim off sprue entry points with razor blade or sharp knife. Note gear number molded into side of each gear. Assemble as shown. Number 4 gear is factory assembled and should not be removed lest the alignment of the pot wiper be disturbed.



GEAR TRAIN AND IDLER SHAFTS IN PLACE BEFORE COVER IS ADDED TO ASSEMBLY.

[] It may be necessary to deburr gear pin holes. Use light pressure - do not remove too much.



[] Stick one piece of foam to bottom of case and the other to the back side of the pot. The board is sandwiched between these foam layers. When inserting assembly into servo case, do not allow lead on capacitor C2 to be bent over so that it touches the lead on resistor R4.

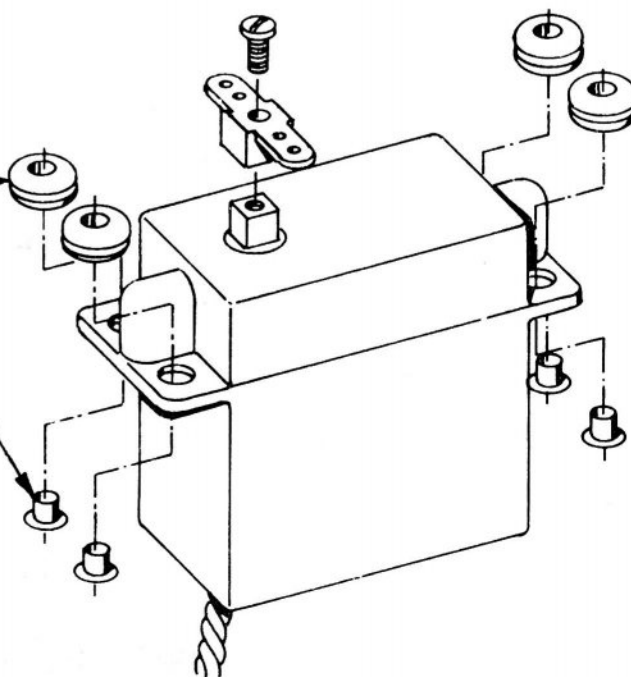
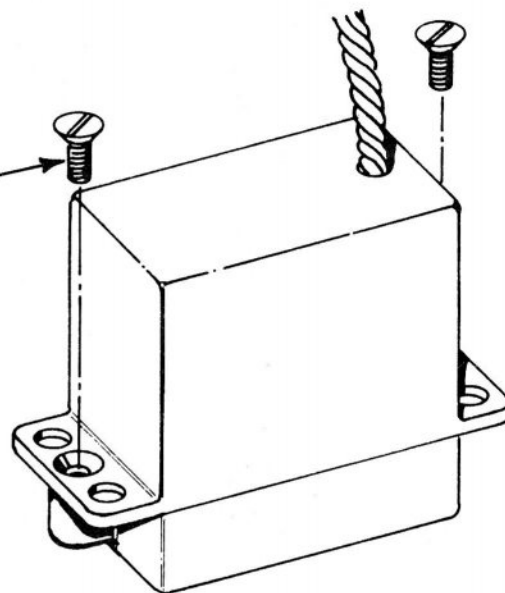
THICK FOAM

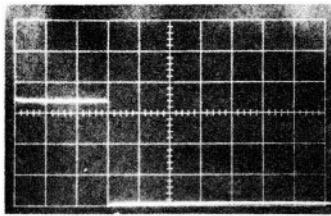
THIN FOAM

NOTE: See how wires are tucked in.

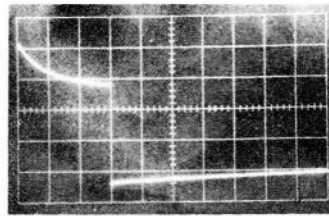
[] Servo case is assembled with two 2-56x1/4 Phillips screws.

[] Assemble grommets and eyelets as shown. Select output arm and assemble as shown.

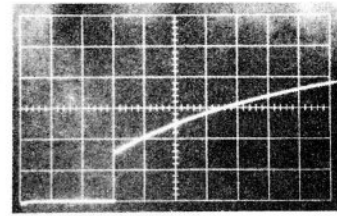




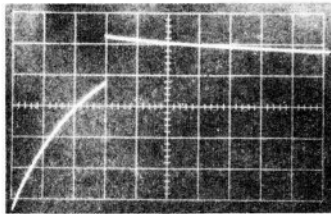
A
Input pulse from decoder.



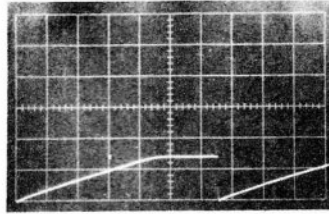
B
Input to WE3141



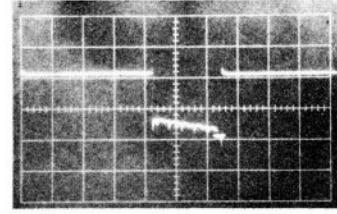
C
Wave form out of one shot multivibrator at terminal "C".



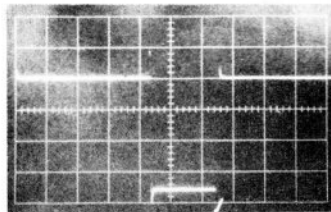
D
Wave form out of one shot multivibrator at terminal "D".



E & F
Output of the pulse stretchers with the motor removed from the servo and motor free running.



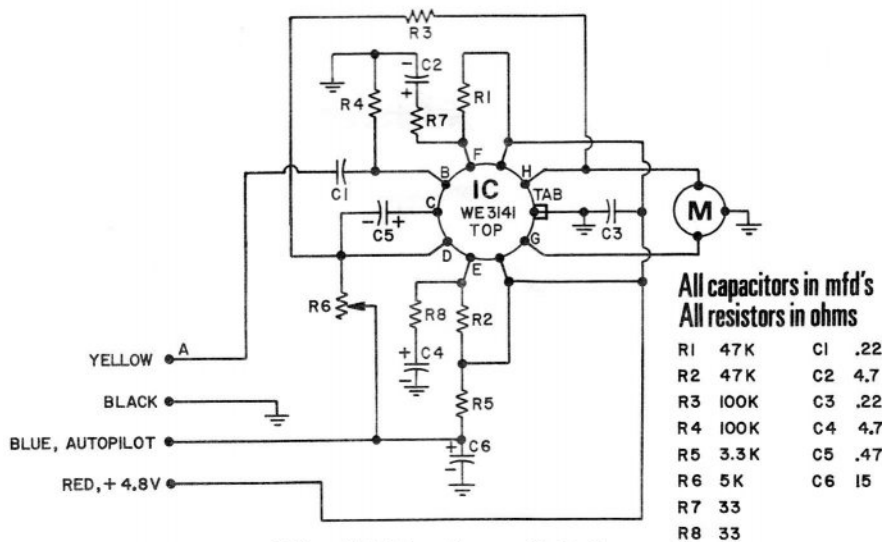
G & H
Input from IC to motor – motor running.



G & H
Input from IC to motor – motor stalled.

Scope settings used for photographs A thru H.
Scope used to get these pictures Tektronics No. 454.
All measurements were made from negative 4.8 volts.

	VERTICAL	HORIZONTAL	NOTES
A B C D	1 volt per div	.5 ms per div	
E F	.5 volt per div	5 ms per div	Motor removed
G H	1 volt per div	5 ms per div	



World Engines S-9 Servo

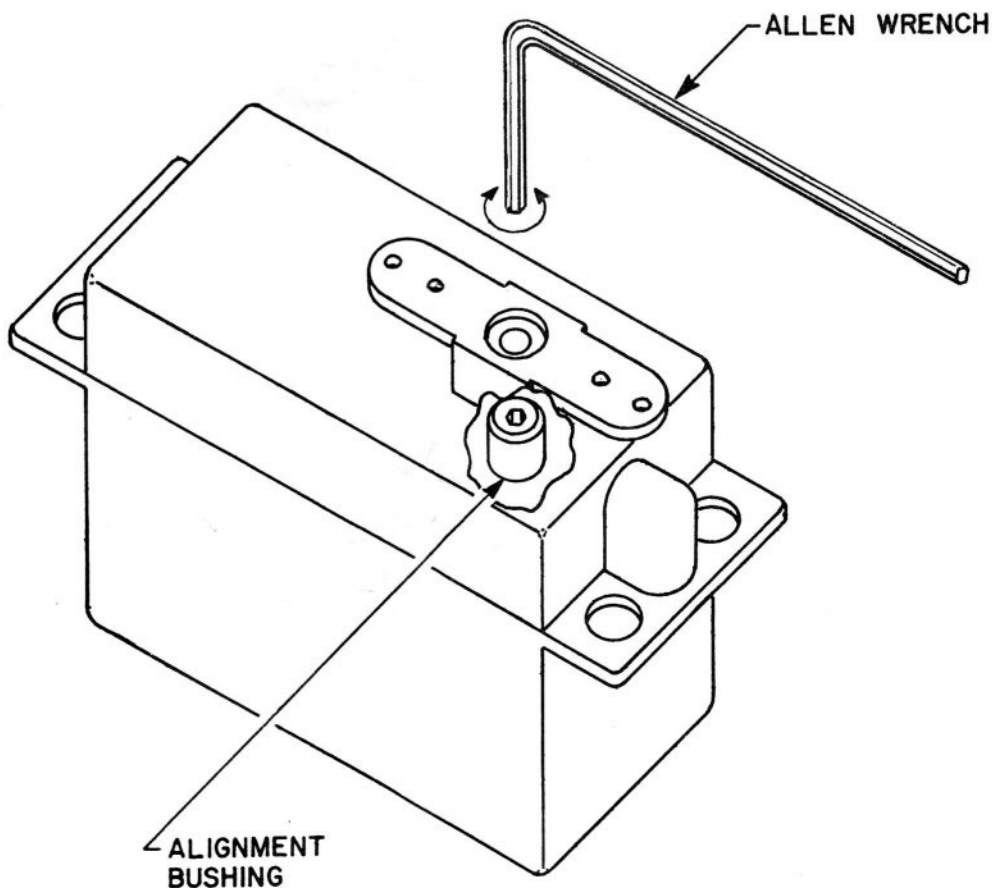
SERVO ALIGNMENT

This is the simplest method of aligning the servo after construction. The requirements are:

- (1) A working transmitter, accurately aligned.
- (2) A working receiver, aligned and matched to the transmitter.
- (3) A flight-pack battery and switch harness.
- (4) An Allen wrench measuring 1/16" across flats.

Rotate the output arm of the servo so that its position is midway between the stops. Remove the screw holding the output arm to the output shaft. The servo brass alignment bushing is inside the output shaft and is accessible through the hole exposed by removing the hold-down screw. Insert the Allen wrench into the hole so that it is seated in the hexagonal hole in the bushing. Plug the servo into the yellow-red-black cable from the decoder and plug the flight-pack battery into the orange-red-black cable through the switch harness. Set the aileron control and aileron trim on the transmitter at neutral.

Turn the transmitter on and note any rotation of the servo arm. Twist the Allen wrench in a sense opposite to that required to restore the output arm to its middle position. That is, if a clockwise rotation of the arm is required to restore it to neutral, twist the Allen wrench counter-clockwise.



REVISION SHEET FOR S-9 SERVO (12/13/73)

- (1) The 7" blue wire for Autopilot usage is not supplied with the S-9 Servo Kit. This wire will be supplied with the Autopilot Kit when it becomes available.
 - (2) Resistor R4 is changed from 100 K ohm, 1/4 watt to 100 K ohm, 1/8 watt. This change eliminates the possibility of its lead being bent into contact with the lead on capacitor C2. R4 is the 100 K ohm resistor which is closer to the WE3141 chip in the diagram on page 2 of the instructions.
-

S-9, S-10 SERVO REVISION SHEET (Feb. 5, 1974)

- (1) Page 2, 4th and 10th steps. Change resistor color code from (brown, black, black) to (orange, orange, black).
- (2) If your kit should contain any or all of these extra parts,
 - 10 ohm, 1/8 watt resistor(s) (brown, black, black)
 - 15 ohm, 1/8 watt resistor(s) (brown, green, black)
 - 0.56 microfarad capacitor, tantalum

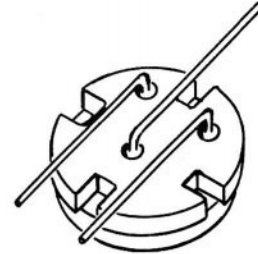
PLEASE do not attempt to use them in the construction of your servo.

SERVO PARTS MODIFICATION (Feb. 19, 1974)

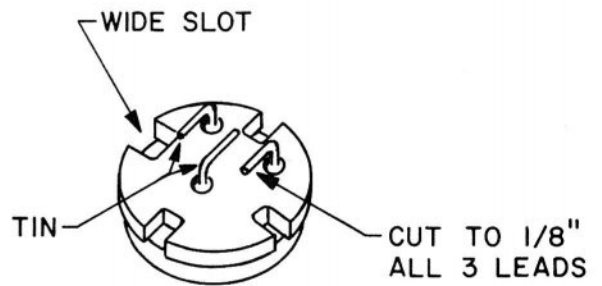
NOTE: R4 is a 100K ohm, 1/8 watt resistor. It is to be used in the 6th step on page 2 of the Servo Instructions.

MODIFICATION FOR INSTALLATION
OF CONDUCTIVE PLASTIC POT
(supersedes first four steps of page 5)

- () Bend pot lugs, then cut to 1/8" long. Tin the two leads closest to wide slot in pot.
- () Inspect servo case midsection and with razor blade or small knife, trim off any flash that might hinder gear movement or case assembly.
- () Strip and tin the 2 blue wires from the board and solder to the pot. Position the connection with respect to wide slot.
- () Pass the heat shrink tubing cuff over the motor wires black, white and orange and solder these to the motor as follows;
The black goes to ground. This is the solder tab that is under a screw head. The orange goes to the staked terminal marked with red dye. The white wire goes to the other staked lug.



STEP 1



STEP 2

