

GRID LEAKS

25C

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Multi-Purpose Metering System

GET MORE MILEAGE OUT OF YOUR METERS

Of the many ways of checking receivers, all seem to have disadvantages and are not foolproof with the meter limited to its range. When using a shorting plug, it can make poor contact, can become lost or just plain forgotten to be put in after checking.

With a closed circuit jack, the closing contacts may fail. With a switch across the jack, you may forget to flip the switch or it may get flipped in the launch.

Using the method shown here does away with these disadvantages and is about as foolproof as can be had. The same meter can be used for many purposes.

This method uses a low range MA meter, many of which are available on the surplus market, with a plug or phone tips which plug into matching jacks on the plane, boat, F.S.M., transmitters, or what have you. When the meter is removed the shunt resistor carries the current. Jacks can be installed for checking filament plate or actuator voltages. Jacks can be installed in all gear you own or build, no matter what current or voltage range is required by using the proper shunts or multipliers at each jack. You can afford to put in jacks to check oscillator plate, amplifier plate, and grid currents, as well as all voltages on your transmitter.

To use this system, use a low range meter, such as a 0-1 MA, (any value will do) mounted on a plug as in Figures 1 & 2. For current measurements a suitable shunt is put across each open circuit jack. Shunts can be made as shown in Grid Leaks, Vol. 1, No. 8.

For high ranges the calculated value is much too low to be measured with accuracy on an ordinary ohm meter. The shunt can be made using a multimeter with the desired range for the standard. Use a setup as in Figure 4. Calculate the value of R by Ohms Law, R equals E over I ; where R is ohms, E is volts and I is amperes. Make R slightly larger than this. As an example, suppose you want a 100 MA range (100 MA=.1 amp.) and battery is 4.5V then R is 45 ohms. Make R some value, say 50 ohms.

With the setup using a piece of wire for the shunt (calculated as per Grid Leaks or if meter resistance is unknown, any value longer than necessary), and the multimeter set to read the desired value, adjust R , starting at the full resistance end until the desired current shows on the multimeter. Then with one terminal of your test meter connected to one end of this shunt wire and the other meter terminal connected to a knife or other sharp object, pierce through the insulation of the wire starting near the end connected to the test meter terminal, moving apart until the meter reads full scale. The portion of wire from the meter terminal end

to the point where the meter reads full scale is your shunt. This is wound on a form, which may be a high value resistor. This is done with each range desired, putting a separate shunt across each jack as per Figure 3.

For the voltage checking feature, a jack is put in for each voltage you desire to check, as shown in Figure 5. The value of the multiplier is figured by Ohms Law, R equals E over I . As an example, with a 0-1 MA meter and desiring 30 volts full scale, $R = \frac{30}{.001} = 30,000$. The

right value can be obtained by using standard value resistors in series or parallel to obtain the right resistance. Or you can measure standard value (10%) resistors and pick, say a 33K resistor that is 10% low. This is done with each voltage jack installed. A suggestion, when checking battery voltages, use a fresh battery and pick the multiplier so the meter reads full scale. Then when the voltage gets down to .7 of the scale, (Which is 21V), the battery needs replacing in most receivers. On 1.5V full scale, .7 would be 1.15V, which again shows replacement is needed.

Doing this on each range you can tell at a glance if replacement is needed and all readings are near full scale which is much easier to read.

A variation of this method can be applied to reed (Naughty word, eh, Marcy?) receivers such as Orbit and Bramco or Kraft where you measure the voltage across the relay coils to set and check them, by bringing the common and hot relay connections out to jacks (or a jack and a switch as in Figure 7).

Same can be done on a Marcytone 6 channel or Twin Simul by measuring voltage across the relay coils instead of current.

As a resting place for the meter, it can be installed in the transmitter as the plate current meter or better still as the meter for the "Low Cost Antenna Meter" (Minus meter) from "Young Men", May 1956, which could easily be installed in most transmitters.

Install the jack on a small sub-panel spaced behind a hole in the panel for the meter so the meter is flush when plugged in, as in Figure 6.

With this system, the same meter can serve for all equipment you have; receiver, transmitters, F.S.M., grid dippers, etc., and you don't have to carry a multimeter in your tool box. Pulling the meter does not disable any circuit.

Adam J. Schook
2221 Racine St.
Racine, Wisconsin

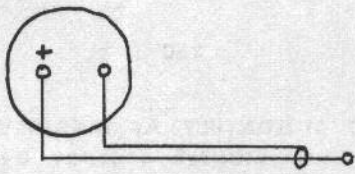


FIGURE 1

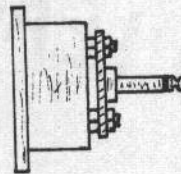


FIGURE 2

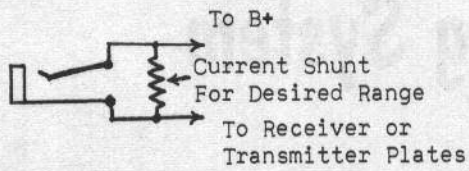


FIGURE 3

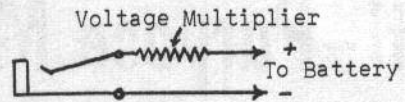


FIGURE 5

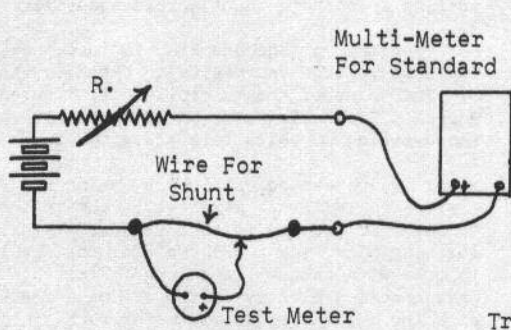


FIGURE 4

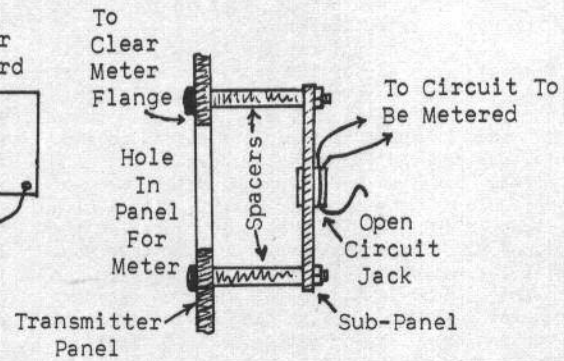


FIGURE 6

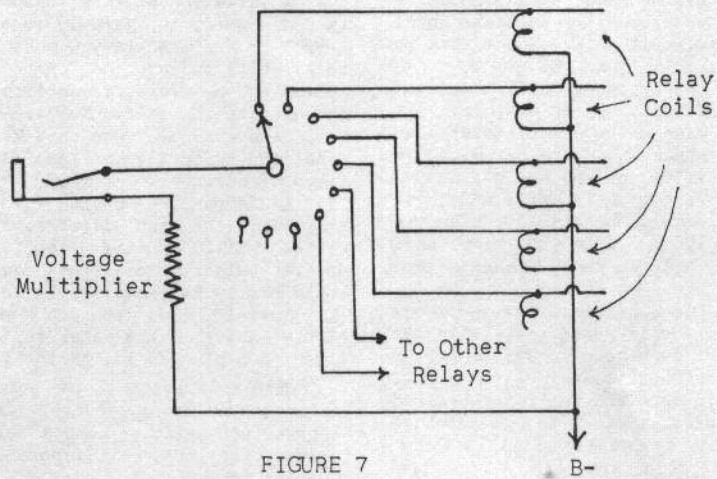


FIGURE 7

RELAYLESS - REEDLESS RECEIVER

FOR THE SERIOUS EXPERIMENTER

As mentioned in Grid Leaks at Play there are constantly new circuits arising on the R/C horizon.

Not only does there seem to be a considerable revival of interest among newcomers into R/C in the art of proportional control, but some who had tried it previously and lacked the results that they hoped to achieve, are going back into it again because of the newer systems and devices which are appearing.

Probably the most deluxe system which is currently available, is that manufactured by Space Control of California. Latest information is Min-x is working on an approach to the proportional system. Min-x is one of the larger manufacturers of reed equipment.

As a Grid Leaks "first", we're very happy to present portions of an article which was shared with us by Ray Megirian and John Hillman, of Rameco Products.

Rameco has, for some time, been making available on a separate basis their little subminiature tuned audio filters. They are hard at work to present a relayless and reedless system, which will not only be a boon to the multi fan as we now know him, but also offer great promise to the proportional fan for future applications.

Because of the tremendous interest throughout the country in this type of thing, Grid Leaks approached Ray and John for permission to present a block diagram and some of the pertinent data on this system as it was being evolved, so that the more advanced of our readers could begin experimentation on their own.

Grid Leaks has as its prime intent the sharing of advanced R/C knowledge with members of the R/C fraternity throughout the world. It goes without saying that the increase in R/C experimentation within the past year is absolutely unequalled and is not comparable to any other like stage of the R/C game during the time that we have enjoyed an examination-free R/C hobby.

With this thought in mind the circuitry is presented and the following info is being shared through the courtesy of John Hillman and Ray Megirian. We think that not only the reed boys but the proportional crowd will enjoy the following information.

This, then, is a preview of an item that may someday appear in "What's New". Publication of the circuitry does not express or imply commercial rights to anyone, except Rameco.

Here is the dope:

The new circuitry is coming along OK. We have a few units in prototype and they work well. There are still a few points that need cleaning up but so far it looks pretty good.

Even though things look good, it's going to take us a little time to get the receiver into production. The reason for this is the seriousness with which we are approaching this thing. We are dead serious about it and we want to be sure that when we go into production on it, we have a unit that works as it should. This naturally takes a lot of time testing and preparation.

The enclosed sheets show the type of circuit we are using. The proposed receiver contains two switching circuits as shown in Fig. 1, plus one combination of Fig. 2 to drive an escapement directly. These circuits are experimental.

The pulse set-up in Fig. 3 works well and, due to the integrating capacitors, (C1 & C2) does not draw high standby current. The pulse rate is 25 PPS and actually can be made higher. We ran one filter stage at better than 60 PPS.

The simplest use of this is tone, no tone or symmetrical pulsed tone for right, left and engine control respectively. More work in the future should bring it in line for a proportional set-up.

The basic receiver then has an effective 5-channel potential with possibility of proportional in the future. It can be used directly with the Transmite to obtain 3-channel operation, however.

The tone generator in Fig. 4 was developed to yield a stable tone with a good wave form which is a definite advantage with the filters.

Figs. 5, 6 and 7 are block diagrams showing general use of the relayless filter circuits.

If everything works out OK we will be coming out with:

1. A 3-channel receiver.
2. A 2-channel relayless filter block to be used with other receivers or to add 2 channels to the 3-channel.
3. A 3-tone dual-simul transmitter.

That's about it Paul. Admittedly we have big ideas but we're working hard to bring them into reality and the receiver shouldn't be too far in the offing.

If you want to use any of the Circuits for GRID LEAKS you have our permission to do so.

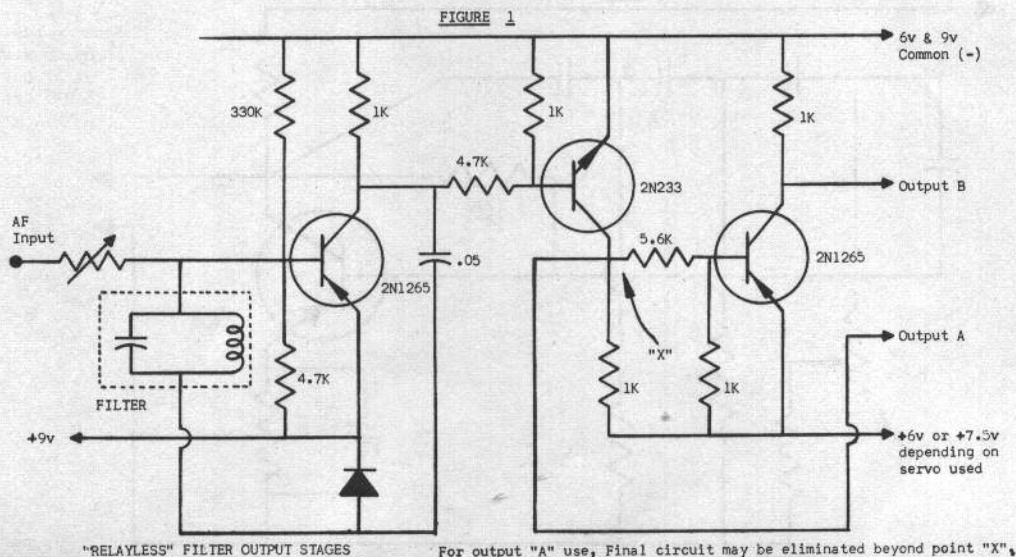
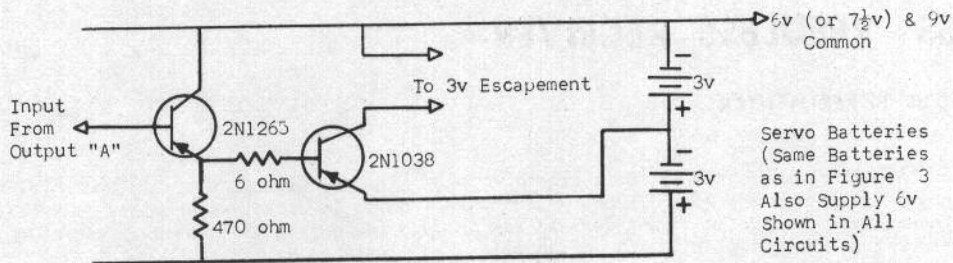


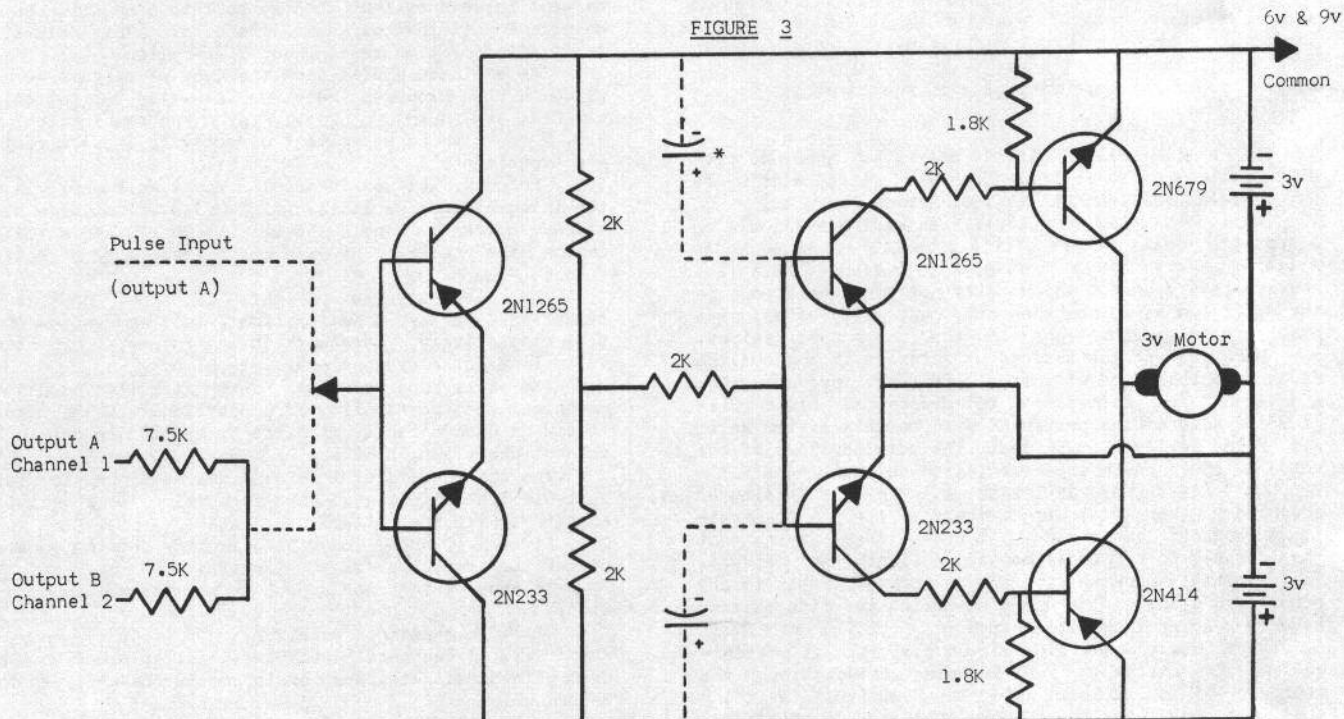
FIGURE 2



HIGH CURRENT OUTPUT STAGE. 2 AMPS. MAXIMUM

Servo Batteries
(Same Batteries
as in Figure 3
Also Supply 6v
Shown in All
Circuits)

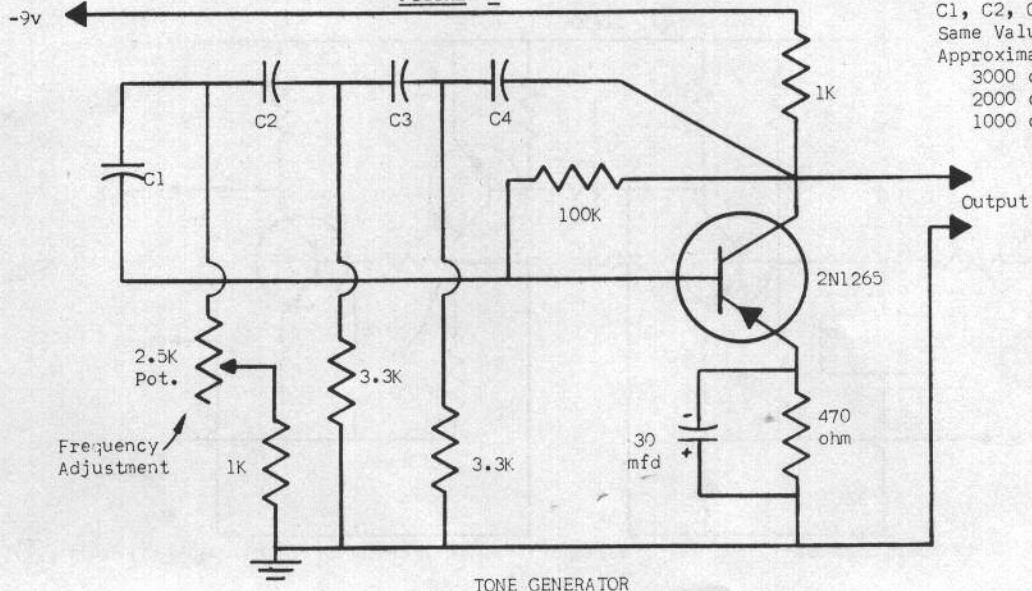
FIGURE 3



* Use for pulse operation only. 20 ufd @ 25 cps.

TYPICAL "RELAYLESS" SERVO

FIGURE 4

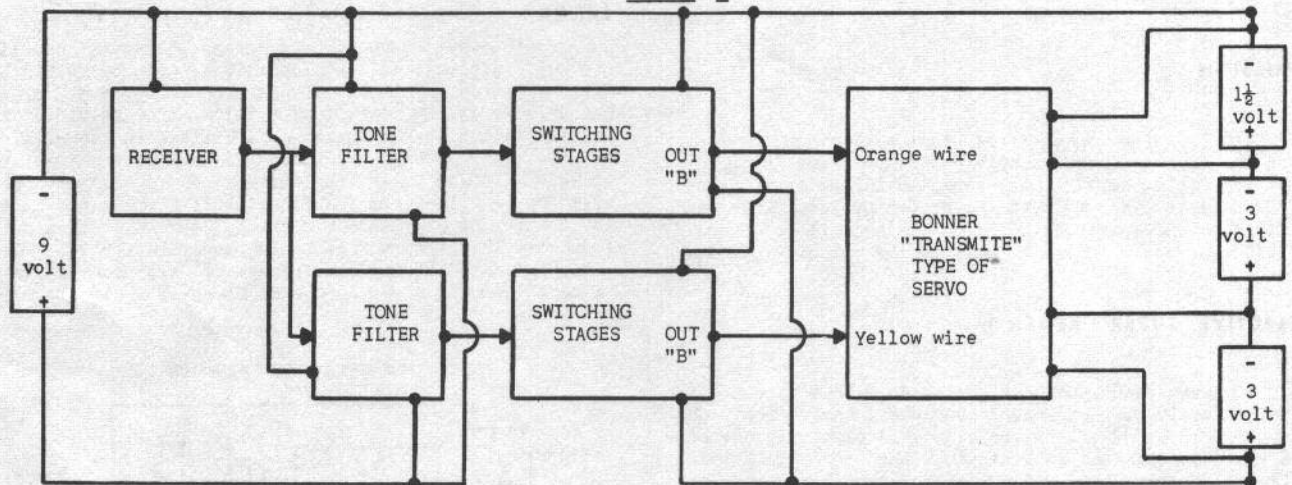


C1, C2, C3, & C4 all
Same Value.
Approximately;
3000 cps---.02mfd
2000 cps---.03mfd
1000 cps---.05mfd

TONE GENERATOR

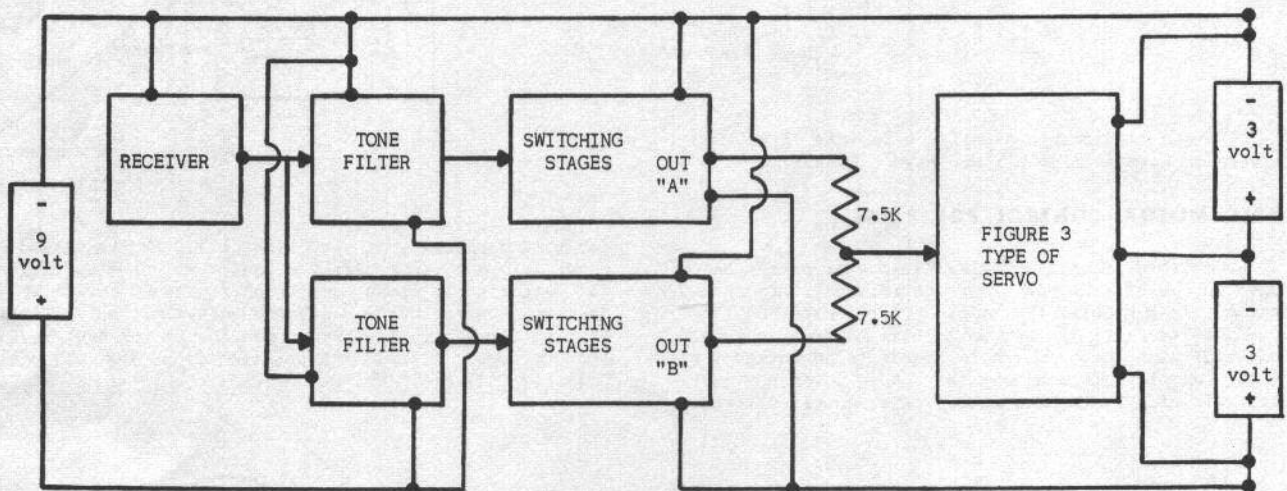
RELAYLESS - REEDLESS RECEIVER, CONTINUED

FIGURE 5



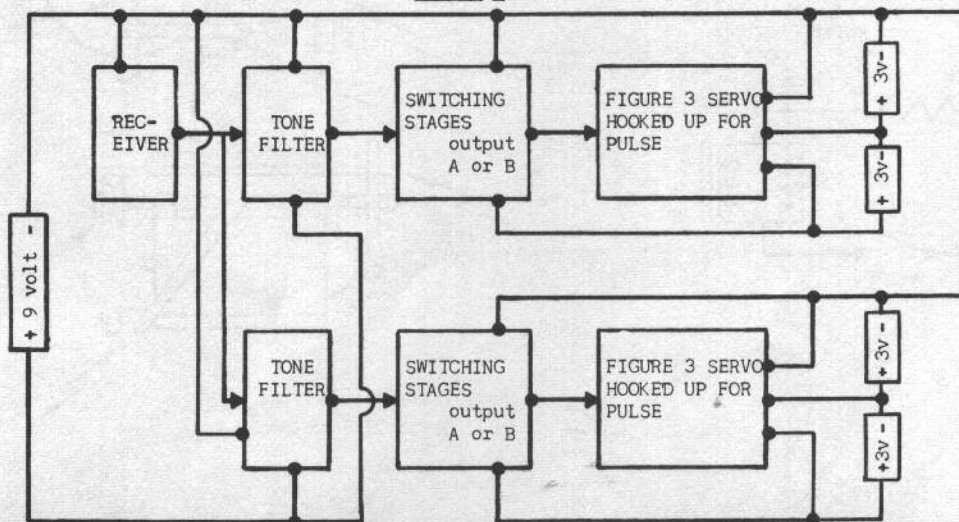
Be careful to avoid 2 inputs at once with this servo)
TYPICAL CIRCUIT USING TRANSMITE

FIGURE 6



(2 tones at once will stop this servo but not damage it)
TWO CHANNEL INPUT TO SERVO IN FIGURE 3

FIGURE 7



PULSE HOOKUP GIVING 2 COMPLETE RIGHT-LEFT FUNCTIONS (4 CHANNELS)

Separate sets of batteries may be used as shown or one set of batteries can supply both.

BITS AND PIECES

OMISSION

It is with some sorrow that we mention the fact that the vibrator power supply #3 "Synchronous Vibrator Unit for Orbit, etc." as presented in the last issue of Grid Leaks was not given the proper byline. This was written by Bill Skipper of Skip's Skip-Craft of Evans, Colorado. Sorry, Bill, we omitted the proper credit.

SELECTIVE SUPER - REGEN ?

I have read numerous articles about the Kraft single receiver, but have never heard any comments on it being in the selective class. I have only one of Kraft single out in this vicinity. When tuned to 27 1/4 it will not operate on 26.995 MC farther than three inches between antennas, and likewise when tuned to 26.995, I can fly my multi-channel Kraft rig with this job and my Kraft 10 transmitter is on 27.145.

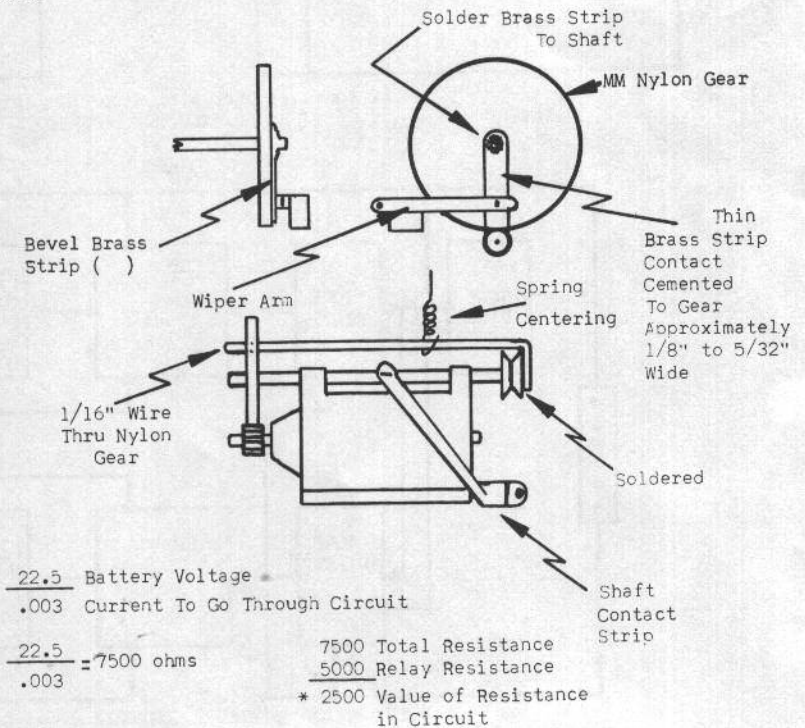
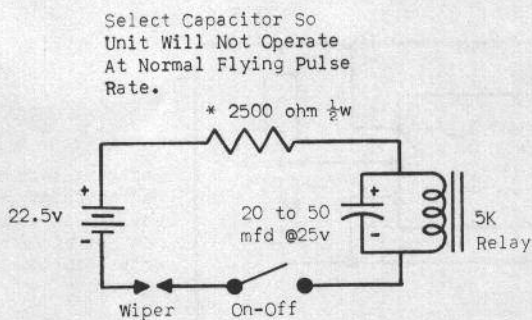
Congratulations to Kraft on the multi receivers and Kraft 10 transmitters. Real range and reliability.

Sincerely,
J. I. Kinnaman
1604 Dewey Avenue
Baker, Oregon

Any other readers had experience in this direction? We'd like to hear from you if you have. Editor.

SIMPLE MOTOR CONTROL FOR PULSE

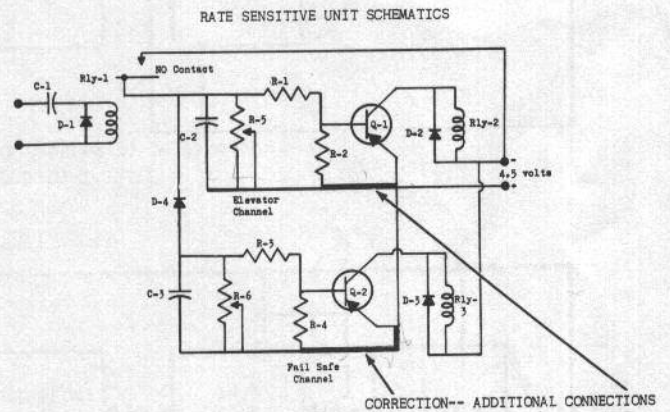
"From George Sexton and Mike Kleinpeter of the Baton Rouge club we offer a new motor control deal. As can be seen, it is a beautifully simple motor control unit for pulse outfits. It is set up to give motor change with a burst of high speed pulsing. Immediate advantage lies in the complete absence of the sudden lurch so characteristic of even the best pulse omission circuits used



ERROR !

In the last issue of Grid Leaks there was an article of interest to the proportional fan by Melvin L. Hall entitled "Simple Proportional System Gives R E M". We are in receipt of a letter from Melvin stating the following: "There is a mistake in the drawing of the RSU. There should be a line from the junction of R2, R5, and C2 to the emitter of Q1. There should also be a line from the junction of R4, R6, and C3 to the emitter of Q2. I double checked the schematics but, I suppose that errors will happen regardless."

Hope this gets to the readers of Grid Leaks in time to make the best possible use of Mr. Hall's circuit.



KRAFT TRIPLE TEN TRANSMITTER

HIGHLIGHTS YOUR LETTERS ASKED FOR

Hardly had the ink had an opportunity to dry on the last issue of Grid Leaks, when it became quite apparent that a number of readers were disappointed because they apparently had hoped that the new Kraft 10 channel Triple Simultaneous transmitter would have been featured in that issue.

Quite frankly it was impossible to complete the instructions on the Kraft Triple 10 transmitter in time for as complete an inclusion in Grid Leaks as we would have liked to do. (See Grid Leaks at Play for further comments).

For the more advanced reader of Grid Leaks we are happy to present some of the highlights of the Kraft Triple 10 transmitter instruction booklet. The use of a number of photographs, line drawings, and the detailed schematic give the values that are used for the Kraft Triple Ten Transmitter. It also goes into considerable detail as to the unique features that this transmitter possesses. Study of the drawings, photographs, and the schematic will reveal these features.

The Hi-Low switch makes the use of a power converter almost unnecessary particularly from a B battery stand point. The total drain of the Kraft Triple 10 with three simultaneous tones is only 6ma at 67½ volts. With this type of drain the large size batteries used give almost shelf life.

The Kraft also has the added feature in that it may provide that extra surge of power by flicking to the high position, or a full 135 volts, in case of a mistuned receiver or an interfering signal.

The use of transistor tone generators and a transistor mixer, instead of vacuum tubes, means that the A battery is subjected to only 220 mils of filament drain which is required by the one 3A5 which is used in the MOPA section.

It will be noted that a half-frequency crystal is

used in the master oscillator which is doubled in frequency to the final output stage in the power amplifier. By doing this it eliminates the necessity for neutralization which would be required if a crystal of the desired output frequency was used in the oscillator section.

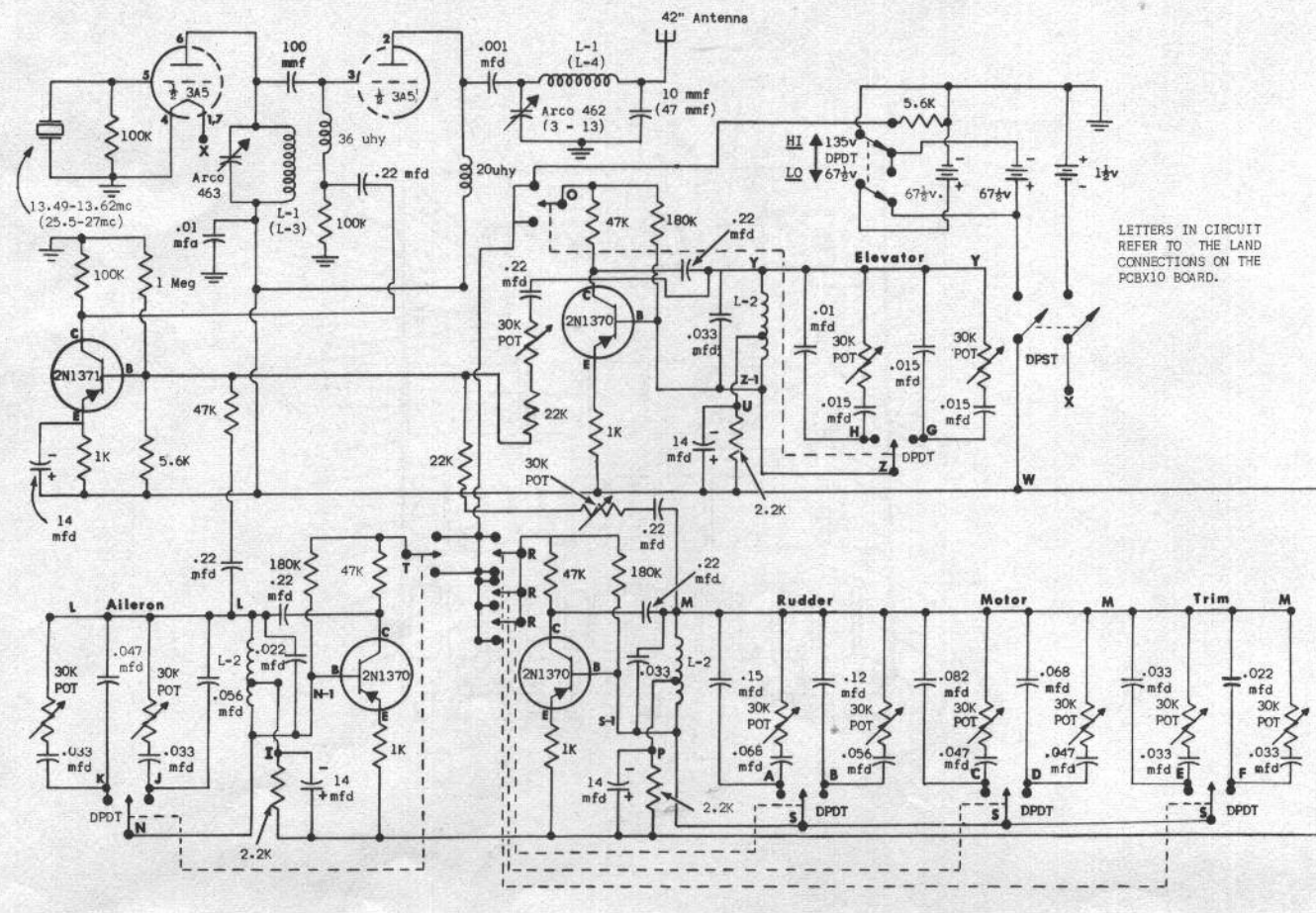
Another feature is the use of the Radiohm pots designed especially for printed circuits applications. This allows the use of a plug in deck on the transmitter without any protruding knobs or dust catching holes. Yet the use of extra pot decks means that the transmitter may be used with several different receivers with each pot deck tuned for its respective reed bank.

The circuit uses 2 Henry Toroids to provide the absolute minimum of padding. By using 10% value components in the audio section very little, if any, padding has been found necessary to date by builders of this particular unit.

The large printed circuit portion which houses the majority of the RF and AF components has phosphor bronze contacts which wipe clean on the printed circuit pot deck and provide for a unique contact arrangement of the plug in portion.

The circuit as shown is the circuit as used in Ace R/C kits and is the circuit that is used in the finished product manufactured by Ecktronic. Ace R/C is the manufacturer licensed to manufacture the kits while Ecktronics is the licensed manufacturer to make the completed units, by agreement with the designer of the units Phil Kraft.

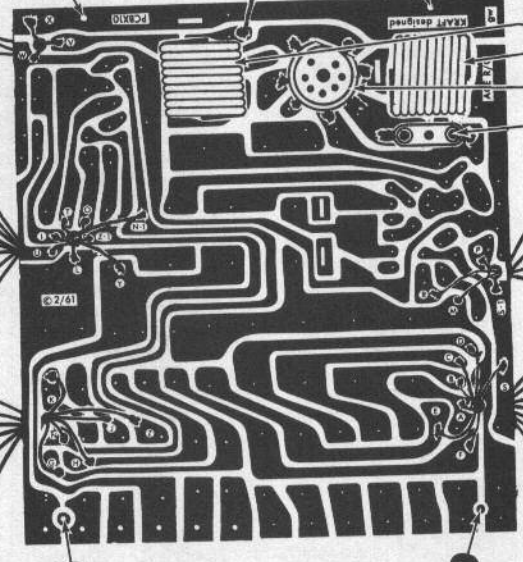
While the material, as presented in this issue of Grid Leaks, is not a do it yourself article, and it is not intended to be, it does give the more advanced reader an insight of this circuit, and will allow him to proceed on his own should he choose to duplicate the construction of this unit.



Glue 2 #4 metal washers temporarily to each hole below, making sure the washers and holes line up.

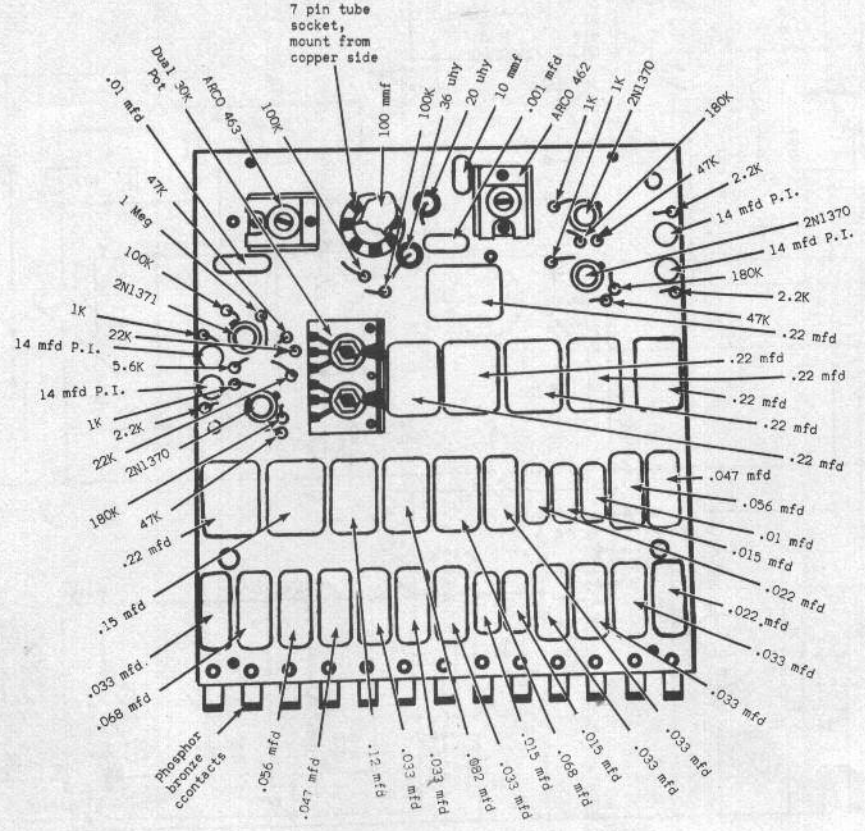
From Coil L-1 and 10mfd cap. to Antenna Lug. ()

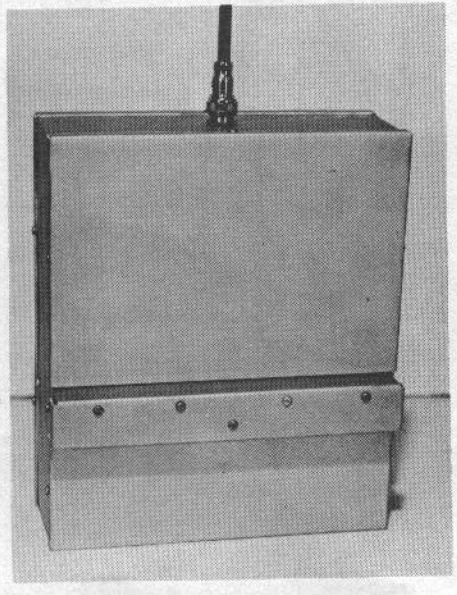
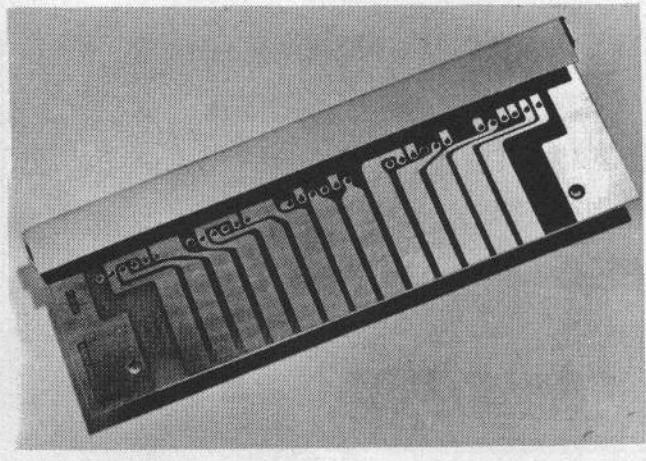
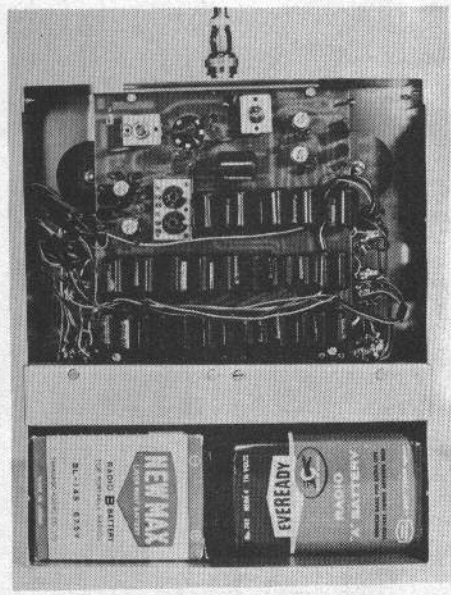
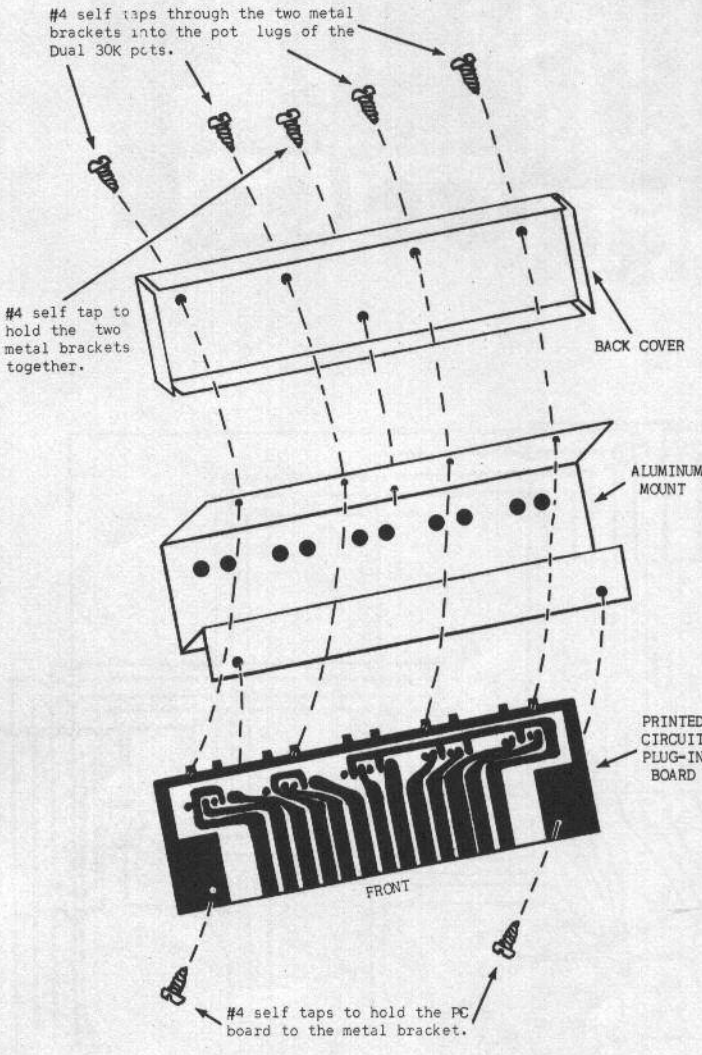
- 70. () Black Wire (7 in.) Land "X" to STD ()
- 71. () Yellow Wire (6 in.) Land "V" to S8B ()
- 72. () Red Wire (6 in.) Land "W" to S8A ()
- 73. () Cut Black Wire Toroid #3 to 6" and Solder to Land "N-1".
- 74. () Cut Black Wire Toroid #2 to 6" and Solder to Land "Z-1".
- 75. () Cut Red Wire Toroid #3 to 6" & Solder to Land "I".
- 76. () Cut Red Wire Toroid #2 to 6" & Solder to Land "U".
- 77. () Cut Orange Wire Toroid #3 to 6" and Solder to Land "L".
- 78. () Cut Orange Wire Toroid #2 to 6" and Solder to Land "Y".
- 79. () White Wire (9 in.) Land "T" to S2C ()
- 80. () Yellow Wire (3 1/2 in.) Land "O" to S5C ()
- 81. () Brown Wire (3 1/2 in.) Land "H" to S5E ()
- 82. () Green Wire (3 1/2 in.) Land "G" to S5D ()
- 83. () Blue Wire (4 1/2 in.) Land "Z" to S5F ()
- 84. () Red Wire (8 in.) Land "N" to S2D ()
- 85. () Orange Wire (10 in.) Land "K" to S2D ()
- 86. () Grey Wire (9 in.) Land "J" to S2E ()



- 87. () As You Receive L1 They are Wound to 14T, Unwind 1/2 Turn From Each End. Scrape & Tin Before Installing.
- 88. () L1 - 13T #16 3/4" ID
- 89. () L1 - 13T #16 3/4" ID
- 90. () 7 Pin PC Socket. Make Sure Pin 7 & 1 Are Soldered To Same Land. Solder Balance.
- 91. () Crystal Socket. Bend Leads to "O" And Solder Directly to the Copper Land.
- 92. () Cut Red Wire Toroid #1 to 4 1/2" & Solder to Land "P".
- 93. () Cut Orange Wire Toroid #1 to 4 1/2" and Solder to Land "M".
- 94. () Cut Black Wire Toroid #1 to 4 1/2" and Solder to Land "S-1".
- 95. () Orange Wire (3 in.) Land "R" to S1C ()
- 96. () Grey Wire (4 1/2 in.) Land "A" to S3E ()
- 97. () Purple Wire (4 1/2 in.) Land "B" to S3D ()
- 98. () Yellow Wire (8 in.) Land "E" to S5E ()
- 99. () Red Wire (8 in.) Land "F" to S5D ()
- 100. () Brown Wire (1/2 in.) Land "C" to S1E ()
- 101. () Green Wire (4 1/2 in.) Land "D" to S1D ()
- 102. () Blue Wire (4 1/2 in.) Land "S" to S1F ()

Glue 1 1/16" fibre washer temporarily to each hole above, making sure the washers and holes line up.





NEGATIVES FOR PHOTO - ETCHING PRINTED CIRCUIT BOARDS

BY JOHN G. BURDICK

The use of Kodak Photo Resist in preparing photo-etched printed circuit boards has been described by John Merrill in GL, Vol. II, No. 5, or Best of GL. The present article will describe some methods which may be used in preparing the negatives for this process.

1. Kodalith Film.--The methods detailed here involve the use of Eastman Kodak Kodalith film, a low speed process film which has wide exposure and development latitude. In practical terms, this means that Kodalith is a very "forgiving" film; exposure and development times are not too critical. It may be used with the most elementary darkroom facilities; two trays and the necessary chemicals are all that are needed. It is sold in 50 sheet boxes; 5" X 7" costs about \$7.00, 4" X 5" costs about \$5.00.

2. Photographic negatives.--The neatest and most professional-looking boards will result from the use of photocopied negatives. It is probably most convenient to have the negative made by a professional who specializes in such work; the cost should not exceed \$2.00. It is possible to make your own negative if a Speed Graphic or other camera having a focusing back is available. It is also possible to use an enlarger as a copying camera, if a negative carrier larger than the size of the finished board is available. This may be done by placing the Kodalith film in the negative carrier, after having previously focussed the enlarger and adjusted it for the desired size reduction. Arrange 2 #2 Photofloods so that the layout is evenly illuminated, and expose by turning the Photofloods on and off. Exposure is best determined experimentally; with the illumination described and a size reduction of 2:1, 2 seconds at f.8 should be somewhere near the proper exposure.

Whether the negative is commercially made or homemade, it is necessary to begin by preparing a positive layout. Since copying processes in general can reduce this layout in size during the process, the original may be prepared two or three times larger than actual size. It is not necessary with this method, (or any of the methods described here), to prepare a reverse layout, since the necessary reversal may be obtained by reversing the negative when the board is exposed.

After the parts placement has been determined, the positive layout may be made using any method which will produce a black pattern on a white surface. Painting with black poster paint on white poster cardboard will work, as will cutting the land patterns from black paper and pasting to white cardboard. Carefully clean the layout with an artgum eraser, and spray with acrylic resin or artist's fixative, if desired. This completes the positive pattern.

3. The tape positive.--Good boards may be produced by other than photocopying methods. One of these is the tape-positive.

Begin by making an actual size layout on typing paper or 1/16" ruled paper, which is simpler. While the original is being made, make one or two carbon copies, so that the original may be saved. Using as many straight lines as possible in making the layout will simplify later stages in the process.

Select a piece of clean, scratch-free single weight glass slightly larger than the film size being used. To one side of this glass apply any opaque tape. Masking tape in 3" width is suitable, as is Scotch lane-marking tape, available in rolls 3" wide and 36 yards long from industrial supply houses. If these are not available, strips of 1" plastic electrician's tape will do; be sure that no light shows between the edges. Cement one of the carbon copies to the tape with rubber cement, and cut out the pattern with a pointed modeler's knife. Since this is a positive, be sure that the tape is left where conductors are desired. After the cutting is com-

pleted and the paper pattern peeled off, wash away any excess adhesive with a cotton swab soaked in rubbing alcohol. Check again to make sure that no light shows between the edges if tape strips were used; if light does show, carefully push the edges of the tape strips together. Clean away any lint or dust that may have collected around the edges of the tape lands with a pointed modeler's knife.

The negative may now be made by placing the completed pattern, tape side down, on the emulsion of a piece of Kodalith. Kodalith should be handled in complete darkness, or with a Wratten 1A safelight. A 110 volt safelight of the inexpensive Eastman type is suitable. Expose the Kodalith through the tape positive to a dim light source, such as a 7 $\frac{1}{2}$ watt bulb which has been placed in a holder and covered with wax paper. Exposure is again best determined experimentally; an exposure of 4 seconds 4 feet from the source described might serve as a starting point. When you have found the correct exposure, note it for future reference. Over-exposed negatives may be recognized by a fuzzy appearance around the edges of the pattern; underexposed negatives will be grey and will show many "pinholes" of light in the dark portions of the negative.

After exposure, develop for four minutes in Kodak Developer D-11, or in Kodalith developer according to the instructions supplied. Fix the film for five minutes in Kodak Acid Fixing Bath, and wash for 30 minutes in running water. Hang up to dry. After the negative is dry, check for pinholes, and paint them out with Kodak Negative Opaque, or some similar material. Caution: do not use black dope, as dope is a solvent for the base material! The negative is now ready for use.

A tape positive may also be made by using narrow plastic tape and applying this directly to the glass where conductors are desired. This type of tape may be obtained from Techniques Inc., many office supply houses carry Labelon tape which is also suitable. These tapes may be obtained in varying widths. It is suggested that conductor width should not be smaller than 1/16th of an inch, however. This positive may now be used to prepare a negative in exactly the same fashion as described above.

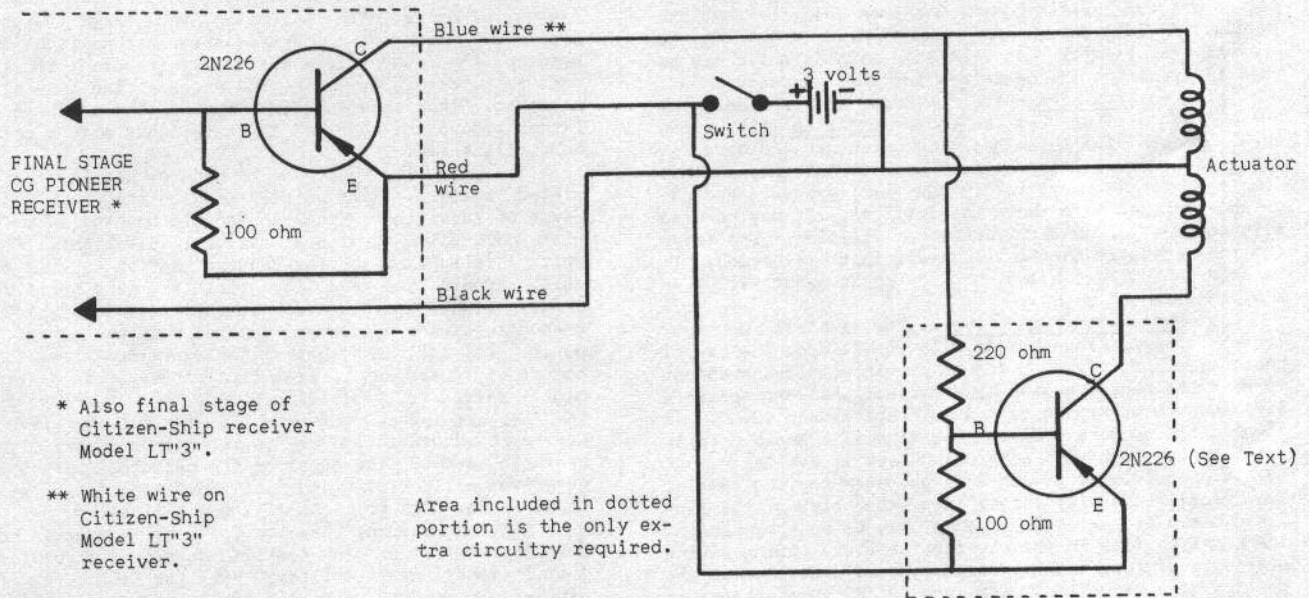
4. The painted positive.--Satisfactory negatives may also be obtained through the painted-positive method. Start with a piece of clear celluloid; this may be obtained by bleaching a piece of Kodalith in Fixer. Place this celluloid over the actual size pattern, and using a size 0 or 00 brush, paint the pattern on the celluloid with Kodak Negative Opaque. A steady hand and some brush-work talent is necessary here, but with care good positives should be made. Particular care should be taken to see that there are no pinholes or streaks in the finished positive.

5. Making the boards.--Little can be added to the Merrill article on the use of Kodak Photo Resist. The board used should be clean and free from scratches. Above all, try to avoid allowing dust to settle on the boards while they are drying. Exposure, development and etching are all perfectly straight forward if Merrill's directions are carefully followed.

Although PC board making by these methods may seem like a great deal of extra work, negative making--particularly by the tape-positive methods--can be done quickly and easily. Even where single copies are desired, the neatness and precision of photo-etching make it worth considering. Its advantages where multiple copies are desired are obvious; and where parts placement is critical or where fine detail is desired, photo-etching is the most satisfactory method of resist application available to the average builder. Try it--you'll be surprised at how easy it is, and how valuable.

USING ACTUATOR WITH RELAYLESS RECEIVERS

SIMPLE CIRCUIT SHOWS PROMISE

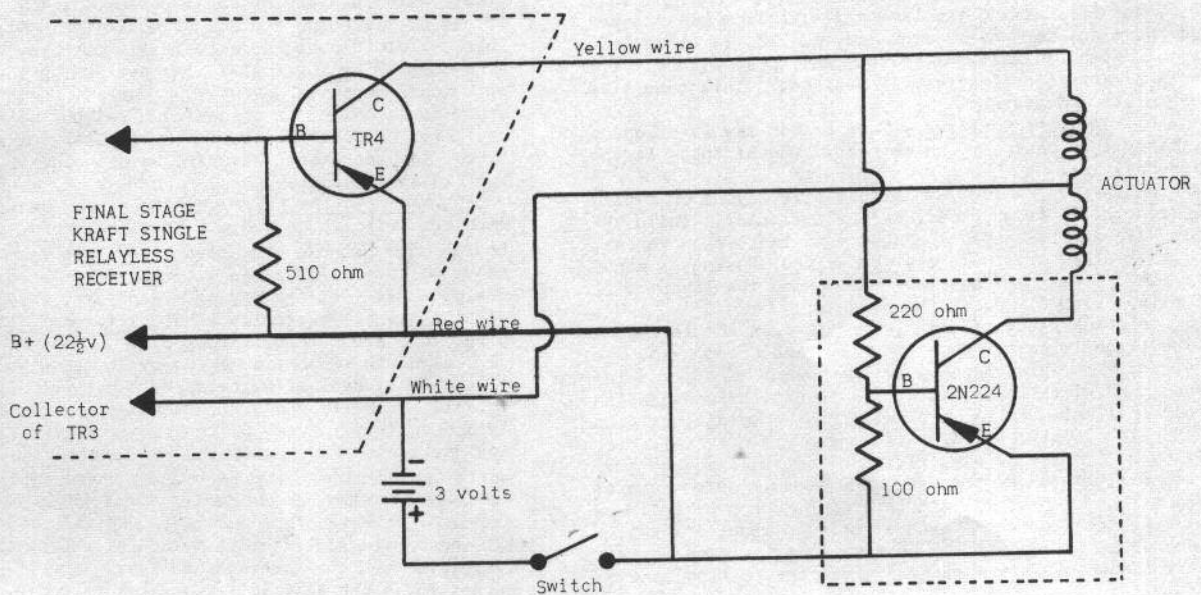


In the other day's mail came this note from Don Putz of 3416 SW 8th, Des Moines, Iowa: "I built Stan John's Septallete and the Trammel type actuator as shown in GL., Vol. 3 Number 1. Since I own a relayless receiver--CG Pioneer-- I had to improvise a bit on the installation. I wound the actuator to about 30 ohms, center tapped it, and added a duplicate of the output stage of the Pioneer on a PC board about the size of a postage stamp and cemented it on top of the actuator with sponge rubber. Entire installation comes to less than 4 ounces. See sketch enclosed."

This intrigued us and we decided to try it with two of the relayless single channel receivers we had--the LT"3" by Citizenship, and the Kraft single, shown in Model Airplane News several months ago.

The circuit at the top of the page is the one used by Don and tried by us with the LT"3". It worked well with an actuator of the type described, as well as the Sage and the Southwestern, both commercial types. Selection of the type of transistor used did not appear critical, since a 2N223 and 2N224 were used. Circuit also seemed very tolerant of resistance values used.

The Kraft relayless circuit is shown below. No PC layout is shown, since our samples were simply to determine the bench checks of the circuit. So here is an experimental circuit for the many of you who have requested it--proportional for relayless single receivers! Let us hear how your units come out.



What's New?

MIN-X POWERMASTER TONE TX.



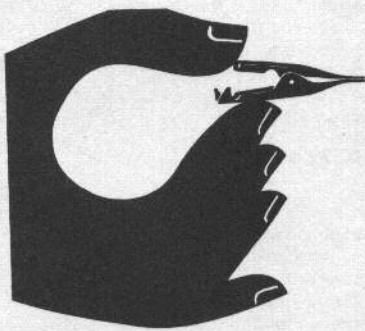
Min-x announces a new Powermaster single channel transmitter as the ideal companion for their Min-x compact and Super-hot receivers. It features dual range circuitry which saves on batteries. It is certified by Min-x to meet all the FCC requirements. Uses a transformer to modulate at 100% at 700 cycles. Uses MOPA circuit with a 3D6 tube in the final amplifier for high output with a 3A5 tube as the master oscillator and the other half as the audio tone generator. This is another unit that carries the Min-x one year warranty and is designed for tone operation only.

According to Min-x typical battery life is "A" batteries, 25 hours; "B" batteries, on low output 100 hours at 8 milliamps, on high output, 25 hours at 17 milliamps.

Unit is designed for hand held use and is housed in an anodized metal case with a removable telescoping antenna.

Price is \$32.88

MICRO - GATOR CLIP



Announcing the new Mueller micro-gator clip. This is the alligator clip you now can use where no other clip will do - on printed circuits, in tight spots and on tiny terminals too crowded formerly. Clip features - length, 1 3/32", tiny tips, only 1/32" across. Ample size knurled thumb grip for easy handling. Solder connection with clinching ears to relieve strain on wire. Comes in steel cadmium plate and the price is very reasonable considering the precision. Only 10¢ each, with-out insulator.

Insulator alone, in red or black, 10¢ each.

HURRICANE'S ROLLING

From Rob Blackwell, of Blackwell Models Manufacturing Company comes word that the Hurricane 600 at long last has rolled off the production line and is reaching hobby shops throughout the country. Says Rob: "The Hurricane has been tested and approved with radio installations ranging from single channel intermediate to 10 channel multi-control. Based on the results of flight tests, it is recommended that this model be flown by radio fliers who have had actual flight experience to the point where control of the model either single or multi-channel is semi-automatic or positive. The Hurricane is a very stable model and when correctly trimmed and balanced is in no way erratic or difficult to control. With factory routed fuselage sides, the wing and stabilizer settings will be correct and the only responsibility of the RC modeler is to see that all surfaces are true and without warp, and the balance must be exact. Any RC modeler who is capable of building structurally true models, is thoroughly familiar with power and glide trim, and who can handle fast models with confidence, will be able easily to enjoy flying the Hurricane 600."

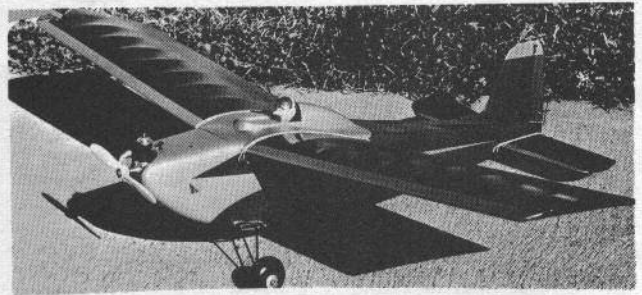
"My sincere thanks to Bud Atkinson and Max Boal of the KC/RC Club, for their valued time in conducting 10 channel multi tests at the lower altitude to evaluate performance. The co-operation, interest and help from them and several manufacturers of R/C equipment has contributed much to the success of the Hurricane 600 project." The Hurricane price has been set at \$15.95.

BLACKWELL PLASTIC CANOPY

From Blackwell also comes word that the plastic canopy as used in the Hurricane, will be available on a separate basis. Full details and dimensions are not ready-- but size will be adaptable to most present R/C planes.

Full details in next Grid Leaks, but price has been tentatively set at 80¢. Ace will accept advance orders.

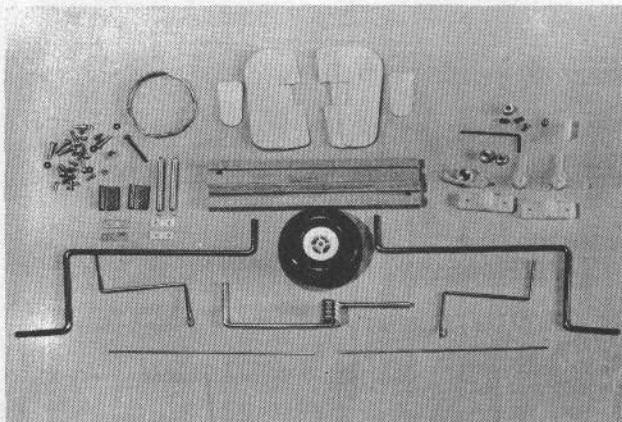
SEPTALLETTE ACTUATOR



With Stan John's Septalette appearing in a recent issue, mention was also made of a homebuilt actuator of the Trammel type. This used a bar magnet. Grid Leaks received a number of inquiries about it, as did designer John. Because of this high interest for an actuator especially it for 1/4A planes, Stan has about decided to market such a unit, built up and ready to go. Knowing Stan's ability this will be a top notch unit, excellently built to high standards. Advance orders will be accepted by Ace R/C.

According to Stan, the finished product may vary a bit from the drawing in Grid Leaks due to the final parts used, but essentially size and weight will be about the same. Price has been tentatively set for \$4.95.

TOP FLITE TRICYCLE GEAR KIT



TOP FLITE has introduced a new tricycle landing gear designed, tested and proven by Ed Kazmirski, designer of the Orion. Tested on hundreds of flights under all kinds of conditions.

Full size plans with hints and comments by Ed Kazmirski; formed 5/32" main gear with mounting blocks and die cut plywood rib doubles; adaptable to most R/C models with maintenance free steerable nose wheel; Rubber nose wheel tire with nylon hub; torsion coil shock absorbing nose wheel strut; brake assembly included; Spring steering eliminates servo shocks; designed to work on all kind of ground surfaces; includes many friction free nylon-see photo above-Easy installation, mounts on any fire wall.

Complete with all parts, fittings, nose wheel and brake assembly. (Two main wheels not included.)
 Kit No. RCN-1 \$9.95

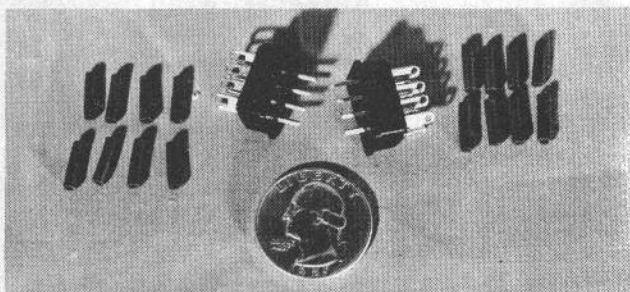
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Ready now are R/C Decals by Frank. These are top-notch, being made on the best material available for easy application. Cover hundreds of R/C installations and applications. See photo reproduction of 8 1/2 x 11" sheet -- available in black or white, depending on type of use it is to be put into. Includes words, letters and numerals as well as symbols and arrows. Price is only \$1.00 per sheet.

DEANS SUBMINI CONNECTOR



W. S. Deans Company, famous for their reed and relay units, have announced a subminiature plug and socket designed especially for R/C use. Units have eight contact plugs and sockets--smooth and tight fitting. Furnished is a miniature sleeving when units are wired to prevent any shorts. Quarter in picture shows comparative size. Up to the high standard established by Deans in the R/C industry.

Plug and socket size is 3/8" x 5/8" x 1 1/8". This is without insulated sleeving. Set is mated.

Price is only \$1.30 per set. Deans 8 prong plug and socket.

P C SOCKETS



The line of Printed Circuit sockets by Ace R/C, has been expanded and now covers three separate ones--each is designed for a specific application. In order to assist you in the selection of the one you need, consult photo above and check to see which one you need, then order by the number given below.

On the left is the PCS-1. This is a 7 pin miniature for use in transmitters of the Kraft single and four and 6 channel type. This is manufactured by Industrial Hardware and requires holes 3/32" diameter for each pin used...mica filled. Price is 25¢. Order PCS-1.

Center shows the Cinch Type and is known as stand-off type. Holes here are outside of the ring. Black colored phenolic body. 7 pin miniature type. Used in the Chapman transmitter as published in Model Airplane News--April 1961 issue. Catalog number is PCS-2. 25¢.

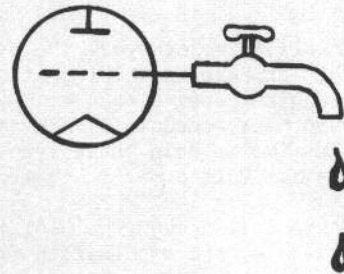
The right side shows the Methode punched hole type, it is designed to snap into a hole 5/8" in diameter. It is the type used in the Kraft Triple Ten transmitter. Is phenolic type. Catalog number is PCS-3. 25¢.

PACKAGED PLASTIC

In the works by an Oklahoma City R/Cer, is a package of self curing acrylic plastic. Comes in two bottles--one a liquid and the other a powder. When mixed according to the directions, has many practical applications for models since it can be used so many ways. Does not shrink, can be drilled, sawed, sanded or sawed. Reset stripped bolts in metal, repair broken metal or plastic parts. Kit contains powder and liquid, which is mixed with a table knife for one minute, let jell for one minute, then use. Can fill in an area, or molded. Also, powder can be sprinkled over an area previously wet with the liquid, another drop of liquid added, which is absorbed by the powder--and this is repeated until whatever you are repairing to whatever level you wish.

First unit to be marketed contains one ounce of powder and one ounce of liquid--with eye dropper and complete instructions for mixing, as well as details for use in model field. Only \$1.20 per package.

Grid Leaks At Play



Dear R/C Fan:

These lines are written last and these pages close this issue of Grid Leaks. We hope you like this issue. There is variety and material to please everyone--we hope!

The life of an editor--even of a paper as small as Grid Leaks--is an interesting one. On the whole, the letters that cross our desk are very favorable. With the last issue, however, there was a rumble of some dissatisfaction. Quite a few letters were received expressing disappointment that the Kraft Triple Ten Transmitter was not in the contents. This on top of letters that had stated "you're not giving us enough on proportional!"

It is interesting to note that interest in certain systems actually is not limited by geography--there are avid reed fans in hot proportional territory and vice versa. And so this issue contains info on reeds, proportional AND filters!

Don't interpret this as a gripe--we welcome your letters--comments both pro and con. We merely try to act as a buffer and put into each issue something of interest to all R/C fans. This is sometimes not an easy task, but we hope never to be accused of prejudice in any one direction. Our firm belief is, and has been, that growth of R/C lies in the fact that there are MANY systems providing satisfactory experiences for many different people. For us to sit at our typewriter and pontifically say this is the only way to have fun in R/C would be a mistake of the highest order. Sorta like saying everybody should wear a brown suit, because it looks good on one individual.

Which brings us to another point. R/C is one of the fastest expanding hobbies we know about. This expansion, we know, must be bewildering to those getting into the hobby for the first time. But this expansion is honestly welcomed by all in the hobby we believe. As a Data Service, we believe it is Grid Leaks' prime purpose to share, as much as possible these advances as we can. For the beginner, we can only recommend several of the books on the market for a fill in on the background of the simpler systems. There are three such now on the market, and several more are scheduled to appear. Most of your letters have encouraged GL in the exchange of experimental circuits among R/C fans throughout the world.

If you have circuits which you feel have promise, pass them along--they may help to develop the art to a greater degree. This means circuits of ANY type--reed, proportional, filter--or what have you. Ten years from now we may look back on R/C as it is today and wonder how we did as much we did with the systems currently available.

For instance, if someone were to tell you that a reed had been developed that has enough zip to operate a servo directly, that it was a magnetic lock proposition, did not require any transistor circuitry to develop the muscle to work the servoes, that would sound a bit on the fantastic side, wouldn't it? But such a reed has been developed--not for R/C yet, but knowing R/C manufacturers, it won't be long (this is relative terminology) before some enterprising R/C'er has it tacked onto his receiver to operate the servoes directly, without transistor amplifiers. And the servoes are little one inch cube with over $3\frac{1}{2}$ pounds of pull. The latter is not a dream, but is actually being flown!

In all this, however, the beginner needs to be remembered, too. And it is with a great big chunk of orchids that Grid Leaks salutes those in each club who, remembering their own struggles, seem always to have time to help those beginners just coming in. We've read and heard many accounts of how certain individuals in a number of clubs always manage to find the time to help these tyros with their, to them inexplicable, questions and get them in the air. More power to them, and may their tribe increase!

One point, though, we want to mention again even at the risk of being a bore. The spots we enjoy are examination free, but NOT license free. Everyone operating R/C MUST have a license. It's so simple to obtain, too. Simply get form 505 from your nearest FCC office, one of the R/C equipment manufacturers, fill out and mail. As with most things, there are certain rules of the game for all who enjoy R/C to abide by. These are contained in Part 19, FCC Rules and Regulations. This can be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Cost is 5¢ cash--but don't use stamps! This MUST be read before filing your application for license!

While all of this may seem involved, just read this quote from a British magazine: "We would warn all prospective R/C modellers that they must hold a special license before operating equipment, even indoors. This is quite simple to obtain from the G. P. O., and costs one pound (about \$2.80) and is valid for five years. It is illegal to use a transmitter without this license, and should one do so, prosecution may follow, and more important, the happy relationship which exists between modellers and the G. P. O. authorities will be placed in jeopardy. So BUY your license."

Compared to the foregoing, ours is a simple procedure. Let's make sure EVERYONE is licensed that operates R/C or intends to operate R/C.

Now for an abrupt change of subjects: Bobbie and I attended the AMA-DC/RC Symposium in Washington, D. C., in May. For the second batch of orchids this issue, we'd like to pass them out in profusion to Maynard Hill, chairman of this event, and all of his co-hosts who helped make the event possible.

Attendance was high, and the quality of the Technical papers was excellent. For a list of the topics and speakers see last issue of Grid Leaks.

The Applied Physics Laboratory of Johns Hopkins University was a wonderful place to hold such a meeting, and with the audio-visual devices used--slides, movies, opaque projector, and a closed circuit TV camera and monitor, gave the speakers the best opportunity to present their material on a level not achieved in most meetings of this type.

Extra copies of the papers presented may be had from the Academy of Model Aeronautics, 1025 Connecticut Avenue, N. W., Washington, D. C., for \$3.00. Not only is there a lot of meat in the papers, but they include a very comprehensive index of R/C articles in the three major model magazines since 1955. This includes not only feature articles but also many of the bit pieces that have appeared in the R/C columns.

The flight demonstrations held at the lunch break at the APL were done by Zel Ritchie, Howard McEntee and Don Brown. Zel flew the Space Control Quadruple proportional system, Howard a version of the Kickin' Duck proportional system, Don the WAG TTPW using his own actuators--which may be marketed soon. Ritchie demonstrated also the nose wheel brake system to be marketed by Space Control by taxiing on the roadway in front of the lab, McEntee did some low passes intentionally for some of the movie cameramen in the crowd, and Don Brown added thrills by making low, low, low inverted passes across the field with perfect timing and precision. More flights were scheduled for Sunday, but we had to board our TWA plane to get back to Missouri in time to work on this issue of GL and other assorted items.

Not the least advantage of one of these affairs is the innumerable rag chewing sessions that take place informally. We were delighted to see so many old friends and to meet so many new ones. Also had the opportunity to have a look at many experimental systems which we hope to share with Grid Leaks readers in coming issues.

In between sessions, the exhibition room was full with participants in the symposium wandering from table to table to ask and to look. Exhibits ranged from airplanes, to control systems, to reed receivers, to proportional systems, to actuators, quadruple proportional outfits. You name it, it was there. So were the opinions!

In order not to leave out any names of those with whom we chatted at various and sundry times, we'll simply leave out ALL NAMES. Memories of an affair of this kind are at best very kaleidoscopic, and unless you've taken full notes you're apt to forget many with whom you shared an opinion or controversy. This means, of course, only names of those who were visitors there same as we were.

After the banquet on Saturday evening the speaker scheduled to appear, unfortunately, had had to make a change of plans. The change, we feel, resulted in one of the high spots of the day. We probably would have enjoyed the featured scheduled speaker as well, but the change was above average for a type of thing which is a last-minute thing, and generally has the program chairman tearing his hair.

One of the features of the change was an informal bit by Walt Good on the early days of radio control. Walt's recollection went to 1936, when the first R/C event was held at a NATS. This was in Detroit. In those days there were no rules, as such, and no one had even figured much on what an R/C plane was supposed to do, except to fly under remote control conditions.

In 1937, again in Detroit, more entries appeared. Nine foot ships were common, with some entries going up to 12 feet. Some of the early receivers employed 3 tubes, and one of the early ideas was that any points amassed should be multiplied by the number of tubes used! These were the days, when an airplane, once successfully launched, was given a set of maneuvers to perform by the judges.

Along about this time Walt and Bill Good introduced the first super-regen hard tube receiver, which upon signal dropped current to operate the relay in "Guff" -- the ship now hanging in the Smithsonian Institute.

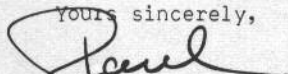
Receivers using 90 volts of B batteries were not uncommon. This in the days when 90 volts of batteries weighed almost 2 pounds! And battery manufacturers were not willing to ship out some of the miniature (not submini) jobs, until just before they were to be used because of their short life.

Along about this time, too, saw the first reed job by Leo Weiss and John Lopez. Comment then was, "Radio Control is not a one man job. To do it best, you should have plenty of time, and it would be helpful if you had a financial sponsor"!

Finally, in 1939, some rules began to emerge. Most prominent was that the aircraft should not exceed 25 pounds in weight!

Looking back on those days, R/C has come a long way. It probably has still quite a long way to go--and our considered opinion is that affairs like the AMA-DC/RC Symposium, will help it on its way.

Yours sincerely,


Paul F. Runge
Editor-Publisher

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If you have ideas you would like to share with other R/C fans throughout the world, we welcome them. All ideas are given careful consideration from the point of view of trying to help R/C by sharing experimental--and sometimes not fully developed--ideas among a growing subscription list.

If you want to insure your getting every issue of Grid

Leaks, but your dealer is out, subscriptions are available on a ten issue basis for \$2.00. Some back issues, primarily of Volume 2, are also available. Price of the back issues, however, is 35¢ per copy.

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Address all correspondence to Grid Leaks, C/O Ace R/C, Box 301, Higginsville, Missouri.

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By arrangements with Malcolm Douglass of Radio Control Equipment and Accessories, 19 Byron Drive, Rawcliffe Lane, York, England, Grid Leaks is available on a

subscription basis to arrive via first class mail through Mr. Douglass for 25/0 for the 10 issue volume. Subscription will be begun with the current issues unless otherwise specified. Direct all subscriptions for delivery in Europe to the above address.

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