

# SIMPLE

# PROPORTIONAL

## *Final of Three Parts on Simplified Proportional Control*

The Multiplex Master system consists of the Master Pulsmmitter (transmitter and pulser unit), Pulsmaster superhet receiver, Master battery pack, and Master Multiplex rudder, elevator, and motor control servo pack. In addition, we received a separate Master proportional servo which plugs into the master servo pack for coupled ailerons. The separate servos were also shipped so that they might be evaluated along with the single servo pack.

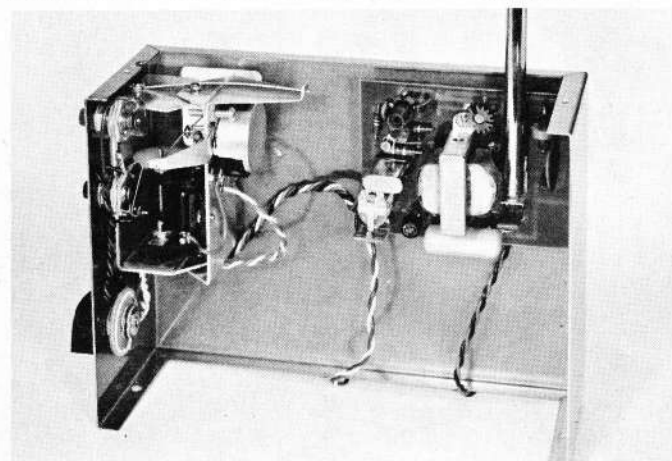
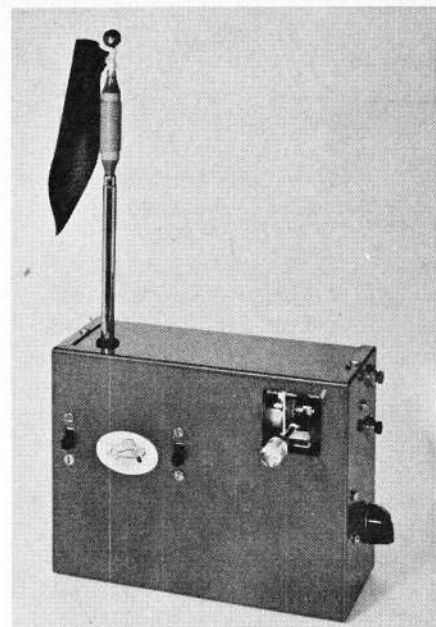
Starting with the Pulsmmitter, the design is the result of Tom Dion's ten years of experience in single and multi proportional RC. It is a pulsing transmitter of a very simple and proven design, providing linear, non-interacting pulse composition that will not vary regardless of temperature or battery conditions. The transmitter section is all-transistorized and utilizes

For the final installment in this three-part series on simplified proportional control, we selected a commercially available single channel system for evaluation and discussion. The system chosen was the Multiplex Master, a simple, dual-simultaneous proportional system manufactured by Tom Dion of Glass City Model Electronics, Toledo, Ohio. Our decision to present the Glass City system was not an arbitrary one, but rather, was based on numerous reports we have received from Multiplex owners attesting to its performance and reliability.

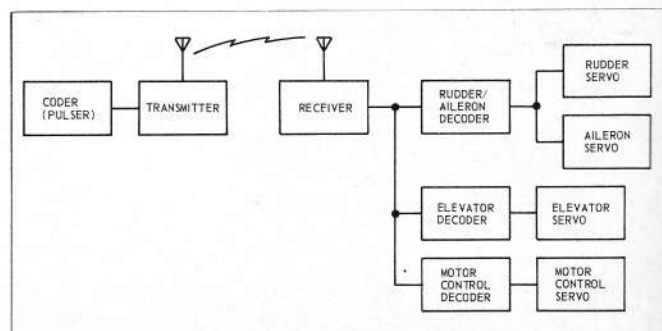
The Glass City unit is a pulse system based on the inductive kick theory, and offers simultaneous proportional control of rudder and elevator plus trimmable motor. Provision is made for coupling the aileron and rudder for an additional control function.

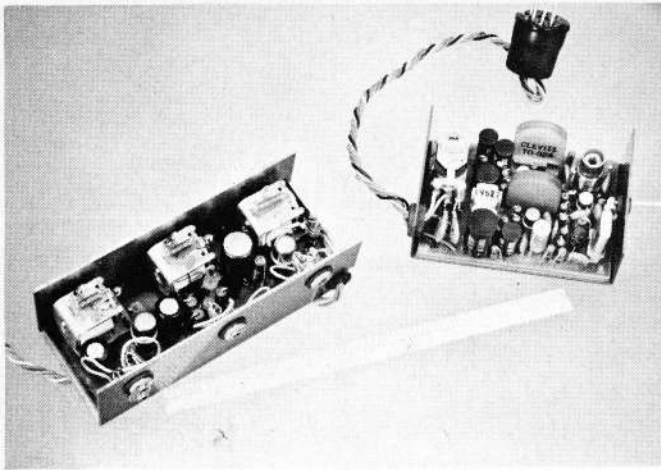
an externally loaded antenna for maximum radiated power with minimum input. Using a single 9V Burgess D6 battery, the transmitter drew 30 mills with tone off. Drain was 38 mills when the tone was keyed. The pulser is of mechanical design, using a 6V screw terminal lantern battery for power. A single pot is coupled with a Mighty Midget motor and circular wiper assembly to code the radio signal for control functions. A separate pot is provided for elevator trim. Two buttons, signal ON, and OFF, operate the throttle control trim servo.

As stated in the instruction manual accompanying the Multiplex system, some erratic performance on the part of the pulser was experienced until the wiper contact was seated on the split plate. Less than a half-hour of continuous pulser operation was required for this break-in period.

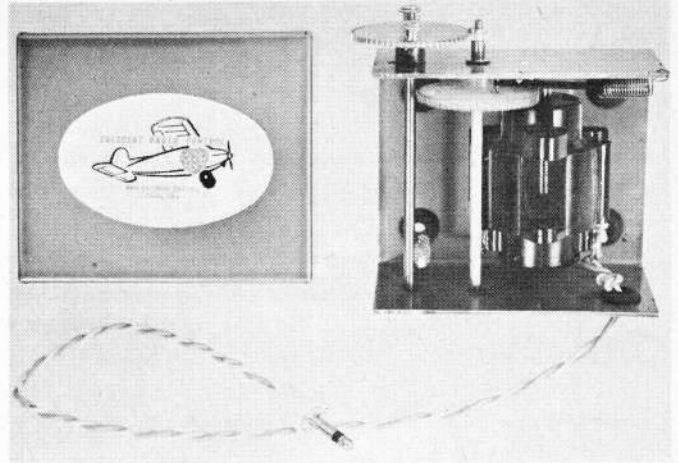


*Inside Glass City's Pulsmmitter. 9V and 6V batteries used. Block diagram shows functions of system.*





*Superhet receiver and master decoder used with individual servos.*



*Glass City servo with 49:1 gear ratio. Good centering and power characteristics.*

The Master Multiplex multiple proportional servo pack consists of three Mighty Midget pulse servos and the electronic circuitry for the decoder, all in a single servo pack. The Master Decoder, containing the decoder circuitry alone, is used when the individual servos are used rather than the servo pack of three servos. With the Master Decoder, and separate servos, the Multiplex installation can be geared to almost any type of RC aircraft without worrying about the larger size of the master servo pack. Servos may be added or taken away from the Master Decoder without changing its operation. In other words, the RC'er can start with sim-add motor control, followed by elevator, and finally work up to a Class III system by using all functions including coupled ailerons.

The single servo pack of three servos measured  $3\frac{7}{8}$ " x 3" x  $1\frac{7}{8}$ ", with an all-up weight, including relays, circuitry, and case, of 10 ounces. Battery drain was 320 MA RMS. Servo gearing was 49:1.

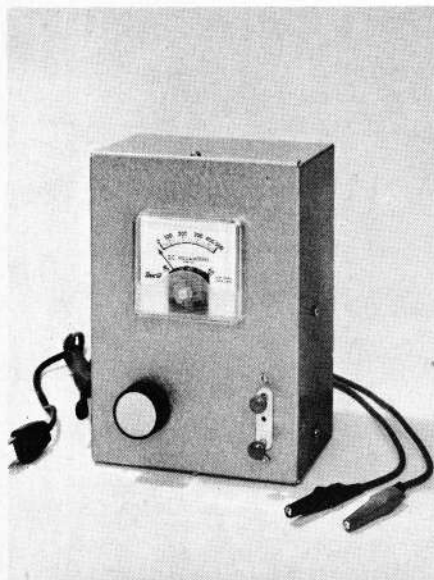
Two models of the individual servos were tested, with the smaller of the two shown in the photographs, being provided with current Multiplex systems. Although both units were excellent and employ the same servo principles, the newer servo showed an approximate increase in power of 20%. The Master Decoder used with the separate servos is a self-contained decoding unit that sorts out coded information from the pulser and applies it to the proper servo. Size is  $3\frac{5}{8}$ " x  $1\frac{1}{2}$ " x  $1\frac{1}{4}$ ". Weight is  $4\frac{1}{4}$ " ounces. Battery drain is 40 mills for the decoder, and 150 mills

RMS for each servo.

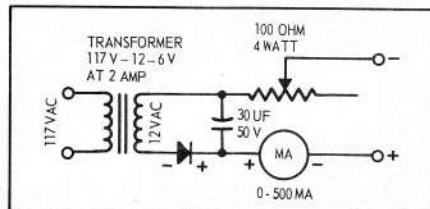
The superhet receiver furnished with the system proved extremely reliable and satisfactory for pulse operation. Utilizing Clevite Transfilters, examination of the unit disclosed that it had been modified by effective relay hardening and effective noise suppression. Size was  $1$ " x  $1\frac{3}{4}$ " x  $2\frac{1}{2}$ ", with a weight of  $2\frac{1}{2}$  ounces. Battery requirement was 6 volts, and provided as part of the Master Battery Pack. Current drain was 9 mill idle, 50 mill on signal.

The Master Battery pack contains four 1200 mah sealed rechargeable nickle cadmium batteries plus four E91 Alkaline energizers for receiver operation. Size of the battery is  $3\frac{7}{8}$ " x 3" x  $1\frac{7}{8}$ ". Weight is 10 ounces.

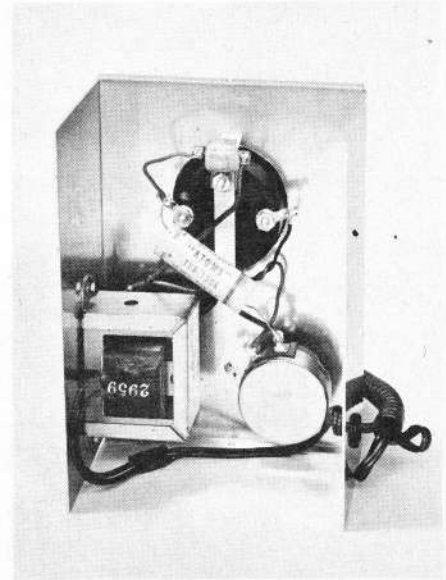
*(Continued on page 48)*



*Left: Charger made from schematic—charges from 100 to 500 MAH.*



*Right: Interior shows simple construction.*



# Fly the 404

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## SIMPLE PROPORTIONAL

*(Continued from page 31)*

Ninety minutes of flying time was available between charges.

As received, the Glass City proportional system is completely wired and cabled. All that is necessary to operate the unit is to plug in the receiver and battery plugs and flip the two switches. The unit operated perfectly with no adjustments. Although the manufacturers manual contained specific instructions as to the installation, and recommendations as to suitable type aircraft, we assumed that many individuals would not pay attention to these recommendations, and subsequently proceed on their own. For this reason, we gave this system to two of our Consumer Re-

search Editors, and deliberately withheld the instruction manual from them. Neither individual had flown any form of proportional control before and no assistance was rendered to them. Within two days a well-worn Sterling Rudder Bird, formerly equipped with six channel reed system, was airborne. Almost every rule in the manual was violated insofar as installation was concerned. With an OS .19 up front, the Rudder Bird performed completely satisfactorily and with no difficulties experienced. Many local fliers tried their hand at the unit and none experienced any difficulty whatsoever.

Following this acid test, the Multiplex system was installed in a deBolt Jenny and further tests conducted. Performance was smooth and excellent in all respects. Power from the Mighty Midget servos was ample for all but the most violent maneuvers. Used as a rudder-only system, the decoder and individual rudder servo was installed in a Ted Strader designed Gypsy glider. Formerly using

a single channel servo, the glider showed a definite tendency to yaw — this was completely corrected by the infinite variation of control available from the Glass City unit and the rudder only flights proved exceptional. In all tests, the dither, or waggle, of the flight surfaces was barely apparent except at the slowest pulse rates.

In order that the individual flier may achieve maximum results from this system, several notes are in order. First, as with all pulse systems, pushrods, control linkages and control surface movement **must** be absolutely free. Binding of any kind will definitely limit performance. Any drag or bind in the control linkage will destroy the linear control response and cause the controls to "hunt" in operation.

Although the manufacturer recommends either 1/8" dowel or 1/4" square balsa for pushrods, we definitely recommend the latter. Keepers should be bent to make a very light contact with the servos, checking to make sure that the keepers themselves do not cause binding. Support must be given to pushrods that exceed 24" in length. For a first ship for this pulse proportional system, the manufacturer recommends the LiveWire Champion, and we concur in this recommendation.

If you have had any multi-channel experience, a deBolt Jenny is also recommended, although a more high-performance type aircraft. Do not hesitate to start with rudder-only on this system and build up to full-house control as you gain experience. No matter how far you want to go, this system will work with you, as with certain simple modifications, it has been used in Taurus, Viscount, and Interceptor designs for high-performance contest type work. An excellent Class II design for the experienced flier would be the Aristo-Cat, recently featured in another model publication.

The elevator trim control used with the Multiplex system is a most useful feature. Set for slight up trim, the model climbs out beautifully on takeoff. Feeding in down trim, when airborne, can hold the model inverted "hands off." Trimming in a little up, along with retarding the throttle, and you will experience some of the smoothest landings you have ever



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made.

The photographs and schematic of the nicad charger shown are for the unit recommended in the Glass City Manual, and as constructed by the editor. If you do not have a variable rate charger, this unit will charge the Master Battery Pack at 120 mills for the recommended 18 hours. The charger, as shown, is not suitable for other applications where a much lower rate is required, unless it is modified appropriately. Parts for the charger consist of 1-wire wound Clarostat A58-100 ohm 3-4 watt pot (\$2.00); 1-Shurite 8312Z 0-500 ma D.C. Meter (\$2.90); and 1 P-2959 Merit 115V 60 cycle 12.6V 2Amp transformer (\$3.36); plus case and assorted hardware.

As a summary, the Separate servo Multiplex Master system, with superhet receiver, is priced at \$224.95. The superregen set is \$196.95. The Multiplex Master with the "three-in-one" servo pack is \$199.95 for the superhet version, and \$174.95 for the superregen version. Aileron servo is \$11.95 additional. Several comments from local fliers included — "it has to be seen to be believed," and "too bad the present full house quad proportionals don't work this well." The secret to the reliable, consistent performance of the Glass City unit seems to be in its simple design — the lack of complexity that characterizes the more exotic systems. We have flown this system under every possible condition and it worked — and worked well. It is the culmination of several years of research into intermediate, single channel pulse systems, incorporating many of the ingenious and practical aspects of the so-called "Mickey Mouse" systems, while rejecting the impractical or complex aspects of these units. It was selected for this final of three parts as the culmination of all of the ideas presented for simple proportional, and as an item of evaluation and review, is recommended as a reliable, everyday unit for proportional flying — a system designed for the sport flier, bringing simple proportional control into the financial and practical reach of almost every RC'er.

## EDITOR'S MEMO

*(Continued from page 8)*

who probably has conveniently forgotten the time he raced onto the field, jumped out of his VW bus almost before it had come to a stop, lined up three rudder-only jobs, then hurriedly fired up the first, a Nomad, launched it, and flew for a full three minutes before he discovered that his one and only receiver was still in one of the planes on the ground! Which shows to go you no one's perfect... that is, except for yours truly. Somehow... I can't seem to remember... any mistakes I've ever made...

On the more serious side, we have good reason to celebrate this month. This issue marks RCM's entrance into national newsstand distribution with a record-breaking circulation of 61,000 copies. Prior to this, RCM was distributed internationally through hobby shops, by subscription, and on certain selected newsstands. RCM is now available at virtually every local newsstand throughout the U.S., and we are grateful to each and every one of you for making R/C Modeler the largest radio control publication in the world, and the third largest of all model publications.

As another facet of our good fortune this month, we are proud to announce that two of the most well-known and well-liked members of the R/C fraternity have joined the permanent staff of R/C Modeler — Ken Willard and Ted Strader. Ken will be writing a monthly column for beginners and will answer many of the questions we receive each month from the newcomers to RC. Brother Ted, who presents, in this issue, the Gulliver, successor to the ever-popular Nomad, will be pounding out another exclusive monthly stint in his own inimitable, tongue-in-check style. Ol' Ted, having vacated his former position with another model publication, will also make the scene with most of the major Eastern bashes, so look him up at contests East of the Big Stream.

We've heard so much about the four-headed monster called the 'Builder Of The Model Rule' that it's becoming downright depressing. Quite