# An Improved Motor Control Servo

A motor control servo for use with proportional systems whose throttle is a trimmable function only.

Propo MC Servo: As a followup to the Dickerson analog servo in the April issue, we give here details of a somewhat similar servo of use to the experimenter. Don designed it basically for motor control uses with the B&D and Citizen-Ship analog systems, to be controlled for trimmable throttle by the usual steady-tone or off-tone. An input of at least 1.3V plus and minus, referred to battery center tap (2.4V on the accompanying circuit) is required. During absence of throttle command, means must be provided for clamping the servo input to 2.4V; this already exists in the C-S system, and the servo is a direct replacement except for fitting the proper connector. With
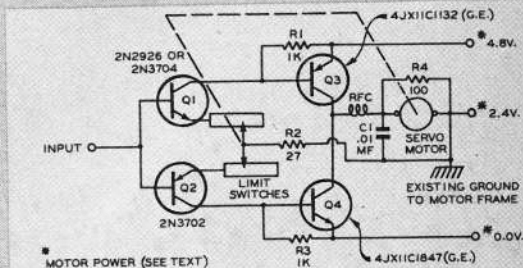
TRIMABLE THROTTLE SERVO – FOR ANALOG PROPO.
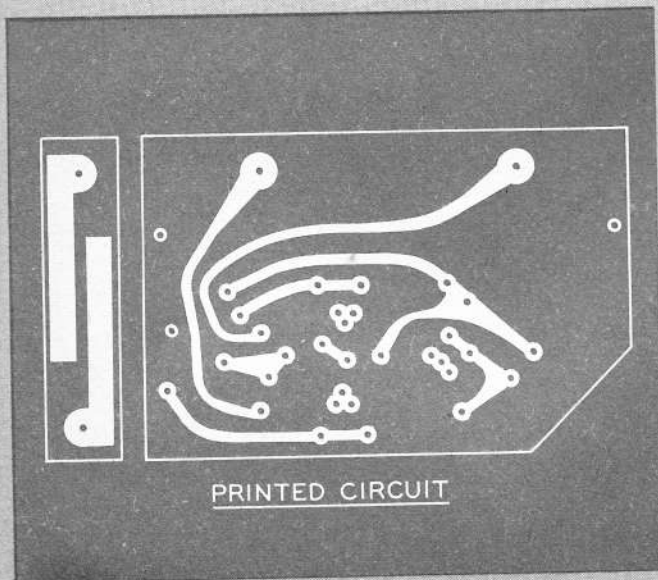
PRINTED CIRCUIT
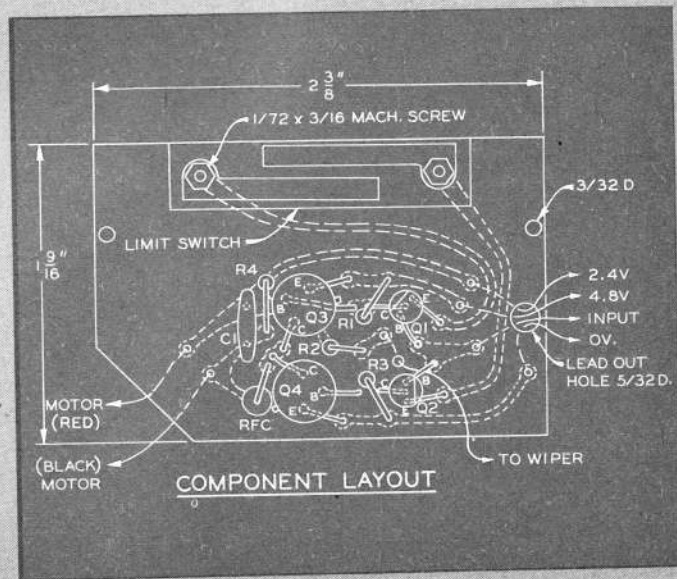
COMPONENT LAYOUT

An Improved M. C. Servo

the B&D system, the throttle servo amplifier in the receiver is disabled by breaking connections to the bases of transistors Q11 and Q12. A wire from R25 and the normally-closed relay contact is brought out of the receiver, and run to input shown.

This servo is based upon Kraft mechanical parts and motor, as was that featured in the April issue, so study that article before proceeding further. It has some special features too; for example, limit switches are placed in the emitter leads of the input transistors, which result in these switches carrying only 25 to 30 ma resistive load, which helps reduce electrical "noise" and to prevent wiper wear. Another feature is use of a separate P.C. wiper contact plate, which may be replaced if it shows wear. Note that this servo makes use of both wiper contacts found in the Kraft servo components (available, as are all other parts, from Ace Radio Control) and neither should require modification. A positive input voltage, relative to servo battery CT will cause the output arm to move away from the motor end of the servo, and vice-versa.

The B&D system provides a positive input with steady tone-on, and this should be utilized for high engine speed. The input to the servo should be limited to about 16 volts plus and minus as referenced to 2.4 volts to prevent excessive current through Q_1 and Q_2. This can be done with an appropriate dropping resistor in series with the input whenever the signal voltage exceeds plus and minus 1.6 volts. For signal voltages of 2.4 volts plus and minus, a 1.8k resistor should be about right. The limiting resistor already exists in the B & D and C-S systems.

With two sets of batteries, or one battery and two sets of wiring (as described in the previous servo article) all power to this MC servo should be considered "motor driver" power, and wired accordingly. C1 should be ⅜"dia. or less (10V rating or higher) to fit in the space available. RFC should be 10 micro-henry and 1 ohm or less. P.C. board material can be either 1/32" or 1/16" thick epoxy fiberglass. All resistors are ¼W carbon, 10% tolerance. The P.C. board is shown exact size, may be used for reproduction, and we show the copper side, of course. The Component Layout shows the reverse side of the board—the side where parts are inserted. On latter drawing, the limit switch copper side is depicted, of course. Wire at bottom right of this dwg. goes to the wiper on the movable arm. 2N3702 and 2N3704 transistors are Texas Instrument; all others are G.E. types.