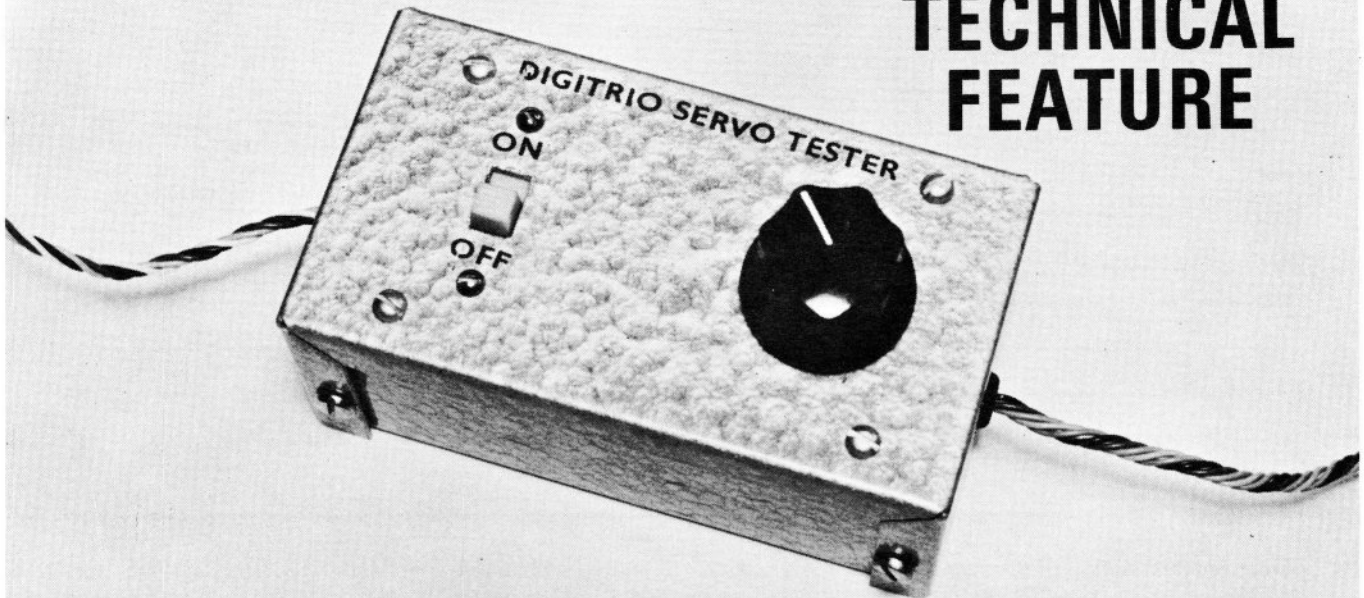




R/C
MODELER

TECHNICAL FEATURE



By DAVE HOLMES

DIGITRIO SERVO TESTER

Designed for the Digitrio, this servo tester can be modified for use with any digital system. Excellent for setting up linkages or operating servos without using the transmitter.

Tech Editor's Findings

RCM has checked Dave's servo checker and finds it to be an extremely useful device for testing Digitrio servos. As the author says, the basic design can be modified for use with other type digital servos. Some servos will require a negative going pulse for proper operation and a pulse inverter could be added.

THIS is the first in a possible series of articles on test equipment for proportional equipment. While this tester is designed particularly for the Digitrio equipment, it can be modified to work with other systems such as Micro-Avionics, Kraft, PCS, etc.

This little device will allow you to work on servos without having to use

the transmitter and receiver and also comes in handy for setting up linkages in a new airplane. Since I often fly in contests, I have also felt the need for some way to operate the throttle servo when my engines are acting up (normal conditions) and my transmitter is impounded. Contest pilots can appreciate this point.

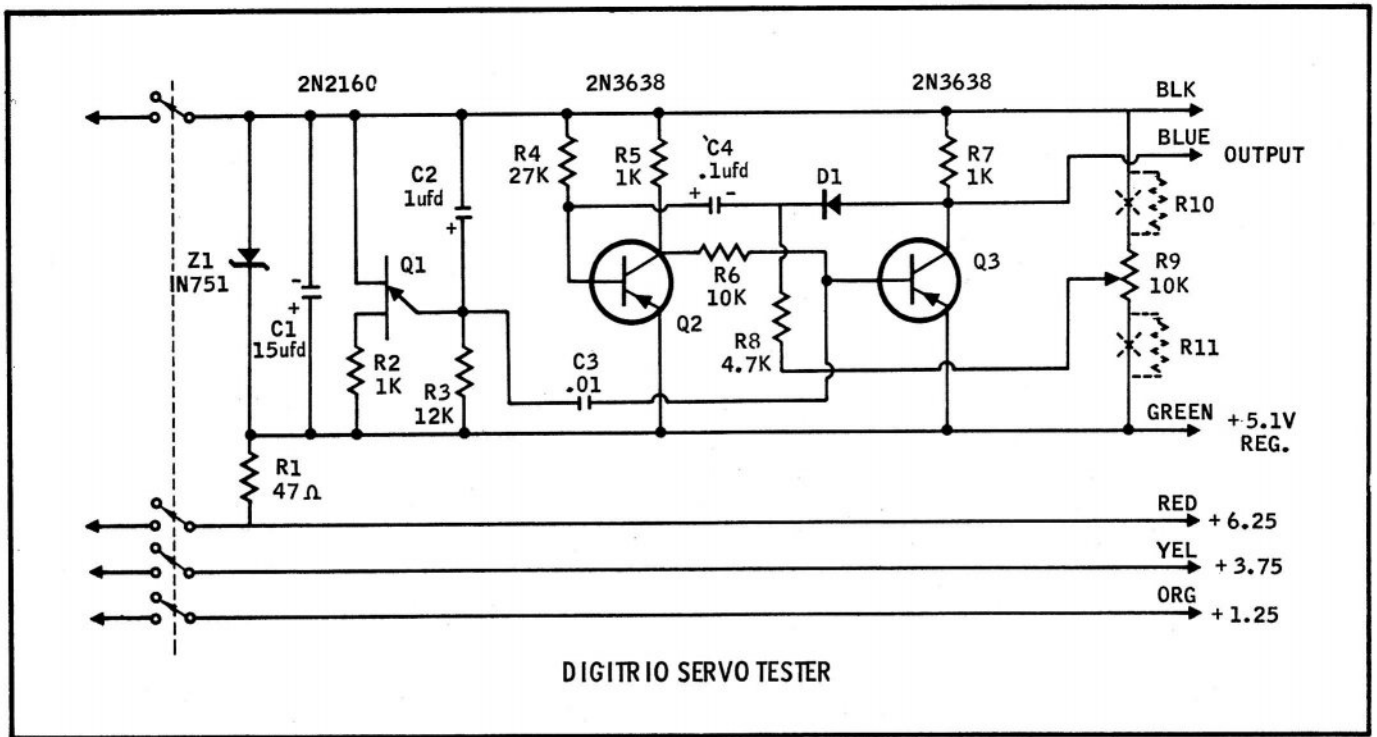
The cost of this tester is in the vicinity of \$12.00 or less and it is well worth the time and expense involved.

Construction

Construction is quite simple and proceeds as follows:

- () Drill all holes in board with #67 drill.
- () Enlarge mounting holes with #44 drill and tap for 4/40 bolt.

- () Install all resistors.
- () Install all capacitors. Observe polarity of C1, C2 and C4.
- () Install diodes. (Check polarity.)
- () Install transistors.
- () Install 4" lengths of red, black, yellow, orange hookup wire in proper holes. (Zener end of board.)
- () Install 6" lengths of red, green, blue, black, yellow, orange hookup wire.
- () This completes the wiring of the board. Clean all joints with thinner or alcohol.
- () Lay full-size template over top of box and mark holes and switch cut-out.
- () Drill all holes as indicated. On the



cutout for the switch, a little care in drilling a row of holes around the inside of the marks and filing out the remaining will give you a neat appearing cutout.

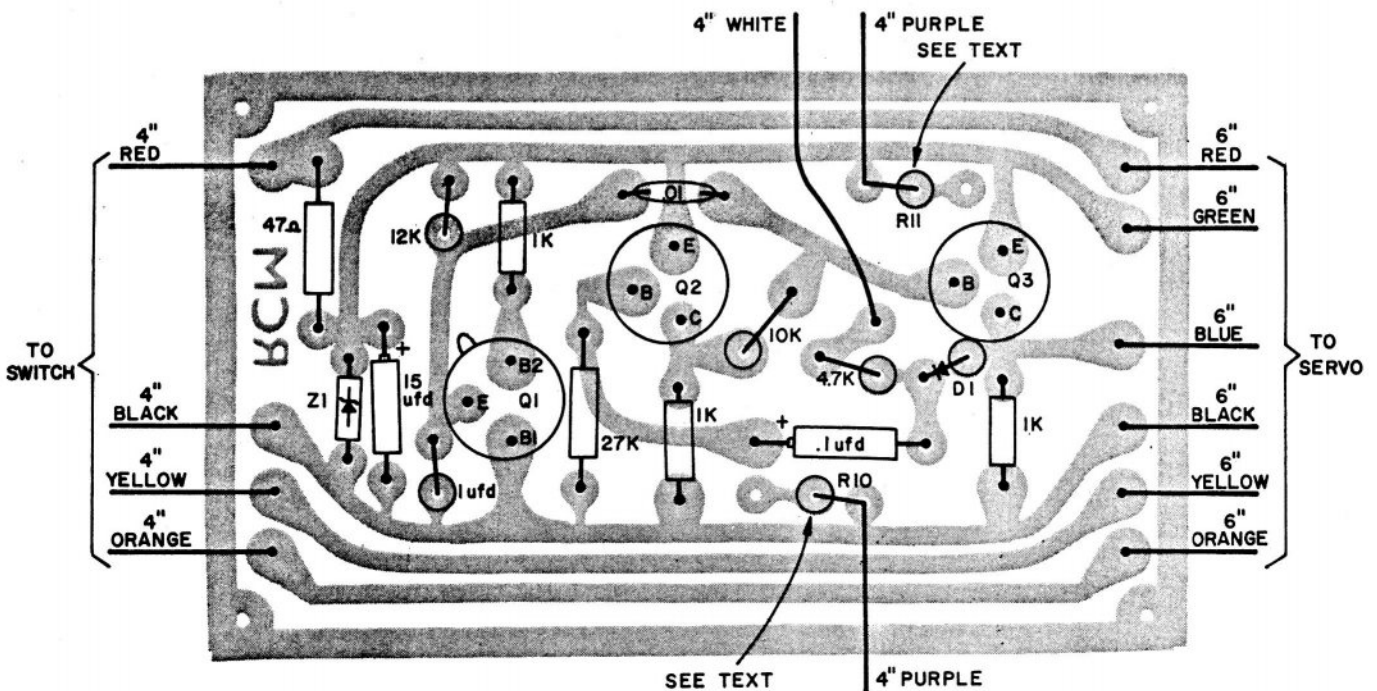
- () Drill holes centered in the ends of the box to accept $\frac{1}{4}$ " grommets for servo and battery leads.
- () Cut 4 ea. $\frac{15}{16}$ " lengths of $\frac{5}{32}$ " brass tubing for spacers.

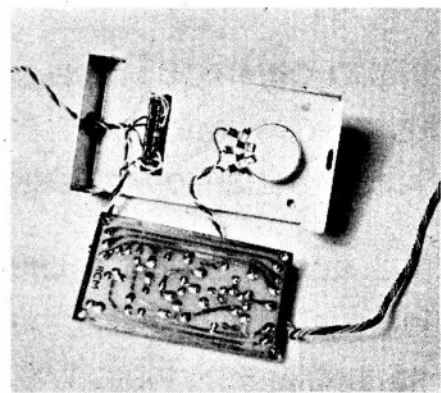
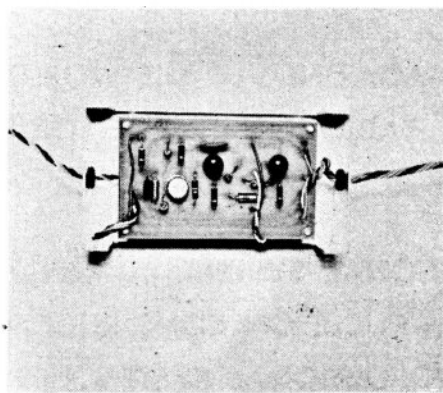
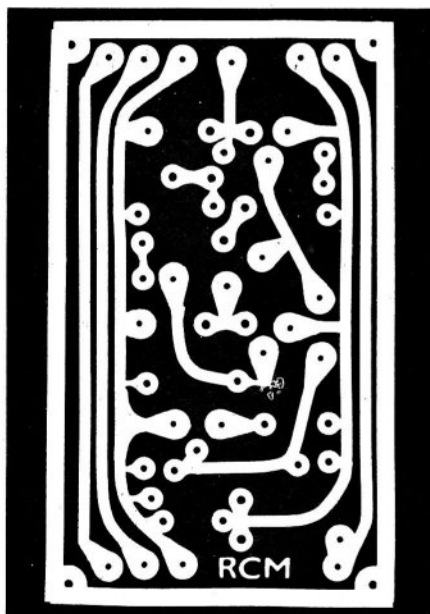
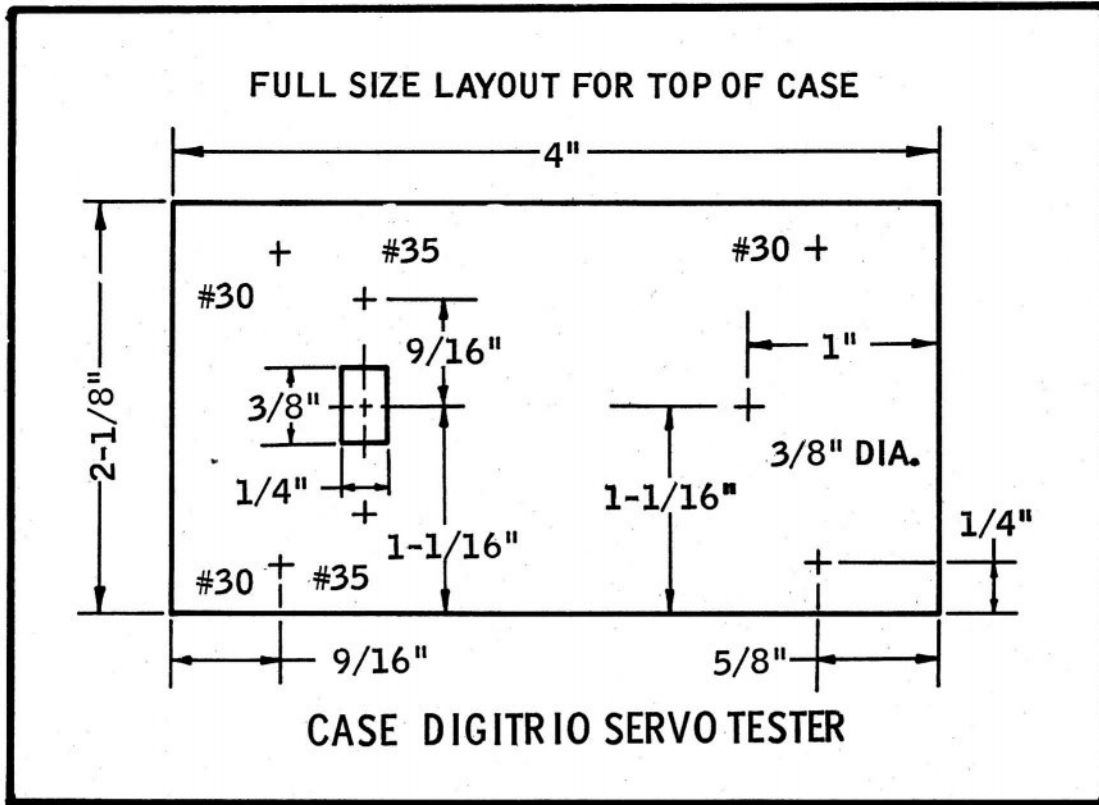
Assembly of the tester is best done by first mounting pot and switch in the case. Wire the battery leads to the center arms of the switch. Lay complete P.C. board component-side down beside box and route 4" leads to switch. Trim

and solder. Route 4" purple and white leads to pot with white going to center arm. Fold board over and install bolts and spacers. Route servo and battery leads out through grommets and assembly is complete. Recheck all connections and check battery cable with ohmmeter for shorts and proper connections to board. If you are sure of the connections then a smoke check is in order. Plug in battery (no servo) and turn on switch. Check voltages at servo cable with a volt meter. Measure voltages with minus lead of voltmeter to black lead of servo cable. All voltages should check as indicated on schematic. If all

voltages are right, set the pot in the center of its rotation and plug in servo. Turn on power. Servo should seek approximate center and stop. Adjust knob to position servo in exact center of its rotation and reset knob on pot to a reference mark. That completes alignment of your servo checker.

The tester with the parts values as shown yields the same servo movement for pot rotation as your transmitter gives you. If vernier action is desired, two 4.7K resistors may be inserted, one in each arm of the pot as shown in dotted lines on the schematic (R10 and R11). Pads are provided on the board for these





resistors if you wish to use them.

If it is desired to use this tester with other than the Digitrio, some wiring changes may be needed. The output from the unit is a one MS nominal positive-going pulse. If the servos you wish to use it with take a one MS positive pulse you are "in." Otherwise R4 may have to be varied. A larger value of R4 gives a longer nominal pulse and vice-versa. The pulse repetition rate can be varied by changing R3. Here a larger value gives you a lower repetition rate. These two resistors could also be replaced with trim pots if desired.

I hope you get as much pleasure from your servo checker as I have from mine. With this unit there should be no excuse for not giving your servos the periodic maintenance recommended by Ed.

Good luck and may you grow fewer grey hairs at the service bench.

PARTS LIST FOR DIGITRIO SERVO TESTER

R1	47 ohms	¼ W	10%	Carbon
R2	1K	" "	" "	" "
R3	12K	" "	" "	" "
R5	1K	" "	" "	" "
R6	10K	" "	" "	" "
R7	1K	" "	" "	" "
R8	4.7K	" "	" "	" "
R9	10K			potentiometer CTS PQ 11-116
R10	4.7K	¼ W	10%	Carbon
R11	4.7K	" "	" "	" "
D1	DHD806, 1N658 etc. Silicon Diode			
C1	15 ufd 6 volt tanalytic			
C2	1.0 ufd 6 volt tanalytic 10%			
C3	.01 ufd ceramic capacitor			
C4	.1 ufd 6 volt tanalytic 10%			
Q1	2N2160 G.E.			
Q2	2N3638 or 2N3640 Fairchild			
Q3	2N3638 or 2N3640 Fairchild			
Z1	1N751 Zener			
1	Aluminum case, Premier #PMC-1002, 4 x 2½ x 1½			
4	4/40 x 1½" bolts			
2	¼ grommets			
1	Pkg. hookup wire (8 colors)			
1	ea. female servo connector and male battery connector			
1	W.E. 9F switch 4PDT			
1	Knob			
1	4" ⅜ brass tubing			



DIGITRIO

As most of you undoubtedly know by now, World Engines is kitting the DIGITRIO package. DIGITRIO is a three channel digital proportional system which was designed by Ed Thompson and is currently appearing as a series of construction articles in Radio Control Modeler magazine. Ed Thompson and RCM have given World Engines the exclusive right to kit the DIGITRIO system. Several of these systems have been completed and are being flown; some very enthusiastic reports are already coming in. Those interested in this control system may purchase components separately from the published parts lists, however, a little investigation will reveal that the prices of the parts' kits as packaged by World Engines cannot be beat and represent a substantial savings.

Transmitter Kit

The photo shows a completed DIGITRIO Transmitter with the Bonner Stick option. The Tx kit price of \$69.95 includes all parts, crystal and hardware except the control stick assembly and the power pack. The aluminum case (7" wide x 5" high x 3" deep) comes with only the major holes punched. Holes in the printed circuit board have been drilled and the antenna bracket mounted. With each kit we include any

pertinent information, minor improvements, circuit corrections, last minute component changes or notes from Ed Thompson. For example, in the Tx a better shielding setup was worked out and we are including notes on this. We'll try to keep you up to date!

Bonner Stick Kit

We are making the Bonner Stick assembly available in kit form less the pots (they are included in the Tx kit). We do not have assembly instructions for these as such however, we must say that they are not too difficult to assemble and quite a number of them have been sold for the DIGITRIO system. There will be an article in RCM later concerning this assembly. Price of the stick kit is \$10.95.

Charger Kit

Bob McKnight here at World Engines has worked up a dual output battery charger just for the DIGITRIO system. It will charge the Tx and Rx simultaneously. The charging rate is in the safe area of 30-32 MA to allow longer battery life. The circuit is transformer based for shock protection. All components are mounted on a printed circuit board. Two indicator lights show when the unit is in operation. Price of

the complete kit, punched case and all parts is \$7.98.

Receiver — Decoder Kit

The DIGITRIO Receiver and Decoder kits contain all parts that are needed including etched and drilled printed circuit boards, all components, crystal, battery and servo connectors. Both the Rx and the Decoder fit into the punched aluminum case (1½" x 1½" x 2½") that is provided. The DIGITRIO Receiver kit price is \$29.95 and the Decoder kit is \$27.95.

Servo Kit

The DIGITRIO Servo was designed around the Controlaire Servo mechanics: motor, case, gears and rack. The amplifier circuitry was developed by Ed Thompson. It uses a regulated voltage to eliminate neutral drift. No short cuts were taken and only top grade components used. The circuit has proven stable and trouble-free. As to the servo mechanics we can only say, "we use them ourselves." With the servo kit as the others everything is furnished. Price is \$24.95 for a complete servo kit DTSC-1 (a total of three is needed for the system). For those interested in using parts bought separately we also sell a kit, DTSM-1, of the servo mechanics and miscellaneous items at a price of \$13.95.

Complete parts lists with prices for each unit of the DIGITRIO System are available upon request and free of charge from World Engines, Inc.

DIGITRIO-4 MODS.

Tx - 4 Ch Mod Kit less stick	\$ 7.98
Same Rx is used in both 3 Ch and 4 Ch.	
Decoder 4 Ch Kit same size as Channel	\$29.98
Dual Charger Kit	\$ 7.98

 **WORLD
ENGINES**
INCORPORATED
8880 ROSSASH AVE. CINCINNATI, OHIO 45228