

Sterling's Command Master Superhet Provides

And a lot of very unusual features, too. Manulkin & Co. have carried "Black Boxism" to an all time high as they prepare to keep your rig always in working order.

How did Sterling Models, long a successful maker of plane and boat kits, get into R/C equipment manufacture? It began back in 1960. Sterling prexy Ed Manulkin and his associates wanted to diversify. What better way than to market an R/C system which could be used with Sterling kit products? The concept was a "Model T" system—simple, not costly, ultra-reliable. While rather complex internally, the system components are simple as far as the buyer is concerned since he has no adjustments to make, no tuning, no wires to solder. Whenever there has been conflict between cost and reliability Manulkin has insisted on the latter. While you can buy lower cost outfits, Ed feels you can't obtain a more reliable one. His aim has been for a system of which "the modeler won't be amazed when it works every time."

Prior to settling upon design, Ed visited many flying fields and many hobby shops. He talked to countless modelers and scads of retailers. He found why R/C equipment is handled by so few dealers . . . shops would be happy to sell the equipment, but most know nothing about it technically, are not able to handle complaints, don't want to get involved with returning equipment to its maker for service. Ed figured Sterling's had to be salable without any technical knowhow needed on the part of the seller, and returns had to be direct to factory.

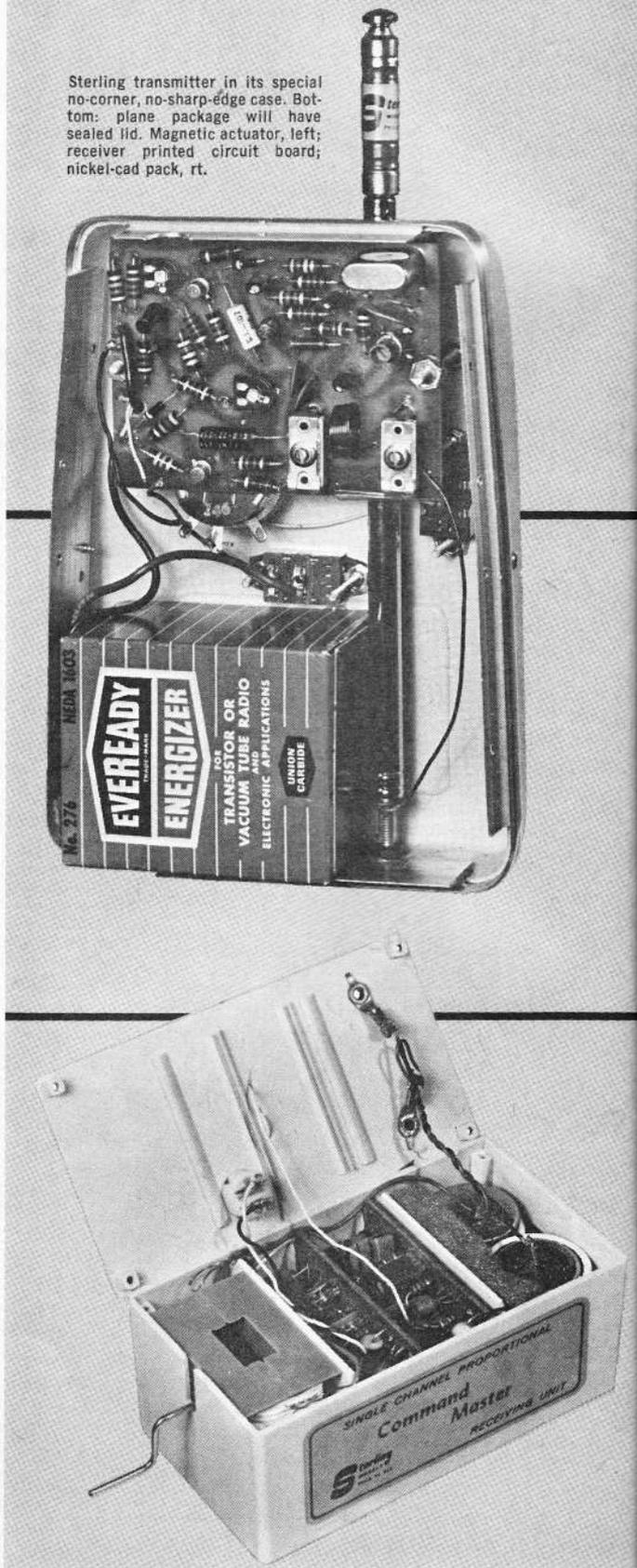
So almost six years ago Sterling arranged with Dick Jansson to develop the circuitry for a simple proportional outfit for rudder control only. Motor control was to be included via an escapement external to the receiver package—this escapement to be the only external component.

Circuit design is modern throughout. While the instruction booklet does not give circuits (remember, this equipment is designed for the fellow who couldn't care less about what makes it tick) we wheedled 'em from Ed. You technically knowledgeable types will note unijunction oscillators for pulser and AF tone, silicon semi-conductors throughout except in those spots where germanium do a better job. The super-het receiver helps minimize interference troubles, accepts only a very high AF tone to provide unwanted signal rejection. It's relayless, so the user won't have vibration and dirty relay contact problems. The motor control circuit functions when you send a burst of high pulse rate; this means the rudder remains fully operational even though you might hold the MC button operated overly long. A search for the toughest plastic for the receiver case narrowed down to Lexan. This material is far more expensive than most plastics generally employed.

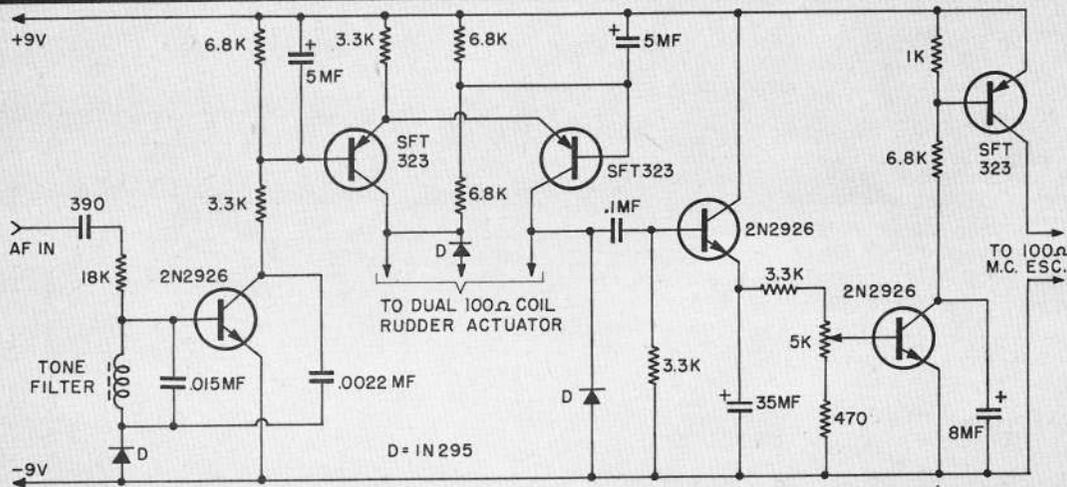
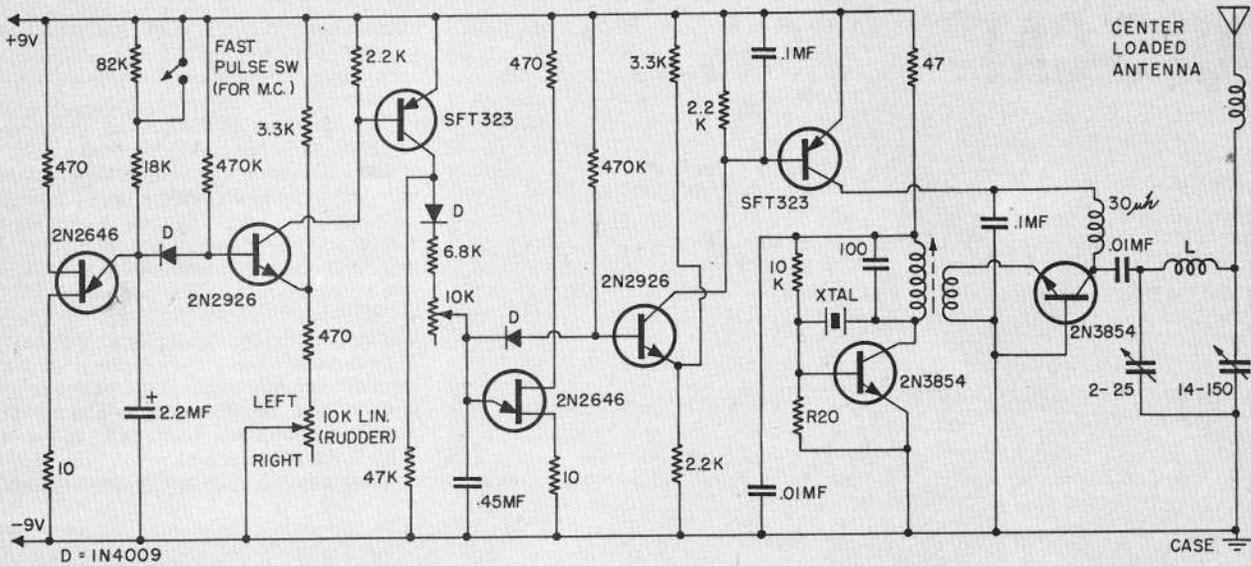
Sterling intended a trapdoor for insertion of batteries, these to fit into spring contacts. But the contacts could be a cause for trouble, and battery sizes vary considerably. Furthermore, could Sterling be sure the user would insert the proper cells, or batteries in good condition? The decision to sell the unit with soldered-in nickel-cad cells was another strike against ultra low-cost, but a home run for reliability. With the battery factory-installed the case could indeed be solidly sealed. But Sterling recognized that there are many modelers qualified to service their own equipment. So the compromise case has seals on the screws that hold the cover. The seals are soft plastic which the user can remove. Doing so voids the guarantee so repairs on an opened receiver will be at a price set by the factory.

The built-in switch can be reached through (See pg. 66)

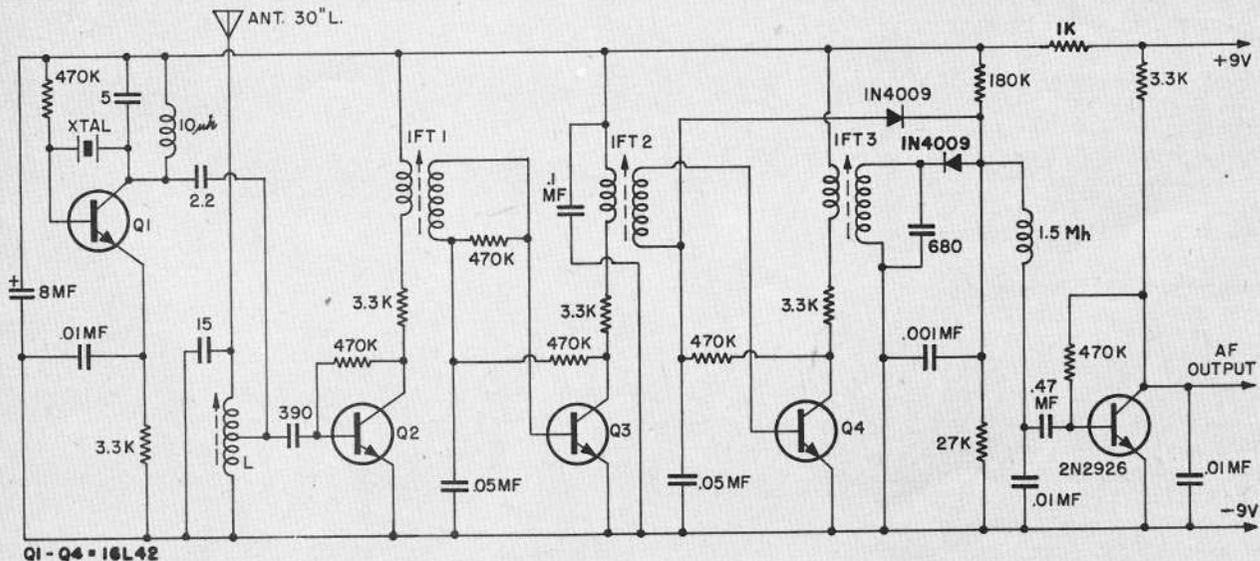
Sterling transmitter in its special no-corner, no-sharp-edge case. Bottom: plane package will have sealed lid. Magnetic actuator, left; receiver printed circuit board; nickel-cad pack, rt.



Single Channel Proportional Control



Schematics from top are the Command Master transmitter, decoder and receiver. You won't find these circuit drawings in the data book!



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a hole in your plane's fuselage. Or you can work the knob remotely. Atop the case is a two-pin connector for the MC escapement and two snap fasteners for the charger. Neither can be plugged-in incorrectly.

The compact charger in a plastic case has an isolation transformer so you don't get a hot one if you touch any open leads on the system, and a water pipe or other ground at the same time. Charging rate with dead battery starts around 50-ma, gradually drops as charge progresses, automatically terminates at full charge.

The receiver was the main holdup in system development and marketing; Manulkin estimates that 70% of the problems have involved the plane unit. When work started on the system super-regen receivers were in wide use doing a good job. But as interference increased more and more fliers objected at having to fly one plane at a time. It became evident Sterling should have a super-het receiver. Production plans came to a screeching halt while a super-het deck was developed for the receiver package. Jansson had the assistance of a prominent figure in the R/C field on this task, between them they came up with a receiver prototype that "flew right off the drawing board." It satisfied Ed Manulkin's demand for an ultra-reliable unit.

First thought had been to incorporate a commercial magnetic propo actuator, but no suitable unit could be located. So Jansson designed one of simple con-

struction and relatively potent, a result of using Delrin plastic frame which also provides almost friction-free bearing surfaces, Alnico 5 magnet and a nickel-plated, rust-free, hardened steel axle. The actuator has a high number of ampere-turns—which means that it is electrically efficient. It has two 100-ohm windings, so current drain is reasonable. It fits snugly into its own compartment in the case, with just the crank projecting.

To assure trouble-free linkage to the rudder, some nifty Universal Torque Rod Connectors were designed of nylon. Two are needed in a plane and you get a pair with each system. They work so well that modelers in the Philly area have snagged lots of them from Ed. Like other RT-1 components they will be marketed separately.

The actual receiver circuitry is on two P.C. boards, one for the super-het, second for the decoding circuits that drive the actuator and MC escapement. Aside from making construction easier, there is a special reason for the *two* boards . . . which we'll get to later. Sterling obtains the nickel-cad batteries from their maker fully charged so you can see things wiggle and click as soon as you put a battery in the transmitter.

Most present escapements have too low resistance to work with the RT-1 circuitry—they would require too much power. One exception is the Babcock MC-27 which has the required high resistance winding. Since one with push-pull output arm would make throttle linkage simpler, Sterling is having such an escapement made by an experienced manufacturer; it has a 100-ohm winding, provides three positions, for low-medium-high engine speed.

The transmitter came through pretty much as originally laid out. Manulkin had expressed dislike for the usual metal transmitter cases with their sharp corners and edges; a neat design was worked out with two molded plastic halves attached to an extruded aluminum "ring". Its ABS plastic probably rates next to Lexan in toughness but is considerably lower in cost.

The control knob is spring loaded, can be grasped with two fingers or you can "thumb it" as the reed fliers operate their controls. The control pot is mounted so the lever protrudes at a handy angle. For utmost output from the transmitter, regardless of how the user holds it, a center-loaded half wave antenna puts out about the same amount of signal whether you clutch it tightly with sweaty hands in mid-summer, or hold it lightly with heavily-gloved hands in winter. The antenna is 49.25" long extended, projects 5.25" above the case top when collapsed, and never has to be removed from the xmtr. It works so well another R/C manufacturer will utilize it.

While the transmitter and receiver are intended for the 27-mc R/C spots, they will be available on special order for 50-mc operations probably at slightly higher cost. No doubt these units will be set up for the if-and-when-we-get-them 72-mc R/C spots on the same custom basis. Each paired transmitter-receiver are tuned together, both are crystal-controlled; you have the frequency shifted by returning both units to the factory.

To assure that the two major components of each Command Master RT-1 system work perfectly together, after a transmitter is tuned and checked out,

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that xmtr is utilized as a signal generator to tune and test its mating receiver. This assures that RF tuning, AF modulation, pulser rate and motor control high speed pulsing of the receiver are exactly right. All paired units are given matching serial numbers and field tested for range and overall operation before being packed. If you wish a second receiver for another plane (though it is a simple matter to shift the receiver package from model to model) return your transmitter to the factory to have the additional receiver matched to it.

An 8-page booklet includes details of installation, arranging linkages, installing transmitter battery, charging receiver battery. There is a page on testing and flying a new model, but no description of inner workings, no circuits, only brief technical specs. This booklet is for the non-R/C modeler and he won't become bewildered by a lot of technical lingo.

Here are technical details on the system which we measured on one of the first production units. Transmitter battery drain was about 45-ma with antenna collapsed, a few mils more extended. No difference in current drain

was apparent when the MC button was actuated, except that due to the much higher pulse rate, the meter needle stopped its slight flickering. The transmitter weighs a modest 23.3-oz with battery and antenna in place.

Total drain on the receiver battery was some 135-ma with the transmitter sending its pulsed signal; there was little change in current with the MC button actuated (but 90 to 100-ma would be added to the total with a MC escapement in circuit—the Sterling escapement wasn't available for these early checks). Our receiver case measured 4 x 2.187 x 1.812" less the various projections; unit weighed 11-oz. Receiver requires 3600 cycle tone from transmitter.

We've chronicled the development of a high grade single channel propo system with features you can't get in other equipment. Now about the built-in "insurance" you get with each system...this via Sterling's unconditional 5-year Black Box Guarantee. Realizing that while even a horrible crash may not damage the tough Lexan case, it just might disrupt some of the more delicate vitals of the receiver package, the maker offers to replace an unworkable package for any reason whatever and that includes crashes, being run over by a truck, dunked in the ocean for a cost of \$7.50. This offer is contin-

gent upon units that have their factory seals intact. The defective unit must be sent direct to the factory. The unit you get back will be shipped by first class mail within 24 hours (in a real hurry, add 50¢ for airmail), may or may not be yours.

Your \$7.50 includes shipping costs of mailing a replacement receiver back to you. However, to assure maximum range, you should return your transmitter with the non-working receiver unit so that tuning of the replacement receiver can be matched to your transmitter; transmitter return fee is \$1 (\$2 by airmail).

If you are the crash-happy type, you can avail yourself of this \$7.50 replacement deal as many times as you have need, within the 5-year period following your original purchase. Needless to say, an offer like this necessitated a vast amount of head-scratching at the factory. They had to set a price that would probably (all fingers are crossed at Belfield Avenue & Wister St.) cover cost of making a replacement, yet the price had to be low enough to convince the buyer he was getting real "insurance" with his original purchase. This guarantee backs up the more than \$40,000 that Sterling has put into developing and marketing the Command Master RT-1 system.

Every set returned from the factory will have been updated to include any circuitry or mechanical improvements found to be useful or necessary. As technical advances are made in the electronics field, matching improvements will be made in production to keep pace.

In addition to its Black Box guarantee, Sterling provides a warranty on the entire system, covering defects in materials or workmanship; the defect will be repaired or the unit replaced within 30 days from date of original purchase when you return the entire system right to the factory.

Most R/C'ers expand as they gain proficiency. They want to step up to more complex systems for more controls. Sterling has assured us that they are in R/C equipment manufacture for keeps, that they will bring out more complex systems. Will owners of the RT-1 system lose their original investment? No, because the units are designed so they may be expanded to incorporate additional controls. Work is under way to add another control to the RT-1 system, hopefully by mid-'66. Such work can run into time-consuming snags so we wouldn't hold off buying our RT-1 system in the expectation that in a month or two we might be able to buy one with elevator control added. The point we make here is that Sterling isn't resting on its oars now that they have their RT-1 on sale. If they do come out with an RTE (propo rudder and elevator) system, they will keep right on making the present RT-1. Ditto if and when they work out means to add ailerons to the setup. In any case, the simpler systems will be convertible to the more complex, so you will be able to retain a considerable portion of your original investment in the equipment and still have the use of your first purchase in the meantime.

With their present Black Box Guarantee and future expansion program Sterling has added some fresh concepts to our field. Everyone in R/C—producer, seller and user—will be watching for what's next from this old-line hobby manufacturer.