GRID LEAKS

VOLUME 2 NUMBER 3

NOVEMBER-DECEMBER 1959

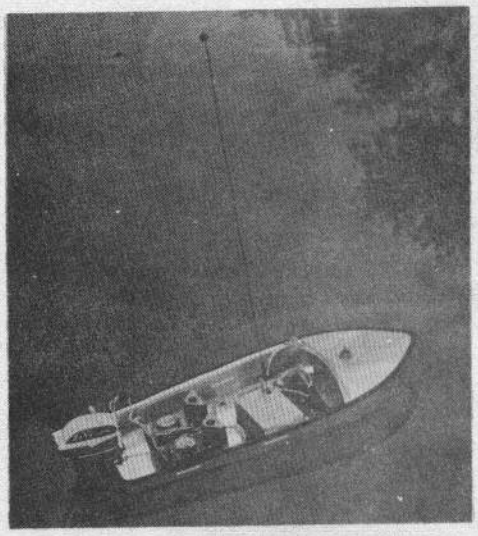
25C

PUBLISHED BI-MONTHLY AT HIGGINSVILLE, MO.

R/C DATA SERVICE

Small Boat Radio Control

Ann Runge, of Higginsville, Missouri, pilots a 16" K & O outboard. Small boats mean lightweight, simple installations. Use of lighter nicad type batteries lower operating costs since they may be recharged.



In Volume II, Number 1 of Grid Leaks, we presented a Greyhound bus which had been wired by L. R. Purdy of Cobb Hobby--producers of the Electro Compound, Electro SN, Electro 3P as well as the series of escapements and servos.

This one will show you the installation that L. R. dreamed up for a boat. This is in a 16" outboard type boat which is available from your hobby dealer readily but we don't necessarily recommend that it be used in this boat only. We are merely showing you an installation idea.

The cover photograph shows the installation being used in the K & O Dolphin. Many of the boats ranging from 16" to 20" in length could be easily adapted for this type of installation.

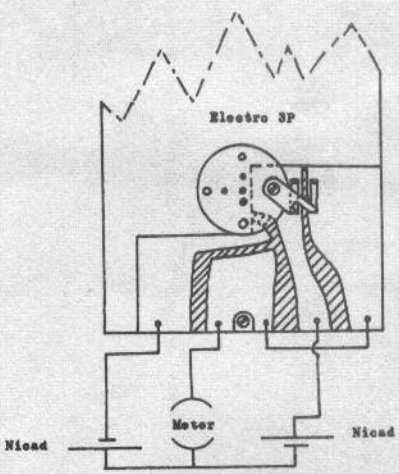
As you will recall, the bus had a stop, forward, reverse working off an Electro Compound, going to a 3P and had a special printed circuit reversing board. It was shown in that issue but we are repeating it here.

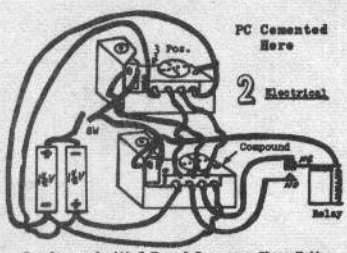
No great details outside of the photographs will be shown since we feel that each individual may want to vary in his own installations.

This boat is, we feel, primarily designed for the Esther Williams type swimming pool. The reversing action originally, we felt, didn't have a great deal of desirability. Upon taking the boat out and trying it in a swimming pool, we immediately found out why the reversing action was necessary!

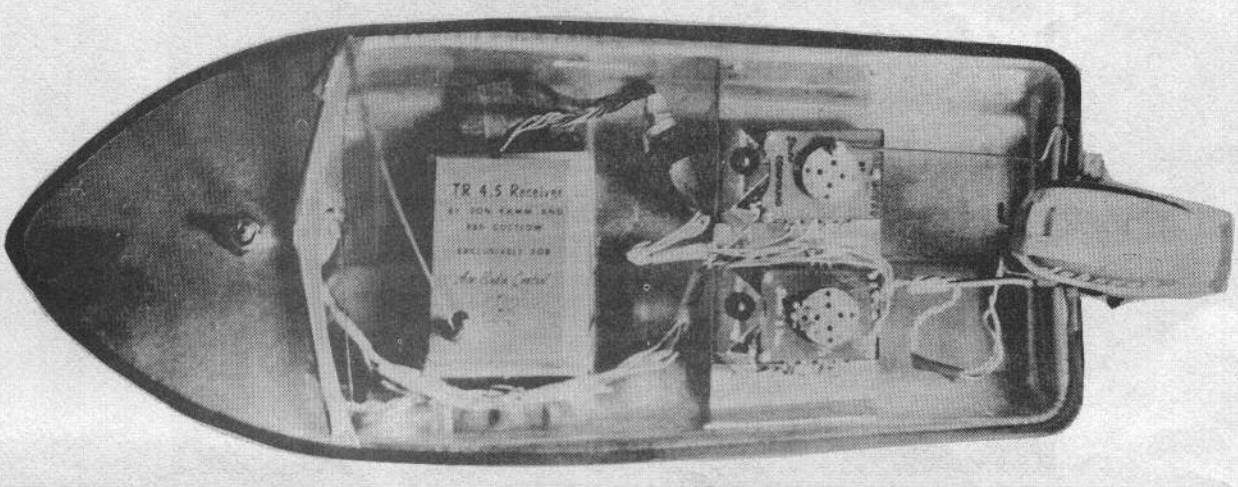
The boat isn't any great shakes as far as speed is concerned using the VO.500's as power but it certainly goes more than scale speed and can provide hours of fun as evidenced by the fact that four of our staff had a ball taking the pictures that you see.

If you haven't tried R/C boating, you're missing a very fine sport. It's much simpler than R/C plane flying. You can't lose your boat and it's just plain fun all the way around. We are presenting another article on boating this time for the very simple reason that, from mail we have received, R/C boating is coming into increasing favor. If you haven't tried it yet, get your feet wet!





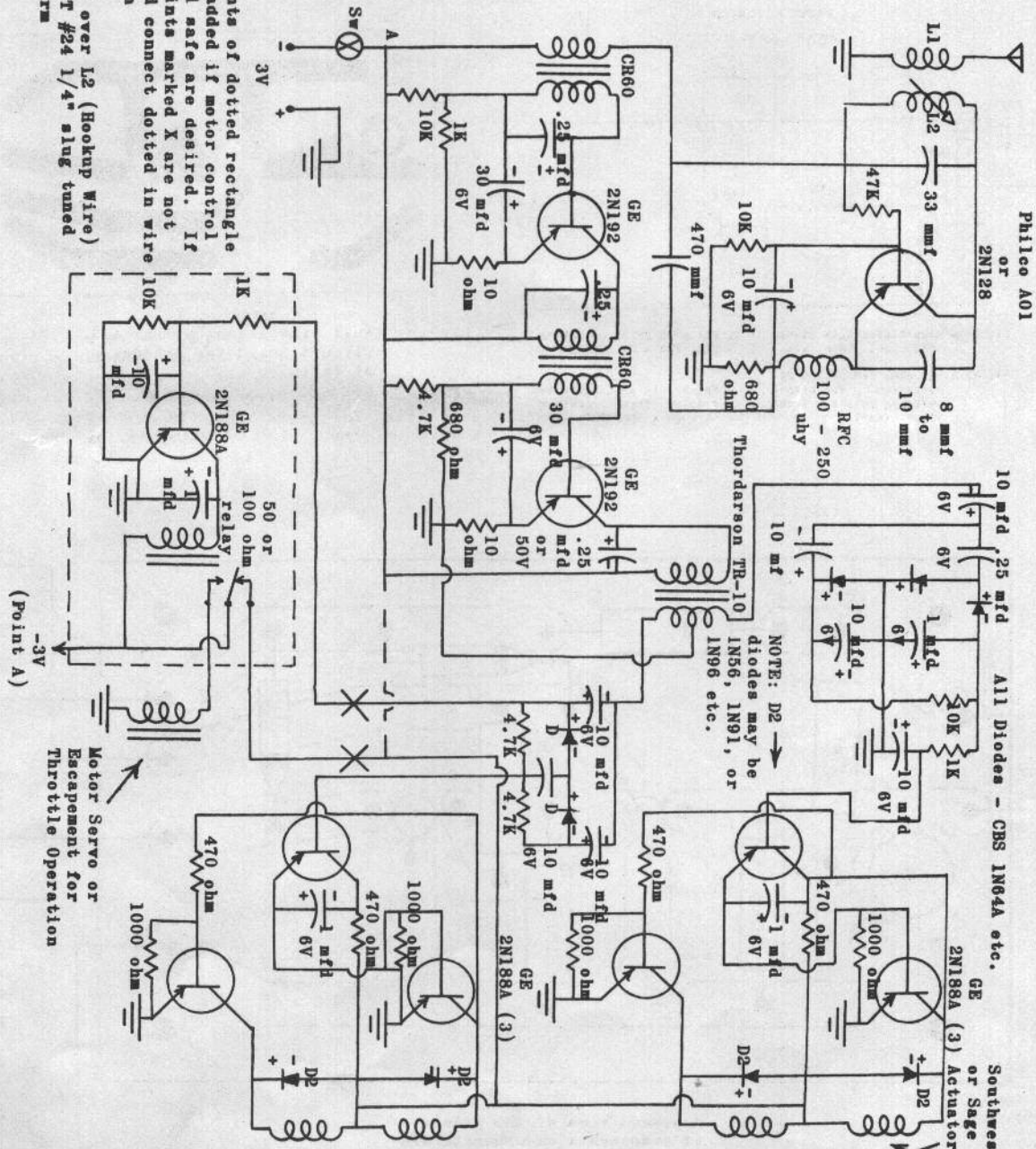
For Compound with S-W or 3 Pos. as a Slave Unit.



DUAL PROPORTIONAL RELAY-LESS RECEIVER

BY NEIL DELAFIELD

EDITOR'S NOTE: Your mail to us has indicated your desire to see a circuit of this type. Admittedly, it is not for the beginner, but there is a lot of meat in the schematic that will be of interest. No base layout is given. Receiver operates on 3 volts. Neil says: "This reciever may pulsed as fast as transmitter is able. No points to arc or to get dirty and stick, except in motor control and fail safe."

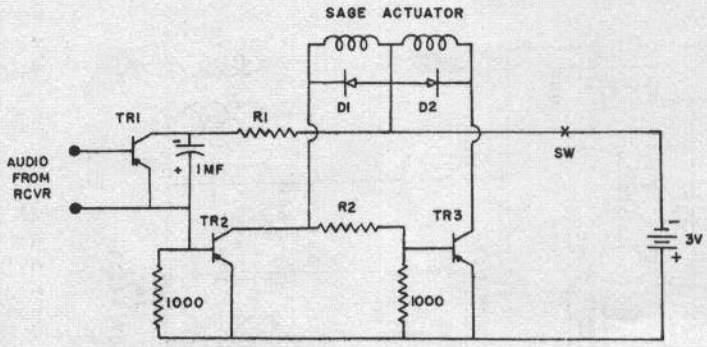


PC BOARD FOR BORGES' RELAY ELIMINATOR

BY R. A. KONKLE

When the proportional relay eliminatorappeared in Volume 1 Number 6 of Grid Leaks, written up by D. B. Borges, I set about developing a printed circuit board for it, which I could piggy back on my CG Pioner receiver. The board is shown full size, and there is a larger view of the part placement to make it simple to duplicate. The circuit on PC has worked very well for me.

To duplicate the PC board, any of the methods described in recent issues of Grid Leaks may be employed. Testors dope makes an excellent resist and there are usually quantities of this in every model builder's shop. After pattern has been applied, use ferric chloride to remove excess copper. Pattern may also be laid out on copper and with a sharp knife such as an Xacto, may be cut out. Excess copper is then peeled off.

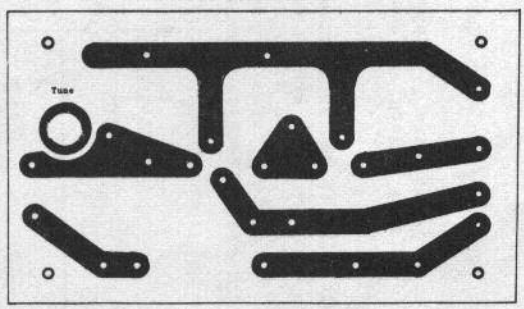


D1, D2 = High Conductance Diodes 1N56, 1N91, 1N96, etc.

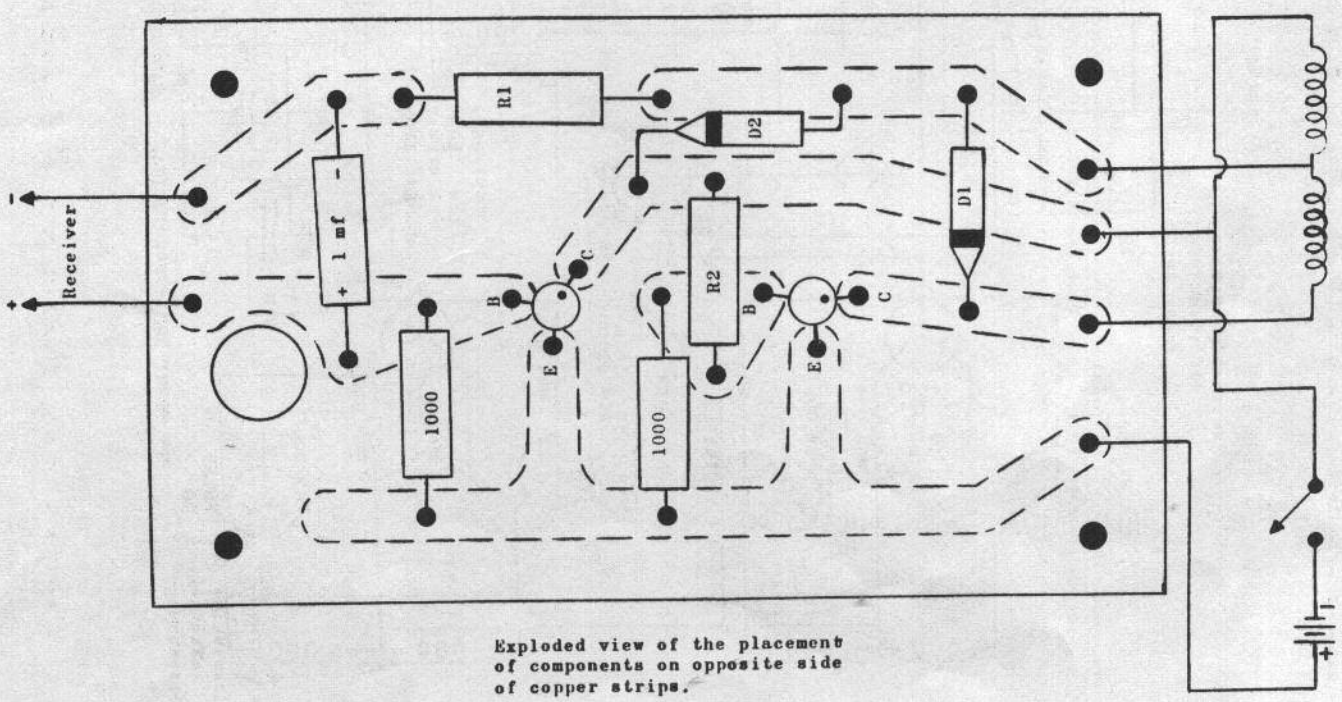
R1, R2 = 560 ohms for 3V/100 MA operation. For higher currents values lower proportionally

TR1 = GE 2N188 or 2N188A
TR2, TR3 = GE 2N188A

TR1 should preferably be coupled from receiver through a transformer.



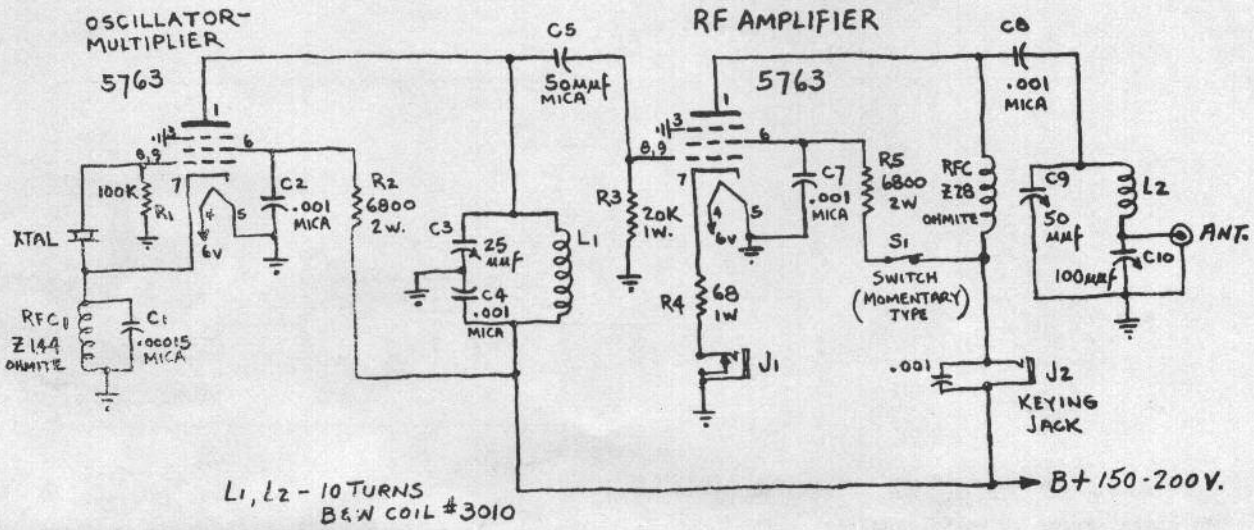
Full size layout of Printed Circuit Board for schematic at left.



Exploded view of the placement of components on opposite side of copper strips.

Mobile 6 Volt MOPA Transmitter

BY LEONARD CHIOMA



This unit was designed for use as a mobile transmitter operated from a 6 V vibrator power supply. Initially, operating voltages and power output were greater than the 5 watts allocated by the FCC for R/C, however, by the simple expedient of decreasing the plate voltage, it becomes a compact portable field transmitter for R/C work rather than for the ham usage it was originally designed for.

RF SECTION

The RF section utilizes two of the 5763 tubes, one as a tritet oscillator-multiplier, and the other as an RF final amplifier. The oscillator tank circuit is tuned to the specific R/C spot and provides ample drive to the final amplifier.

The tritet coil is a commercial RF choke, an Ohmite Z144.

The antenna coupling system is especially interesting because it very effectively discriminates against harmonics. This type of coupling (a modified pi network) compared to the conventional link coupling, provides only 1/4 of the 2nd harmonic output, 1/9 of the 3rd harmonic output and proportionately smaller amounts of higher order harmonics. Maximum loading is obtained by tuning the capacitors in the pi network.

This unit, with the addition of a modulator, could readily be adapted either to a tone transmitter or as a citizens band transmitter. The crystal can be a low frequency rock i.e. 6813.75 kc for 27.255 mc operation.

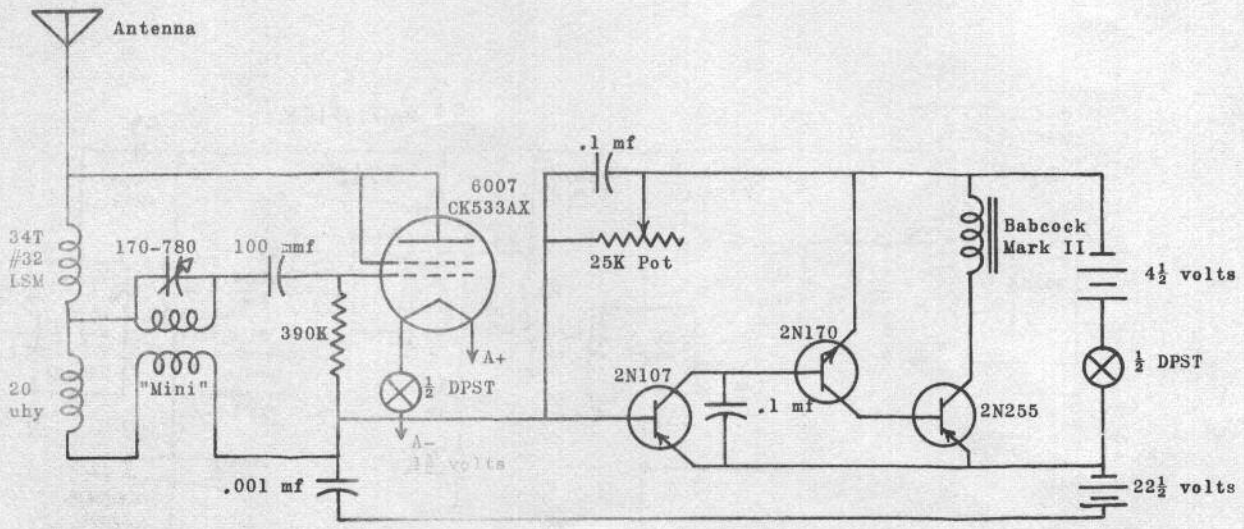
After completion of the unit, the unit is checked out quite simply, as follows: After connecting a half wave dipole antenna to the antenna jack, insert a 0-50 ma meter in the cathode circuit of the amplifier (J1) open switch S1, apply power and then tune the oscillator circuit (C4) to resonance by observing the meter. The meter indicates grid current of the amplifier because S1 interrupts the screen supply and allows no plate or screen current to flow. (This switch can be used for keying purposes other than the method shown on schematic). When sufficient grid drive is obtained (1.5-2.5 ma.), the RF amplifier can be operated by releasing S1 and tuning C9 in final tank for a dip in the cathode current. The oscillator tube draws about 15 ma at 200 volts.

The antenna should be reasonably close to the correct length (9½ ft.) for the operating frequency to prevent any difficulty in loading the transmitter. (Antenna should be fed through 72 ohm coax). Decreasing the capacitance of C10 increases the plate loading but, for efficient transfer of power to the antenna, the capacitive reactance of C10 should equal the transmission-line impedance. For 72 ohm coax, C10 should be adjusted to approximately 80 mmf (for 52 ohm coax to about 100 mmf). If this adjustment does not provide a plate current of 20-25 ma (measured cathode current less about 4 ma for screen current and 1.5-2.5 for grid current), decrease the capacitance of C10 until the approximate value is obtained. After each change in C10, retune C9 for maximum dip in cathode current. A further check may be made by means of a neon bolt placed at the antenna.

The exact values of currents noted will be directly influenced by the B+ supply voltage used.

Hybrid CW Receiver

READER OFFERS COMMENTS AND CIRCUIT



My latest issue of Grid Leaks came a few days back. The questions which you propose concerning the content of future issues are interesting enough to make me want to add my comments, for whatever they are worth.

The basic issue seems to be "should GL articles be for the beginner or the expert?" I wonder if an "either --or" approach is necessary. Isn't there really a place for both types of articles? Certainly, it is not reasonable for GL to repeat "beginner's articles" ad infinitum and ad naseum. On the other hand, equipment and techniques suitable for beginners change--at least as much as those for the experts. What beginner, a few years ago, would have tackled a Lorenz receiver? With an "Ace" kit, I did, and the results were completely satisfactory. Now, tone receivers which, conceivably, a beginner could build are on hand. Why not articles aimed at beginners which explain techniques of construction and adjustment of tone receivers?

Still on this subject, a severe shortcoming, in my own opinion, of nearly all the beginner's articles which appear in all of the publications is the emphasis on practice and the deficiency of theory. If a beginner is to make progress in the art of radio control--particularly if he is interested in design and development of his "own-design" equipment, he needs the theoretical knowledge to do so.

To illustrate--what, exactly, is the function of the quench frequency on receiver sensitivity? I have asked a good many modelers these particular questions, including some of the local "8 channel" fliers, and have yet to receive a satisfactory answer. Perhaps I am letting my own tastes affect me too much but I see a definite need for articles which explain the theoretical fundamentals as applied to R/C.

I am enclosing the circuit for an experimental receiver in which you might be interested since it is a sort of cross between the transistorized "Commander" and the "Aeromodeler" receivers.

This version, however, has good range and operates well on 22½ volts "B" plus escapement volts. Tuning procedure, however, is a little complicated. The front end is tuned like any other hard-tuber. After this is done, a 500 ma meter is inserted in the escapement lead. The 25K pot is adjusted until the current JUST starts to rise with no signal. This point is critically dependent on sensitivity adjustment, antenna length, etc. The pot seems to be absolutely necessary for this reason. When adjusted, tube current is about .02 ma at no signal dropping to 0.1 ma with signal. Escapement current is about 50 ma at no signal, rising to 300-plus ma on signal with 4½ volts escapement supply. This is a little low. A 2N217 in place of the 2N107 might help; I plan to try this as well as a 2N188A in place of the 2N255.

The receiver does not seem to be particularly temperature sensitive which the article on the "Aeromodeler" receiver mentions and which Pete Bliss tells me he found in his receiver.

NOTE: I have used both CK533 and 6007 and believe 6007 is better.

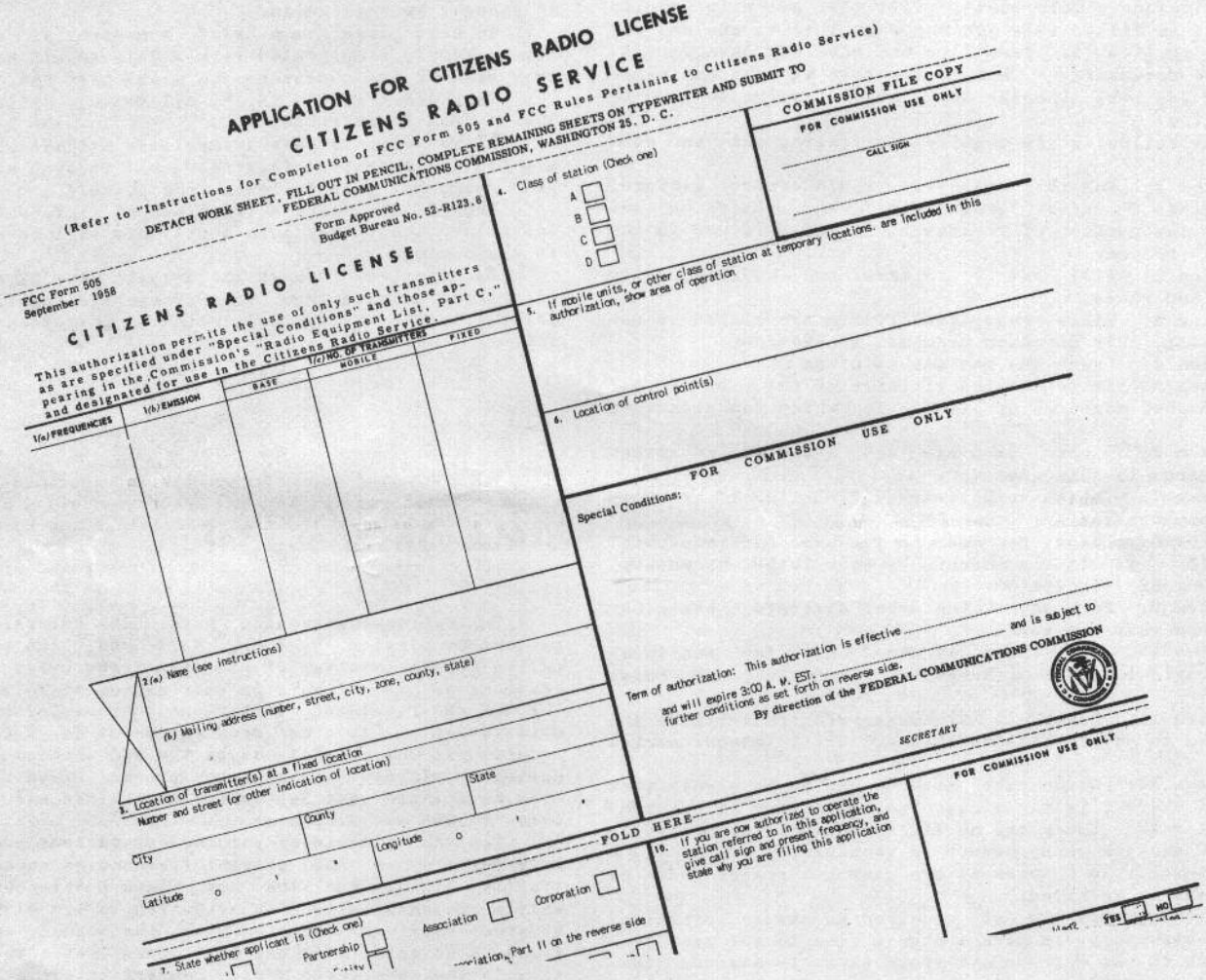
Yours sincerely,

John G. Burdick

EDITOR'S NOTE: In line with our policy of bringing you experimental circuits, here is one that looks good. It has not been checked out at Grid Leaks, however, and we'd be most interested in hearing from readers who do try it giving us their evaluation.

Filling Out Form 505

A MUST FOR EVERY RC FAN



APPLICATION FOR CITIZENS RADIO LICENSE
CITIZENS RADIO SERVICE

(Refer to "Instructions for Completion of FCC Form 505 and FCC Rules Pertaining to Citizens Radio Service)
DETACH WORK SHEET. FILL OUT IN PENCIL. COMPLETE REMAINING SHEETS ON TYPEWRITER AND SUBMIT TO
FEDERAL COMMUNICATIONS COMMISSION, WASHINGTON 25, D. C.

FCC Form 505
September 1958

Form Approved
Budget Bureau No. 52-R123.6

COMMISSION FILE COPY
FOR COMMISSION USE ONLY
CALL SIGN

CITIZENS RADIO LICENSE

This authorization permits the use of only such transmitters as are specified under "Special Conditions" and those appearing in the Commission's "Radio Equipment List, Part C," and designated for use in the Citizens Radio Service.

4. Class of station (Check one)
A ☐
B ☐
C ☐
D ☐

5. If mobile units, or other class of station at temporary locations, are included in this authorization, show area of operation

6. Location of control point(s)

1(a) FREQUENCIES	1(b) EMISSION	1(c) NO. OF TRANSMITTERS: BASE	MOBILE	FIXED

FOR COMMISSION USE ONLY

Special Conditions:

Term of authorization: This authorization is effective _____ and is subject to further conditions as set forth on reverse side.
and will expire 3:00 A. M. EST. _____
By direction of the FEDERAL COMMUNICATIONS COMMISSION

SECRETARY

2.(a) Name (see instructions)

(b) Mailing address (number, street, city, zone, county, state)

3. Location of transmitter(s) at a fixed location
Number and street (or other indication of location)
City | County | State
Latitude ° ' " | Longitude ° ' "

FOLD HERE

10. If you are now authorized to operate the station referred to in this application, give call sign and present frequency, and state why you are filing this application

FOR COMMISSION USE ONLY

7. State whether applicant is (Check one)
Partnership ☐ Association ☐ Corporation ☐
...viation, Part II on the reverse side

EDITOR'S NOTE: Popular Electronics, in their August, 1959 issue carried an article for tips for Citizens Band applicants on the new Form 505. It was primarily related to Class D or transceiver type of operation and we shall attempt to give you a run-down for Class C or radio control operation.

When the FCC opened up the new R/C spots as of September, 1958, they also opened up a lot of transceiver spots which are in the very same vicinity and can cause trouble.

At the same time, they completely revised their Form 505 which is the form that must be filed with the FCC on which you apply for a Citizen's license. It is now a more complex form and is also a very difficult form to procure. Most kit manufacturers are having difficulties in getting these in quantities enough to keep up with the demands for both the Class C and Class D licenses.

There are no stiff rules or code tests and the age for radio control has been lowered to 12 years under the new FCC regulations. You just fill out a form with four carbon copies and mail it to Washington, D. C.

The FCC Form 505, September, 1958 is used as an application for several classes of licenses. Radio control transmitters operating on 27 megacycle frequencies are called Class C. Be sure you understand the various classes. Two-way voice communications are called Class D.

If the manufacturer has been fortunate to secure forms from the FCC directly, you will find a form packed in your transmitter kit or transmitter. If, however, this has not been the case, write to your nearest FCC office.

Before you attempt to fill out the application, send an air mail letter to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. and enclose 10¢ in coin and request Part 19 of the rules governing citizen's radio service. You must have a copy of Part 19 when you fill out the application because you will have to swear, under oath, that you have read it and that you do understand it.

If you should ever be cited for operating improperly, you cannot plead ignorance of the rules.

After you have studied the rules, you are ready to work on the application form. You will see that the papers include a work shett. Fill this out with pencil. After it is filled out, you may show this to one who has already applied if you like and make any changes that might be necessary. This is the best way you can avoid messing up the sheets that you're going to send to Washington.

The following is a guide in filling out your work sheet:

Item 1: For 27 megacycle radio control license, write Class C under "Frequencies" and "Emission" and specify the number of transmitters you will use in the "Mobile" column.

Item 2: Fill out your name and address, city county and state.

Item 3: Since your transmitters are listed as mobile units, this question need not be answered.

Item 4: Check the box marked Class C.

Item 5: Write "In the vicinity of the city of____" (or names of counties or states in which you plan to operate.)

Item 6. Since Item 3 was not answered, no answer is required in this space.

Item 7: Check the box marked "Individual" or whatever term applies.

Item 8: Check Box 8A if you own the equipment yourself. If it is owned by your father or mother, check Box 8B. Ignore 8C.

Item 9: For controlling model aircraft, boats, or cars--use your own words.

Item 10: This space is used only for modifying your original license (change of address, new units etc.)

Item 11: Since all 27 megacycle transmitters are required to be crystal-controlled, check the box marked "Yes".

Item 12: Since your antenna can be no higher than 20 feet above existing structures, no answer is required

Item 13: There are no fixed stations allowable in Class C service so no answer is required.

Item 14: R/C transmitters must be crystal jobs so no answer is required.

Although you are not required to answer several of the questions, it is always a good idea to put your pencil mark in the appropriate space so it is obvious that you did not go by one of the questions that should have been answered.

When your work sheets have been completed, type it up--do NOT use pencil or pen--along with the four copies.

The small print above the signature space and the conditions and warnings on the reverse side of the application should be read with care. Now, take the application to a notary public and sign it exactly as you have typed your name in Item 2. Check the box marked "Individual Applicant" and have it notarized. It will cost you a small fee but this is a small premium to pay for the privilege of radio control.

Your application is now ready to be mailed to the Federal Communications Commission, Citizens Radio License Section, Washington 25, D. C. Do NOT mail to your local FCC office. From 60 to 90 days will be required.

If you have made a mistake on your application, it will be returned to you. If you correct and return to the FCC within 30 days, it will be put in its original place in the processing line. Otherwise, it may be treated as a new application. When you make any changes on the returned form it must be re-notarized. If the application is so badly fouled up that you have to make out a new one, be sure you return the original with the new application.

You are responsible for the manner in which your transmitter is operated regardless of who is actually operating it. Your license can be revoked for failure to comply with the law and the FCC rules. Keep informed of changes in regulations.

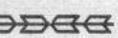
We have given you a brief run-down of what looks like a fairly complicated form. This should help to answer some of the questions you might have had.

We would urge you to, by all means, file your 505 as soon as possible.

If you operate your transmitter without your permit you are operating illegally, and hurting not only your self, but all fellow HCer's as well.

The FCC is taking a long look at different spots -- see below -- but they also state this will be some time in the coming.

Meantime, we DO have the 6 spots near 27 mc. To insure our keeping them, we MUST operate legally. So let's file the 505's, let's stick to the specs set by the FCC.



AMA Testifies Before FCC

In testimony presented before the Federal Communications Commission in June, Walt Good, AMA president, called for designation of six spot frequencies with separations of 2% or more in the region of 25 to 200 mc. The AMA was requested to present current information on utilization of Citizens' Band equipment in R/C for the record. It was pointed out by the FCC that no immediate action is planned to change the present Class C frequencies as revised last September to include six spots between 26.995 and 27.255 mc.

The AMA testimony pointed out various problems of interference on the present frequencies caused by R/C traffic signals and the new Class D telephony units. Walt's statement also drew attention to the high cost of superhet receivers compared with the popular superregen types. He said, "It had been hoped that a cheap addition to the superregen would convert existing receivers into more selective units. As yet, these efforts have not met with technical success."

Also in regard to superhets, it was pointed out that some problems such as overloading at close range and susceptibility to electrical noise have been encountered, but these are considered to be curable.

The AMA suggested four specific frequency areas where shared operation with other services should be considered: (1) The region from 72 to 76 mc adjacent to television channels 4 and 5 because low-power R/C transmitters normally used in rural areas would not cause interference. (2) ISM frequencies. (3) Other services whose geographical restraints would minimize possible mutual interference. (4) Other low power services such as 42.98 mc., which is limited to three watts.

--Reprinted from DC/RC Newsletter.

GILDING THE LORENZ MOPA TRANSMITTER

DALE SPRINGSTED ADDS SIMPLE MODULATOR

Some months ago in MAN, the Radio Control News article showed an improved circuit for the Lorenz Diode receiver. This article was titled "Gilding the Lorenz". The same thing can be done to the transmitter. Gild it, so its use is extended beyond the original design. The following is not a "how to build" article, but simply one showing some changes that may be made to effectively improve the existing circuit, make the unit more stable, and add a modulator for standard single channel R/C receivers such as the TR 4.5, Kraft, WAG single audio etc.

The wiring diagram remains, for all practical purposes, the same as it originally appeared in Model Airplane News.

It is entirely possible to change this from a crystal frequency of 27.255 in most instances to a doubler type circuit using a crystal at 13.6275 by merely adding additional capacity across the tank circuit of the oscillator as shown at point "A" by the dotted lines.

This may be a value from anywhere from 39 to 68 mmf. This has the tendency of building up so that the 13.6275 will take off at that frequency which will prevent loading at the transmitter which the 27.255 sometimes has a tendency to do.

In other words, what can happen with the 27.255 crystal is that CW will seep out of the transmitter case when you're close upon the transmitter with any audio receiver. In effect, this blankets the audio which is coming out of the power amplifier or 3D6 section and thus not give a satisfactory rise in current as would be had if you backed off a number of feet away from the transmitter. With a 13 megacycle crystal which doubles to the 27.255 frequency, since the oscillator is oscillating at 13.6275, any stray radiations will not affect the receiver at all.

If you should decide to add the capacitor to the tank circuit as indicated at "A" by the dotted lines, this capacitor should be soldered and placed directly across the tank coil terminals where it is soldered to the variable capacitor.

One other change in the circuit of the original is to remove the 47K grid leak on the 3D6 and replace this with a 220K value ½ watt resistor. Also, a 68K dropping resistor in the plate side of the 3A4 oscillator has been found to be of considerable help since this drops the operating current on this particular unit and will make it much more feasible to modulate 100%.

If you are dealing with an Ace kit, there is room on the panel to install a 1" wide strip of aluminum bent to a lip on one end. This is shown in the drawing on this page.

This small bracket will hold the modulator tube very easily and the simple layout may be followed for this particular item with the values shown at audio frequency of about 400 cycles per second will result. It is entirely possible to change the cps by changing the 100K variable pot in place of one of the fixed resistors 82K in one of the legs of the grid 3A5 multi-vibrator modulator.

This will give a readily changeable audio frequency of from 200 to approximately 2000 cycles per second which will cover most of the units which are commercially available.

The addition of a DPDT slide or toggle type switch near the key jack will allow the unit to be readily switched to either tone or CW type of operation. The only major change that must be made is in the change of location of the various switches in the present wiring setup. The schematic should make this adequately clear.

Also, with this type of switch design, you may add a vibrator supply without making any further radical modifications. The on-off switch is simply placed in the vibrator supply lead.

All other action switches remain the same.

CAUTION--It should be recognized that you are now keying in the B+ lead and thus the key jack is hot as is the key lead. It is possible to get careless and get bitten and, although not serious, one will jump when this happens.

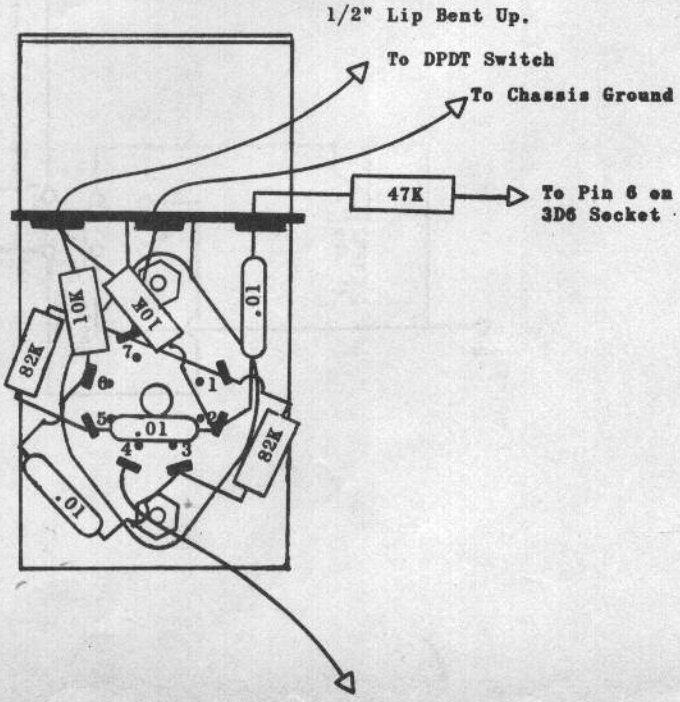
We'd be interested in hearing from other readers who have made similar conversions at existing equipment. This unit, while not the most powerful in the world as far as FCC standards are concerned, still packs a considerable wallop and the changes shown here in the article will enable many existing transmitters to be converted satisfactorily for audio or CW operation without obsoleting any equipment.

The Lorenz MOPA, being an MOPA type of unit, is FCC conformable with the new regulations using either the 27.255 or the 13.6275 rock.

EDITOR'S NOTE--It should be pointed out that if 26.995 operation is desired, either the 26.995 crystal may be substituted or, if a doubler frequency is required, a 13.4975 crystal may be substituted by adding appropriate padding capacitor across the tank as shown at point "A". We feel, that by making transmitting equipment more versatile, the R/C fan is not obliged to lug increasing amounts of equipment to the field with him as he goes out. After all, R/C should be fun and if you are burdened with increasing amounts of equipment, there is just that much more that can go wrong.

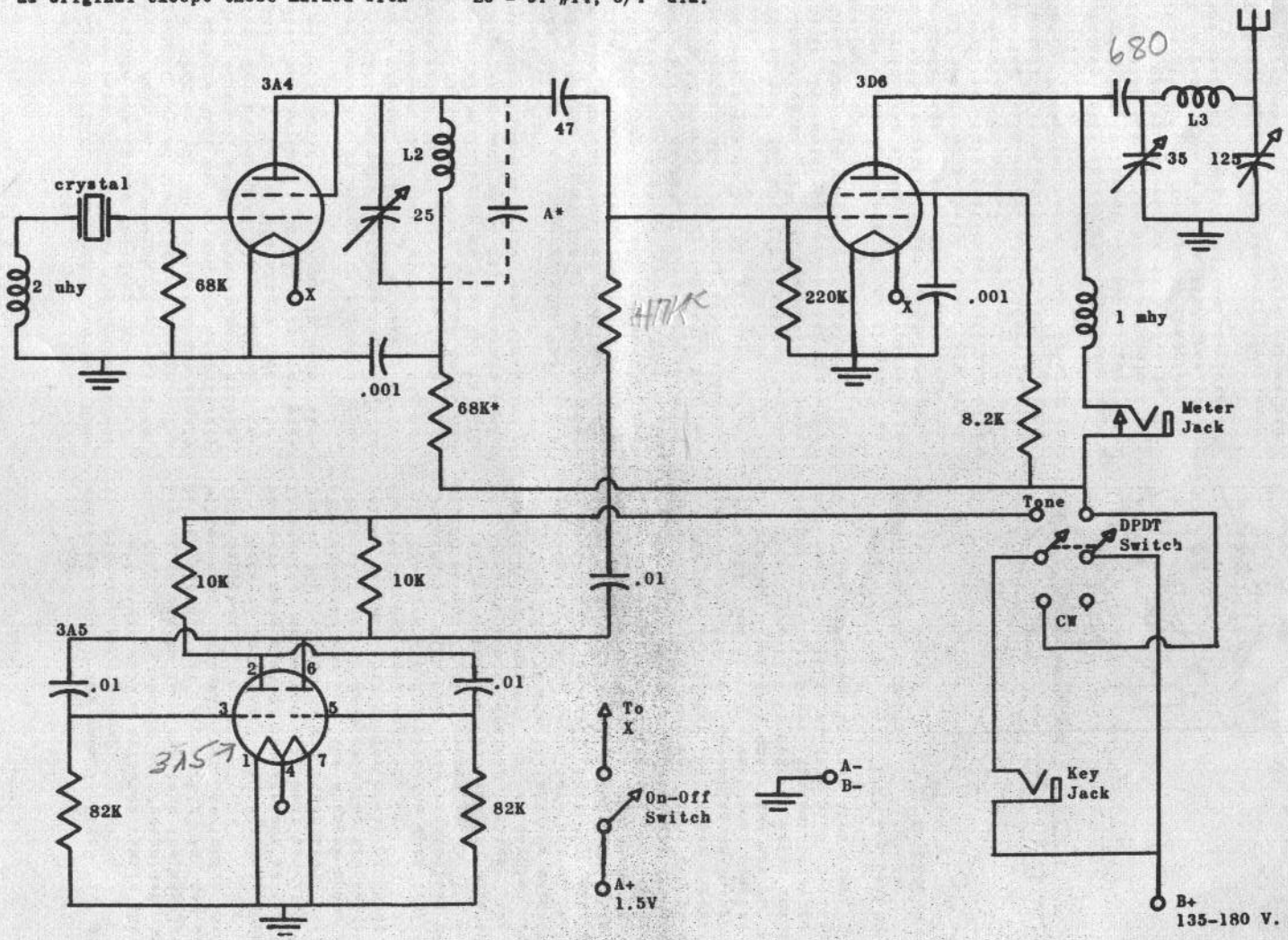
We have a number of other circuits--transmitter wise--which will be appearing in future issues of Grid Leaks and some are of a much more complex nature but all of them are acceptable under the new FCC standards.

Remember, this is your magazine and if you have developed any circuits, transmitter-wise or otherwise, that you feel other readers might be interested in, we would like very much to look them over.



All values in transmitter portion same as original except those marked with *

L2 - 8T #16, 5/8" dia.
L3 - 9T #14, 3/4" dia.



Reader's Comments

RE: Future GL--my vote is for continuation of the past theme. The beginner in R/C can find many sources of information. We need a periodical which monitors the present R/C state-of-the-art in all parts of the country and distributes this information to as many R/C'ers as possible. Like other hobbies--R/C could become stagnant without each experienced R/C enthusiast feeling that it is possible to do more and do it better.

Sincerely,

Ron Mackin
Florissant, Missouri

With regard to your dilemma concerning the type of material to be put into Grid Leaks, I think you should first be sure that everyone is aware of the problem. Repeat the question a number of times in Grid Leaks and ask for everyone's opinion. Then simply divide the elementary and more advanced articles in proportion to the amount of mail that you get in favor of each type.

If I were forced to step forward and be counted as in favor of one or the other, I would choose the more advanced articles. However, it hasn't been long since I asked what MOPA meant. Therefore, you can see that it wouldn't do me much good to have Grid Leaks go off the deep end on the theory and mathematics of radio. I like it just as it has been--with things such as that radio controlled cigar box, how to make sure you haven't read a capacitor upside down, and what I consider to be more advanced items such as the MarcyTone system.

Sincerely,

James H. Barnes
Indianapolis, Indiana

After reading your notes in issue 10, I am sending in my suggestions for the next ten. Please put them out on a MONTHLY basis. I live here in east Texas where there is not too much activity and there are only three outlets near here where one can purchase any radio gear locally. The only exchange of advanced ideas here is in terms of Grid Leaks and the few short columns in the regular hobby mags. I am not an expert radio man by any means but I enjoy experimenting with the various circuits presented in GL and the photos are a tremendous help in duplicating them. A lot of the material has been over my head so to speak but you don't learn about it by looking at pictures of and reading descriptions about switches, pots, relays, etc. as found in the R/C Glossary in #1. This material is available in any standard radio and electronics manual.

I have collected every radio article in all of the hobby mags for over 8 years now and there has been nothing to compare with your articles on the MaRCyTone Twin Simul tone generator of Volume I, Number 10, transistor engine control and other receiver and transmitter schematics. Please keep your--(OUR)--paper full of these actual receiver, transmitter, and modification schematics so that those of us who are not close enough to actually meet and learn from the advanced R/C'ers may do so by way of your paper.

I have had all ten issues before me as I have written this and would not part with any of them for any price and hope that in the future they may come more often and more full of actual project material.

Yours sincerely,

F. Leslie Kammerdiener
Palestine, Texas

In regard to the question of what type of articles to include in Grid Leaks, I feel that it should be a magazine for the modeler that all ready understands his basic radio theory. I feel much the same as the "old timer" that you quoted in "Grid Leaks at Play". I think that you should include information and schematics of new ideas and applications in R/C as soon as you receive them, publishing the more complete information obtained from testing etc. in later issues.

Sincerely yours,

John A. Peters
Fresno 6, California

I have anxiously awaited every issue thus far and will continue to do so whether you go "Beginner" or "pro". Being an electronic engineer, I am inclined to lean toward the "pro" side.

However, I believe the format presently used by Grid Leaks is the answer to the "pro" or "beginner" question. A specific portion, about 10-20% should be devoted to beginner articles while the remainder is devoted to more advanced articles. This would seem to strike a good balance with the percentage of beginners to pros reading the articles.

Whatever your decision, keep it up!

Joseph Loos
River Grove, Illinois

First, let me compliment you on Grid Leaks so far. Although some of the circuits are far over my head--and purse--I have a much better idea of what makes some of the things written up in the R/C columns operate. The general information is very good. Let's hope that, by the time Volume III is started, it will be monthly.

Now, to the question of beginners vs. experts. I think that a great many of us that subscribe are in the "piddler" class. Even though I am interested in radio, it is primarily a means of flying a model and making it perform approximately as I want it to. I have been modeling since about 1932 with some contest activity before and after the war. After the family started, there just wasn't enough time to stay "tuned up" and practice for the contest work. R/C has come into the picture since I quit hobby shop operation a year or so ago. At the present time, I'm waiting on the weather for a Galloping Ghost and one on Kicking Duck. Both ready to go but we have day after day of 25 to 40 mph wind out here at this season. Both of us here (just two R/C'ers) feel that Grid Leaks is, with a little of everything, a very good thing. Let's don't go to an advanced experts mag or to a beginner's mag. Keep the advanced articles and put in the articles on fun flying equipment.

Guess I've rambled enough. Thanks for the chance to put in my two cents worth. We don't often get the chance for a direct vote on a mag of this grade.

Thanks,

G. F. Gunsaullus
Guymon, Oklahoma

EDITOR'S NOTE: Do YOU agree with the foregoing letters? Let us hear from you on what you'd like to see in these pages. If you have developed a circuit or system, why not share it with other readers?

First, let me say how much I've enjoyed Grid Leaks. Please don't change your editorial policy one bit--it's perfect!

Since Phil Kraft's receiver appeared in MAN, I've built several of them--two on 27 and one on 6 meter--and all but one using the CR60 transformer. Operation has been near perfect. Lacking the materials and/or the inclination, all receivers have been built using conventional wiring rather than printed circuits. The receiver fits nicely in the same size box as the single Marcy and leaves plenty of room for relay adjustments, transistor and tube changes, etc. Incidentally, I use flea clips for transistor sockets in a non-conventional manner

The advantages of this system are these:

1. Clips heat very rapidly minimizing danger to transistor.

2. Clips provide a fine binding post for all wiring and wiring may be completed and soldered before inserting transistor.

3. Always having the clip for the base pointing 90° from the collector and emitter clips reduces danger of inserting transistor wrong.

4. Transistors may be changed quickly and easily. Merely slip lead out through slot in clip.

Very simple idea but has saved ma many transistors I'm sure.

Now back to the Kraft receiver. I stated earlier that operation has been near perfect. One trouble that has caused me some grief is that with some transistors idle current has been high and erratic without carrier on. Sometimes as high as 2½ to 3 mils causing the relay to chatter. The fix for this is to change the 4.7K resistor in the second transistor emitter to 10K. This has, in every case, brought my no carrier idle current back to 1.8 mils where it should be. Sensitivity is unchanged and relay current change is still on the order of 3 to 4 mils. Thought I would bring this to your attention in case other readers have experienced similar difficulties. Incidentally, I have been tuning my receivers with a crystal headset connected between B- and through a .005 capacitor to the collector of the second transistor.

I am also using Phil's transmitter design which appeared in April MAN. Works fine! Main advantage very low A and B drain.

I noticed in GL that you are thinking of offering a reed receiver and transmitter in kit form. Kraft has also designed a reed receiver (triple simultaneous) and transmitter which I believe is better than all commercial items available. I am presently using his 8 channel transmitter with a home built Orbit receiver on 6 meters and plan to build Kraft's receiver at the first opportunity. The 8 transmitter uses the same RF section as the single. The modulator consists of 2 transistor tone oscillators with toroid stabilization and one transistor mixer. Output is sine wave partly clipped.

Frequency stability:
60 to 140 volts - 1/2 to 1 cycle shift
70° to 140° F - 1/2 to 1 cycle shift

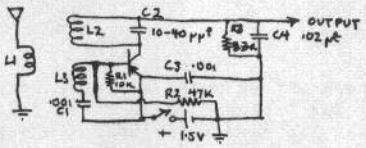
Current drain is 3 mils with both oscillators going at once.

My transmitter layout fits very nicely in a standard 6 x 10 x 3 1/2 Bud minibox complete with a normal compliment of transmitter batteries, and the whole rig comes out of the box for servicing by unscrewing the 5 nuts holding the 4 lever action switches and the on-off switch.

Sincerely,

Capt. Frank P. Jepson
Seattle, Washington

Thanks for the dope. We are very interested in seeing more data and pictures of your reed units. How about sharing them when you feel the bugs are out of it?



L1 = 2t #24 plastic covered over
L2 = 10t #30 enamel above
L3 = 14t #30 enamel all on
CTC SPC2-4L coil form

Transistor = A01, SB100, etc.
Drain at 1.5v = approximately 250 ua.

I thought you might be interested in this superregen detector I built with the object of as few parts as possible (Look, Ma, no chokes!)

None of the parts values seem to be at all critical and the circuit works very well without an antenna. However, if oscillation (hiss) is difficult to obtain, perhaps various antenna loadings or even a different transistor could be tried. Any amplifier-relay system, such as the tail end of the TR 4.5, added to this should make a very nice submini R/C set-up with as low voltage as you could ever want. (I am using it at present as a short-wave receiver--Havana, the B.B.C., and Hams from all over North America come in loud and clear!) When I designed it, I intended C3 and the battery resistance to make the quench frequency but C3's value seems entirely unimportant. Perhaps the transistor's own capacitances make the circuit work. Anyone any ideas? If your amplifier offers a DC input path less than about 50K, R3 may be left out. I would like to hear if anybody else has any success with this circuit.

Sincerely,

Hamish Robertson
Hamilton, Ontario,
Canada

I certainly appreciate the prompt attention to my problem but I should have known it would be taken care of as this seems to be characteristic of your fine organization. As to the Marcy dual--FABULOUS is the word for it! The receiver was changed to operate on six meters and works fine with exceptional range and complete stability. The complete transmitter is housed in a hand held case 12 x 7 x 4 and consists of Walt Good's WAG RF section, a 3A5 dual modulator-amplifier, Marcy's tone generators and pulsers, Al Diem's new 100 ma converter, and five of Esse Radio's 10A nicad batteries which supply power for the whole unit. Total weight is about 5½ pounds but the unit is well balanced and, since complete mobility was desired, fits the situation as expected. The plane is a Smog Hog with rudder, elevator, and proportional motor control. I'm using Tom Dion's Glass City pulse servos for both rudder and elevator and one of his motor control servos for proportional motor. CG V0.800 batteries are used and have an exceptional life for pulse. The plane was test hopped last week and with an all up weight of only 6¼ pounds flies like a dream. Control is smooth and, with the high pulse rate, completely free from gallop. No interaction has been noted in spite of the crowding of components into the case. Keep up the good work as you certainly have been instrumental in putting radio control in the hands of fliers who, a few years ago, wouldn't have dared try.

Yours sincerely,

Leo Pennington
Lincoln Park, Michigan

The Mostest For The Leastest

Dealers--take note! This is the story of an R/C boat and perhaps a lead as to how, with a bit of thought and ingenuity thrown in for good measure, sales can be extended and a satisfied customer gained as a net result.

Some months ago a chap strolled in looking for information on how to tune up the receiver and transmitter in his R/C boat. His initial purchase was made from a standard hobby shop whose owner had not taken time to make any study of R/C equipment or its working procedure. The catalog sale was made and ultimately the purchaser could not tune the equipment. He naturally sought other sources and so found his way to the local R/C center. After airing his problems, the owner was able to render some assistance in recommending a means of mounting components, tuning up the transmitter and receiver, and wound up by selling a new servo since the modeller was not even aware that a simple unit existed which would provide right, left and a stop control as well from single channel R/C gear.

The servo was the Babcock electric compound servo unit. Now the modeller was happy (temporarily) since he could operate the equipment and have fun with it. Like most people in the modelling game, this condition is not held for long since the variety of improvements that can be made are terrific. Thus, in a reasonably short time he called again and wanted to talk about multi for his boat. Like many, his ideas were rather vague but after some discussion it boiled down to the facts that he wished to stop, start, reverse, vary speed, steer, and, possibly at a later date, blow a horn or similar devices. How to do all this at a price to make the sale attractive and, at the same time, guarantee satisfaction and a happy customer is the task that faces the retailer. Here is how this particular problem was solved.

Considering that the boat now consisted of a single channel unit and a Pitman Panther motor with storage battery plus a Babcock servo unit, it seemed foolish to discard any of the existing equipment that might be retained. Thus, the salient features of the Marcy equipment held the obvious answer. Convenient size, relative ease on batteries, non-difficulty in tuning, and most of all, the fact that it is not easily upset by changes in outside capacity thus making the rig pretty easily tuned on shore without the tuning not holding after immersion in the water.

The biggest item in favor is the adaptability to additional channels without scraping the original equipment and starting all over. This, plus attractive price, could and did make an acceptable deal. In addition to the receiver and transmitter, the installation of a Babcock electric motor speed control was made, using an additional channel for this item alone. Now the system was complete. One channel operated the rudder cycling through right and left but quite rapidly. The second channel was applied to the MS control and the operation of this is practically instantaneous. Reversing or change of speed is simple and quick and makes operation a pleasure. In something like one second of time the drive motor can be run through its complete set of 8 positions--4 stop, 2 forward, and 2 reverse. Similarly, the rudder is very easy to handle with a hold position for left and a press, release, hold for right.

Let's take a look at the customized transmitter. Instead of selling a new box for the controls that had to be added, the additional push button and potentiometer were applied to the present single channel transmitter case. This provided a simple compact two channel rig that requires very little tuning and is very reliable as the results have shown. Sketch of the transmitter layout is shown at end of article.

The receiver kit was purchased as a single channel plus the additional components required for one additional channel. The two channels were packed into one plastic box measuring $1\frac{1}{2}$" x 2" x 4". The box of this size has scads of room so installation and mounting is no chore and yet it is a convenient package for installation in the boat.

The original boat layout of components and batteries was left unchanged and the only addition that had to be made was the speed control. However, the installation required complete rewiring. Problems like this, however, the average modeller find fun in doing since the results are undoubtedly worth it. The approximate layout of parts in this boat is shown, however, more than likely no two layouts will ever be exactly alike and it seems that always one can see ways to improve immediately on completion of the job.

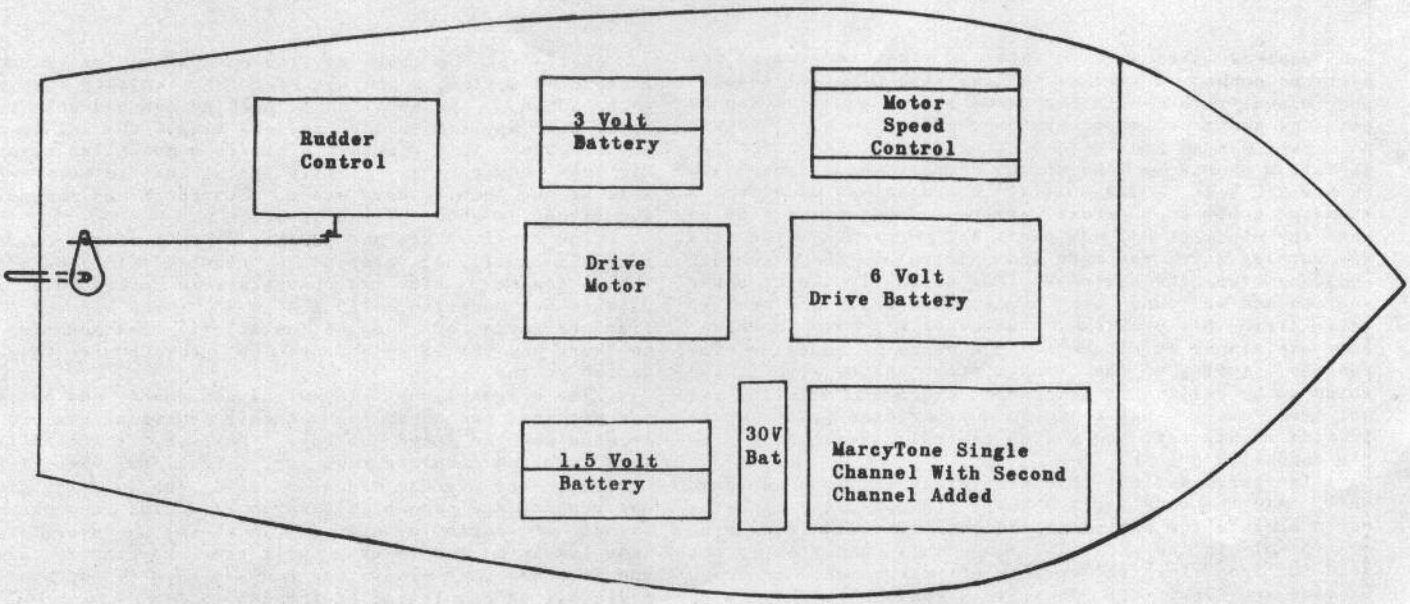
Here's a run down on the retail prices of the R/C components in the most reasonable form offered.

1 - Marcy single channel transmitter kit	$19.95
1 - Extra push button	.50
1 - Extra potentiometer	.50
Two channels for	20.95
1 - Marcy single channel receiver kit	18.95
1 - Extra 5K Gem relay	4.25
1 - Extra filter bank	2.25
1 - Extra transistor	1.50
1 - Extra .25 capacitor	.75
1 - Extra 10K resistor	.10
1 - Extra .01 capacitor to replace .001 in receiver	.20
Two channels for	28.00
1 - Babcock M. speed control	8.95
1 - Babcock boat servo	8.95
Total	17.90

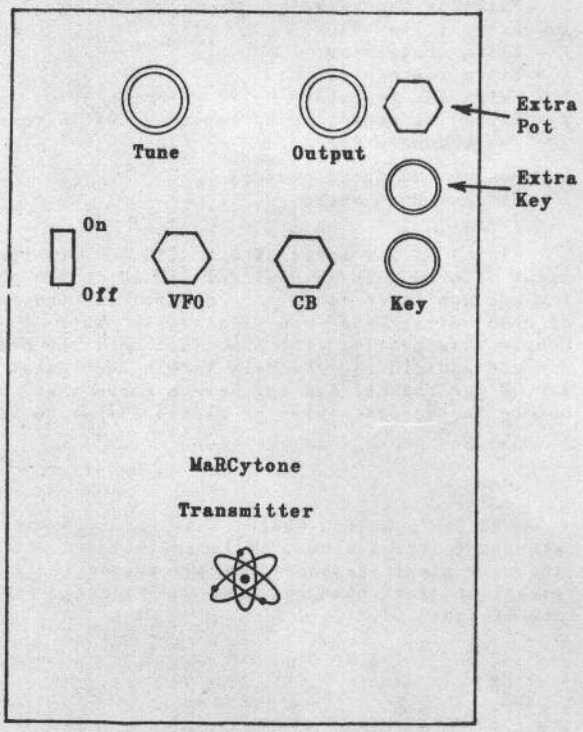
Total of all three items $66.85 or perhaps one might offer a package deal for $60.00 on the whole works. Try and duplicate this much control for the same amount of cash outlay and you will really have to scrounge. Couple this pricing to the fact that the modeller can now add additional channels to his equipment for about $10.00 per channel and now have a combo that simply cannot be beaten price-wise or flexibility-wise either.

by
Mr. A. Retailer

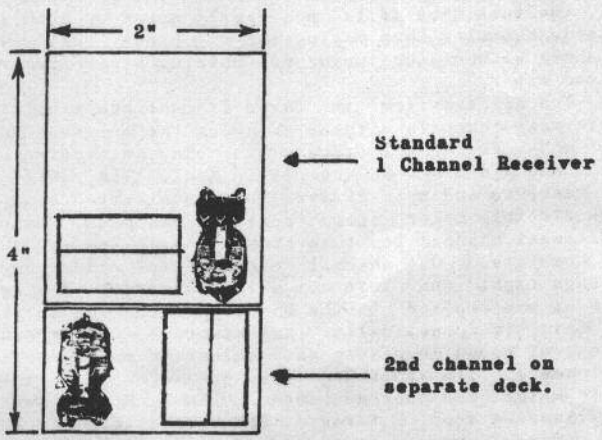
EDITOR'S NOTE: While this article may seem to be slanted to the dealers, it is included in Grid Leaks for the very simple reason that the editor feels that it is excellent for both beginner and expert, particularly, the beginner.



Above layout is the way this particular boat was set up. Because of size variations, there is a great deal of lee way in the matter of placement of parts.



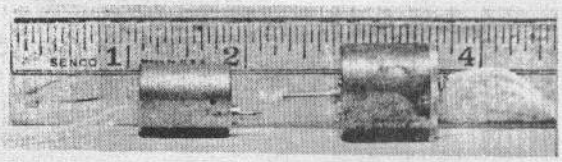
Marcytone Single Channel transmitter is quite easily converted to two channel operation by adding another pot and push button.



Adding an extra filter, relay and resistor and electre convert single channel receiver to two channel.

What's New?

MICRO MOTORS



Two small German motors have appeared in this country. They are not yet currently available on the American market. However, after trying these two particular little beauties, it is this reviewer's hope that they will be soon because we feel they will have considerable use in R/C work. They are known as the "Gnom" micro motors.

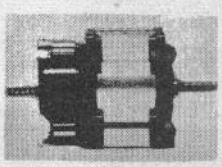
The larger of the two is the T03. It measures 25/32" in diameter and is 55/64" long. It is designed to operate at 1.5 to 3 volts and, on our tests, it was virtually impossible to stop the motor by finger pressure on the shaft on 1.5 volts because there is 59 to 1 gearing ratio built into the motor. No gearing is exposed as a glance at the photograph will show. These motors are built with precision of a fine watch and have a terrifically low drain about which you will hear more later. The T05 is the smaller of the two types measuring 19/32" in diameter and 53/64" long and is also designed to operate on 1.5 to 3 volts. The T05 has a built-in gearing ratio of 29 to 1.

The weight of the T03 is slightly under one ounce and the T05 is about .6 ounce.

Both motors were tested and showed exceptionally low drain on idling. With the motor driving only the gears, the drain was between 16 and 20 mils on 1.5 volts With the load increased to virtually a full stall, the drain only went to 120 mils which, considering the fact that many motors on the market today operate far in excess of this on idle, is pretty terrific performance.

No price has been definitely fixed on these units, however, because of their precision work, it's safe to assume that they will not be cheap since they are definitely what would be called a quality item. An educated guess would assume that the price would be somewhere about $13 or $14 on the consumer price level.

DURAMITE MOTOR

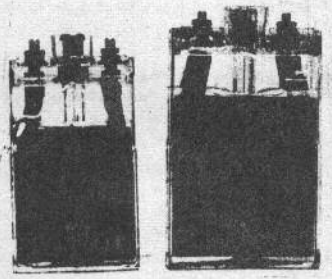


When Bonner Specialties introduced their new Duramite servo, it was around an American motor. Being a perfectionist, Howard wanted a motor upon which he could depend for long trouble-free life. The motor is the integral part of his Duramite servo but, due to the demands from the field, the motor is being made available separately to those hobbyists who have requested it. The motor is pictured above. The dimensions of the motor are 5/8" tall, 1 1/8" wide, and 1 7/8" long not counting the shaft. Complete length with shaft is 2 1/16". Weight is 1.2 ounces. Winding of the motor is 3 ohms. Voltage is 2.5 to 4. Features Oilite bearings and 93% silver brushes with nylon housing. Price is $3.95.

EVEREADY NICAD

Eveready has entered into the nickle cadmium battery field with their sealed Nicads--notably the 450 milliamp hour N46 which comes in the standard pencell AA size and weighs only slightly more. Voltage is 1.2. It is rated at 450 mils with the suggested drain of 45 mils. However, our tests indicate that quite a bit heavier drain up to 250 mils may be pulled out of the battery but that it will go down faster than it's rated 450 milliamp hour life. This is to be expected and, while it exceeds the battery specifications, it apparently does not harm the battery and will accept a charge very easily. The battery will find increasing use in R/C applications by virtue of the fact that it is readily directly replaceable where pencells are being used presently. Price of N46 is $2.95.

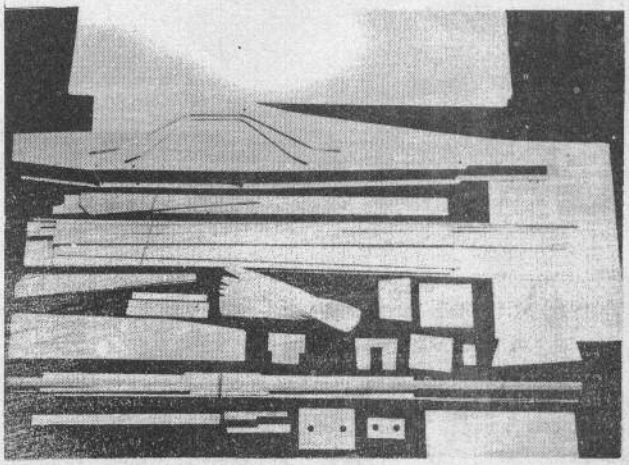
ABC NICAD



New for the nickle cadmium fan also is the announcement by the ABC Battery Company of a rechargeable life-time battery which is ideally suited for the hobbyist. Especially useful as an engine glow-plug starting battery. Other uses would be to power model boats, cars, transmitter voltage converters, and for bench power supply. The battery will supply 5 amperes of current for one hour or one ampere for five hours etc. It will do this almost without regard to the temperature at which the battery is being used. Thus, in freezing weather and below with its no droop voltage characteristics, it is far superior to a dry cell and will provide a longer hotter glow for starting. Hot weather has no effect on this battery either.

Since the ABC battery is rechargeable and almost completely maintenance free, it provides a continuous power source at an extremely low overall cost. The ABC battery may be charged from one cell of an automobile battery. Nothing else, not even a meter, is required. Recharging when used as a starting battery is usually--depending on use--only required three to six times a year. The ABC battery is supplied complete with two feet of #18 twin lead cord attached and a Kwik-Klip for engine starting. It comes charged, tested, and ready for use. The battery is available in two different sizes. #1 is 4 9/16" tall, 2 5/8" wide, and 3/4" thick. #2 is 4" tall, 2 1/8" wide and 15/16" thick. Both have a rating of 5 ampere hours. The battery is a government surplus battery. It has not been used. It is removed from surplus equipment. Original cost to the government was $33.00. ABC Battery Company is selling these units at $4.95.

BLACKWELL T-100

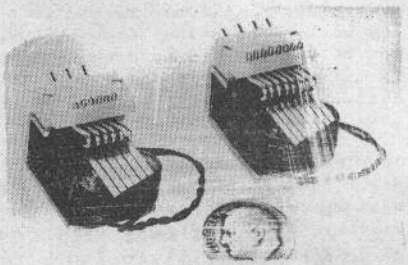


An entirely new concept in high-wing cabin design R/C model aircraft is the T-100 manufactured by Blackwell Models Manufacturing Co. of Canon City, Colorado. It offers clean lines, simplicity of construction, and dependable performance flight after flight and has already won many friends in R/C circles, particularly in the Colorado area. It is an ideal model for the beginner. The fuselage sides and cabin bulkheads are factory assembled. The advanced R/C modeller will also find the T-100 excellent for proportional control or full house systems. Wing area is sufficient to give good performance with heavier radio installations.

Fuselage doublers of 1/16" plywood run from the nose to the rear of the cabin bulkhead. Engine mounts are of maple interlocking the front of the fuselage. Engine mounts cannot be driven into the cabin. Wing spars are full depth, cut, notched for rapid rib assembly. Leading edges are full 3" balsa planking. Wing ribs are capstripped, all features for a rugged wing structure built to withstand abuse.

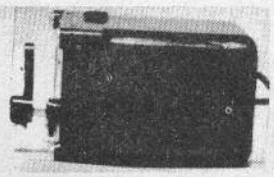
The span is 54", has a wing area of 535 square inches. It is designed for engines of .15 to .19 displacement. The average wing loading is estimated at 14 ounces per square foot. Designed for rudder only, for intermediate, for proportional control, for full house systems. The T-100 is priced at what can be considered a very reasonable price at only $9.95. An inspection of the kit revealed that this is some of the prettiest balsa that we have seen in any kit available at any price on the American market.

MIN-X REEDS



Min-X has introduced their reeds and they are currently being stocked by many hobby shops in the channel high impedance job for which there is the greatest demand. These are very small units, measuring 3/4" wide x 1 1/2" long x 7/8" tall. The reeds themselves are highly polished and the unit is well-made. The 8 channel high-impedance job is at $19.50. On special order from Min-X Radio, Incorporated, 6555 Oakland Avenue, Detroit 2, Michigan, will be the 6 channel, 10 channel, and 12 channel reed banks in almost any impedance coil desired. These will be available on special order only.

NEW FROM MODEL PLASTIC



Throttle control servo by Model Plastic Products, who are the manufacturers of Hillcrest battery boxes, is a compact motor driven job completely encased in plastic weighing 1½ ounces. Operates on 4.5 volts with idling at 500 mils on 3 volts and current is doubled when output arm is held from turning. It uses nylon and metal gears combined and is dust protected. It measures 2 1/8" x 1 3/8" x 1 3/16". Unusual feature is a spring-loaded disc clutch which lets you control engine speed manually without turning on your receiver and transmitter. This offers considerable advantage since you flick the throttle to low speed immediately after starting the engine without having to go through the radio to do it. This unit may be used on Veco, K & B throttles or on RotoValves. $5.95. For multi receivers

Another new product from Model Plastics is their aileron bell cranks. These come packaged a pair in a cello pack and sell for 45¢ per pair. With ailerons seeing increasing use in R/C, these will be found ideal for the coupling on them. Made of tough, unbreakable nylon.

NEW FROM COBB

Cobb Hobby, adding to their line of servos, is ready to introduce the new Micro Multi Channel Servo available soon with the following specifications. Weight is 2.1 ounces, size is 1 1/4" x 2 1/2" x 1 1/2" high. Voltage is from 1.2 to 4.5. Current used at 3 volts is said to be at 80 mils with no load--with one pound load 160 mils--at full stall 360 mils. Develops a maximum power of 4½ pounds of pull. Single unit housing, tough molded plastic, no screws or adjustments necessary, it is completely vibration proof and will sell for $8.95.

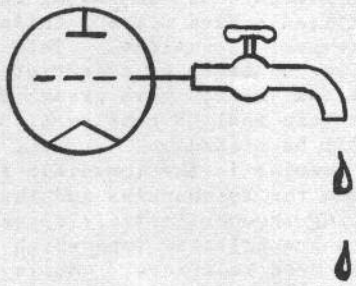
From Cobb also comes word that their Micro-Dyne gear motor with the same specifications as above with 6 to 1 and 36 to 1 ratios will be available by the time you read this. Uses the motor as shown in the picture with slightly a different case. Many of the boys are using this motor for proportional actuating of the rudder or elevator since enough thrust is developed. Price is $2.95.

SPECTRA STRIP AND SPIRAL WRAP

A unique type of hookup wire has appeared on the American market called Spectra Strip. This consists of 10 strands of #24 flexible wire fastened together in a flat strip about 1/2" wide with each wire in a covering of a different color. You can peel off any number of strands you desire just as electrical zip cord can be separated. Spectra Strip colors are arranged in the same code as used for resistors and the material will go a long way in cleaning up wiring in models and transmitters or even larger receivers. Model railroad fans will find an increasing use for this wire as well. The price is a very reasonable 20¢ per foot.

Companion to the foregoing is Spiral Wrap which is a plastic spiral strip which is intended to be wrapped around existing installations. Inside diameter is 3/16" which is expandable to much greater than this so that virtually any numbers of wire can be laced. It is available on a "per foot" basis and retails for 15¢ per foot.

Grid Leaks At Play



Effective November 15, 1959, under docket #12902 of the Federal Communications Commission, part 19.71 of the Citizen's Radio Service goes into effect. This is, in effect, an amendment which adds several things which are vital to all who are currentiy in radio control and others who hope to get into radio control after November 15.

This provides that transmitter kits, with an exception which will be noted, operating in Class C (radio control) and Class D (two-way voice communications) must be tuned by or under the immediate supervision and responsibility of a person holding a first or second class commercial radio operator's license and that such person shall be responsible for the proper functioning of the station equipment at the conclusion of such adjustments or tests.

There is one notable exception listed in the amendment to Part 19 and that is that no commercial radio operator's license is required to be held by the person performing transmitter adjustments or tests during or coincident with installation, servicing, or maintenance of such equipment provided that there is compliance with all of the following conditions: "1. The transmitting equipment shall be crystal controlled with a crystal capable of maintaining the station frequency within the prescribed tolerance; 2. The transmitting equipment shall have been either factory-assembled or provided in kit form by a manufacturer who provided all components together with full and detailed instructions for their assembly by non-factory personnel; 3. The frequency determining elements of the transmitter--including the crystal and all other components of the crystal oscillator circuit, shall have been pre-assembled by the manufacturer, pre-tuned to a specific frequency, and sealed by the manufacturer so that replacement of any component or any adjustment which might cause off-frequency operation cannot be made without breaking such seal and thereby voiding the certification of the manufacturer required by this paragraph; 4. The transmitting equipment shall have been so designed that none of the transmitter adjustments or tests normally performed during or coincident with the installation, servicing, or maintenance of the station, or during the normal rendition of the station or during the final assembly of the partially-assembled kits may be expected to result in off-frequency operation; 5. The manufacturer of the transmitting equipment or the kit from which the transmitting equipment is assembled shall have certified in writing to the purchaser of the equipment that the equipment has been designed, manufactured, and furnished in accordance with the specifications in the foregoing paragraphs."

Very definitely, transmitters that are built from scratch will be required to be checked and tuned by or under the supervision of someone holding a commercial radio operator's license after November 15, 1959. All transmitters that are built from kits become the responsibility of the builder who, in turn, must have these tuned up by someone holding a commercial operator's license. There was some interpretation of this portion of the docket which stated that there might be some relaxation of this rule but the latest information from the AMA and the FCC is that the requirements as contained in the third paragraph above must ALL be met.

Dale Springsted who operates our Service Center, 837 Eastern Avenue, Schenectady, New York, holds a commercial operator's license and, according to information from him, will be set to provide this service for a nominal fee after November 15 to anyone building kits or from magazine articles. This is with the provision, however, that, when tuned by him, the units must be found to be operating on frequency.

It will also probably mean that more manufacturers who are now in the kit business, both in Class C and Class D will, at least in the RF or oscillator portion involving the crystal in any frequency, offer several versions of partially-assembled kits--sealing the frequency determining elements. In the case of audio transmitters, it is entirely likely that only the RF portion may be wired at a slight increase in cost. It will then be checked out and sealed with a certification from the manufacturer that the equipment is operating on frequency. The balance of the unit may then be built by the buyer.

We have learned that Part 19 of the Commission's rules governing the Citizen's Radio Service which was available from the Government Printing Office at 10¢ per copy and was required for Form 505 is no longer available.

It is now included in Volume VI of the FCC's rules which will be available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. in the near future at $1.25 per copy. It is still mandatory that this part of the Commission's rules MUST be read for Form 505. If you do not have a copy of Part 19, you may still file your application if you state under "Remarks" that you have ordered a copy of Volume VI from the Government Printing Office. You should also strike out that part of the certification which deals with the possession of a current copy of Part 19. The order MUST be sent to the Government Printing Office--NOT to the Federal Communications Commission.

Now, for some predictions of the changes that we feel are coming in the R/C field. Increasing interference is being reported from the two-way voice communications receivers from the Citizen's Band Class D units. This is affecting the R/C picture for the immediate future in several directions. This has resulted in a greater emphasis on audio circuits which are less bothered by a carrier signal than any CW receiver is. Audio circuits, within the past few years, have grown increasingly less complex and easier for the average R/C fan to tune than most CW receivers. That is one direction in which we believe additional emphasis will be placed.

Also, looming in the immediate future are superhets which have the ability to discriminate between the frequencies and thus are not subject to interference--either CW or audio. An interesting two-part article appeared in Model Airplane News, October and November, 1959 containing a pre-selector type which goes before your conventional receiver, the WAG TTPW receiver and reed receivers. While we have not checked it yet, this circuit shows great promise and we'll keep you posted on developments.

Another trend, we believe, will be increasing use of the technician's license so that the operators may go on 50-54 megacycles with less danger of interference than they have on 27 megacycle operation.

This issue of Grid Leaks, we believe, contains a great variety of articles to suit most tastes. At least, we hope they do! We have been most interested in the volume of your letters which have been coming in--only a small portion of which could be included in "The Readers Write" page.

As a result of numerous requests, re-runs have been made for all issues of Volume I, Numbers 1 through 10 and these are available at the price of 35¢ per copy. The higher price was made necessary since this was a much shorter press-run than a normal issue of Grid Leaks and those desiring copies should write to Grid Leaks, Higginsville, Missouri enclosing 35¢ per issue desired.

We invite your comments, we invite your articles, we invite your pictures. Grid Leaks was designed to provide an inter-change of R/C ideas for the constructors throughout the country to keep them up to date on the latest trends which are being developed in the field.

There are already articles lining up for the first issue of 1960 which will be Volume II, Number 4. This is scheduled out shortly after Christmas of this year.

See you then.

Yours very sincerely,

Paul

Paul F. Runge
GRID LEAKS

Grid Leaks

HIGGINSVILLE, MISSOURI