GRID LEAKS

R/C DATA SERVICE

VOLUME 2 NUMBER 4

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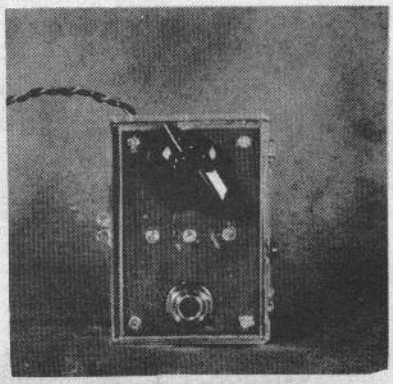
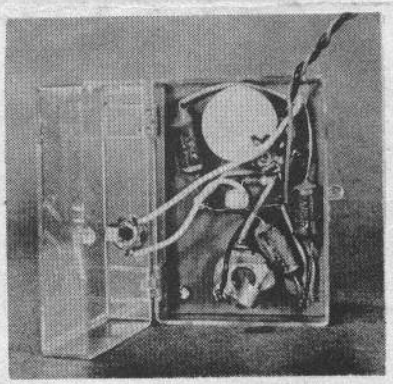
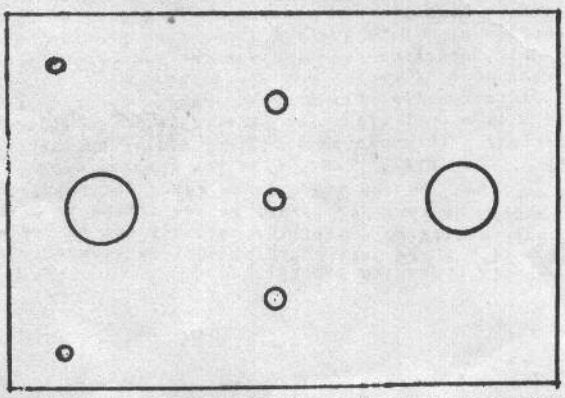
Make Your Code Practice Oscillator







FULL SIZE LAYOUT FOR LINEN BASE

Judging from the way our mail is beginning to look, more and more R/C fans are going to attempt to get their technician's license.

To do this, a knowledge of the code and an actual ability to send and receive code is required.

Nothing is quite as hard to learn--at least, it seems to us--as code out of a book. Having had experience with youth groups and finding Boy Scouts attempting to learn code by the dit-dah method, we've felt this to be a cumbersome way of learning.

By building a simple tone oscillator operated with an actual key and then listening to the sound as well as operating the key, you learn easier and retain code so that when you go for your technician's license, no great difficulty will be encountered in passing the required words per minute.

To assist in building such a code oscillator, we present a simple transistor circuit using only 4½ volts of batteries housed in a small 2" x 2 7/8" x 1" plastic case.

It features a 10K pot to help adjust the tone to the most pleasing frequency.

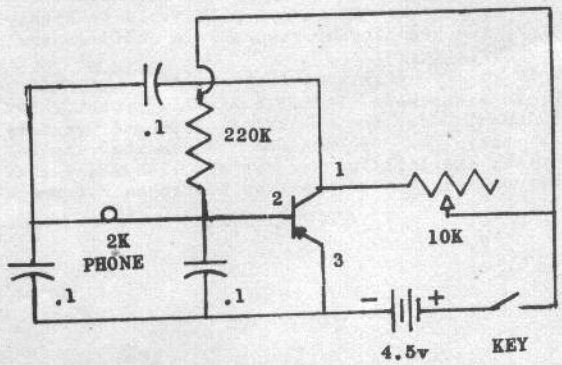
The secret of this particular circuit, since it does not use transformers, is the inductance required from the headset. Headphones of the crystal type cannot be used.

In the construction of this particular unit, it was found that we could very easily place three pencells in the bottom half of the case without any sweat, therefore, eliminating the need for external leads that are shown.

The open circuit jack which is at the top of the case provides a plug-in for the key. This may be any one of the fairly inexpensive ones available from your radio supply stores. The small tini jax at the right side of the case is intended for the headset.

Construction of this is fairly straightforward. A suggested layout is given but it may be made in a number of different ways to suit your needs with the parts at your disposal.

That's it on your code oscillator. It's inexpensive, easy to build, and will help you on your way to your technician's license.



Fly Something Simple!

OLD SONG TITLE PARODY OFFERS SAGE ADVICE

In the mail the other day, we received a very interesting letter. We quote:

"Just recently I have decided to take up radio control. I have long been a free-flight and scale modeler but have never done any radio control work before.

"In starting to look around, I find a complete nothing in good data. I don't even know where to get started. Can you help me?

"I am interested in a six channel plane of about 2" scale. Now, where do I find some data on how to build the model to incorporate radio. Such as: 1. Just what is six channel? 2. What is a servo? 3. Transmitter?? Receiver??

"Anything you can do such as suggest a good book, equipment, etc. will be sincerely appreciated."

Believe it or not, that is an actual verbatum account of the letter we received and it may surprise readers to know that this is not an isolated letter which occurs once in a while. Actually, we receive numerous requests in most every day's mail on how to get started in R/C and, invariably, these starters want to start with 6 or 8 channel equipment using full rudder, elevator, motor control and ailerons.

Our considered advice to all beginners in radio control whether they've had previous modeling experience or not is to fly something simple to begin with.

Check around with any of the experienced radio control fliers and ask them if they feel that a tyro or beginner in radio control would have much chance of succeeding with multi channel equipment from the beginning and you will find the answer to be practically zero.

We don't want to make radio control, to the beginner, a mystery but it is only in their best interest that we suggest a fly something simple approach. Actually, there is no dark mystery about it but the plain fact is that radio control is a bit fussy and, just because you have built many successful U control planes or free-flights, doesn't give you an automatic guarantee that radio control will present no problems to you at all.

There are so many new angles to radio control that even an experienced model builder will have problems. Until you learn to respect radio gear and its associated equipment, you can expect headaches. Especially is this true of the complete newcomer. Not only must he learn model plane building, engine handling, and the like, but also the radio and electrical end of the enterprise.

There are plenty of problems to master with the simplest radio control model. The best advice we can give to you is to try the most elementary radio apparatus with a simple trainer type plane. There are many excellent kits on the market which can be built by newcomers in the field and these have been engineered and designed for rudder control only. It would be highly desirable for the beginner or newcomer in radio control to start only with these.

A simple rudder only installation with the rudder operated by an escapement is the easiest approach. The escapement should be the so-called compound variety which means that you do not need to remember any sequence of right and left but you can get either any time you want by punching the transmitter button once for one direction and twice for the other.

Beside the escapement, you will need a receiver and transmitter. Whether you should build from a kit or buy one ready to fly out of the box, again, is up to you. Suffice it to say that many fliers build their own equipment from kits which are available. Others depend on "out of the box" operation and don't particularly care how the equipment performs. Again, if you've had some electronic experience, there are many excellent kits available from a number of manufacturers which can be put together with a minimum of fuss and feathers and, by constructing a kit, the builder will have some knowledge of why a possible malfunction later on happens.

It is a good idea to check with the owner of the hobby shop from whom you make most of your purchases to see what he would recommend. Check also with R/C fliers in your vicinity for units which they have found to give them the least trouble.

It is also a good idea to attend R/C meets in your locality, watch the flying, pay particular attention to the installation of the simpler type of equipment and be guided by this.

So, for your initial attempt, it should be an escapement operated, rudder only type of plane.

If you are in an area in which proportional control is in favor, then, only, would we recommend the use of proportional control actuator. For this use, a pulser must also be used at the transmitter in place of the push button key. Proportional flying is generally done by substituting an electronic thumb in place of the key of the transmitter to send a series of coded signals which are decoded by the actuator in the plane to give you left and right rudder. Under no circumstances, would we recommend rudder and elevator for the Simpl-Simul type of operation for a beginner until you've had some experience in getting the plane into the air.

Okay, so you've flown for some time. Where do you go next? We believe most experts will advise that motor control be added. This is very simple to do with the compound escapements since it requires the addition of a throttle type of engine with another escapement which feeds off the auxiliary contacts of the compound escapements. You have used, up to now, only two punches on the key. This will require three punches or a quick blip. Please check the instructions furnished with your compound escapement.

We won't go into details for engine control systems except to say that the engine control can be obtained by linkage from escapement to engine or by tubing connections. Both systems work fine provided they are properly installed and the one for you probably depends on what sort of engine you are using.

After you've flown with engine control for some time, then, it might be advisable to consider adding elevator. This can be done by adding another escapement. This will, then, give you rudder, elevator, and engine. But, by the time you're ready for this, you are no longer the type of person we are trying to give some friendly advice to. For the ultimate fun in radio control, if you are just starting out, we earnestly advise you to FLY SOMETHING SIMPLE!

Kraft PC Audio Transmitter

We present the printed circuit board showing the parts layout for this little jewel of a transmitter.

A check of the schematic shows that the same high low features are used. That is, the transmitter may be operated on 67½ or 135 volts. With checks against some commercially available transmitters, this little unit was found to have favorable output on 67½ while others were operating on 135 volts.

This article is presented toward the serious home constructer. We must point up, however, that tuning of this particular unit, under docket #12902, must be done by someone holding a commercial operator's license. No tuning instructions will be given since they should be familiar with tuning a straightforward MOPA circuit which this unit uses.

No special construction techniques are necessary. The completed unit is housed in a small metal cabinet 3" x 5½" x 8" which is adequate for the two 67½ volt 467 batteries and one type 4F 1½ volt A battery. This, with an on-off switch and a high-low switch and a key completes the construction. The parts list is given to facilitate those of you who will want to build this unit. The modulator is very tone stable and will provide a cps of 400 cycles audio tone. The carrier remains on constantly.

The unit is so designed that a fixed 10 mmf capacitor may be used in place of the variable in the pi loading network. This is done so that the crystal is not pulled off frequency. This is done only if a 54" antenna is used which is highly recommended because it has approximately 30% more output with a 54" antenna than with a 37".

If an antenna of a different length is used, it will probably be necessary to put a variable 4-30 in the spot provided. The trimmer is mounted at holes 8 and 9. One special tip is given--all components are mounted on the glass side, away from the coil side, with the exception of the 100 mmf coupling condenser which goes to holes 10 and 11 and is wired in on the copper side.

M goes to key. W goes to B+ on DPST on-off switch. R goes to the low switch. AA is A+ and goes to other side of DPST on-off switch.

Good luck with your Kraft! We will present a revised version of the Kraft receiver as revised by Phil Kraft himself for a designer-approved receiver in the next issue of Grid Leaks. This one has been found to be even more stable, will follow the fastest pulsing, and is more sensitive than the present receiver.

SPECIFICATIONS

	67.5 V.	135 V.
Carrier	5.6 ma	14.5 ma
Modulator	.5 ma	1.4 ma
Total	6.1 ma	15.9 ma
Modulation %	100%	96%
Tone Frequency	400 cps + 60 - 90 cps at 140° F.	400 cps ± 3 cps at 70° F.
RF Frequency	Within crystal tolerance	Within crystal tolerance

PARTS LIST

CAPACITORS

1 4-30 mmf ceramic trimmer capacitor (2 required if variable PI loading is desired)
1 7-45 mmf ceramic trimmer capacitor
1 .01 Disc ceramic capacitor
1 100 mmf disc ceramic capacitor
1 .001 mf disc ceramic capacitor
1 10 mmf disc ceramic capacitor (for fixed loading with specified antenna)
2 .01 capacitors ± 10% tubular 200 V.
2 .1 capacitors ± 10% tubular 200 V.

RESISTORS

3	100K resistors ½ watt 10%	brown, black, yellow
2	470K resistors ½ watt 10%	yellow, purple, yellow
1	330K resistor ½ watt 10%	orange, orange, yellow
2	10K resistors ½ watt 10%	brown, black, orange
1	1K resistor ½ watt 10%	brown, black, red

TUBES

1 3A5 tube

CHOKES

1 40 uh RFC
1 20 uh RFC

COILS

2 L1 tank coils 13T #16 enameled close wound 3/4" I.D.

CRYSTAL

1 13.6275 mc (for 27.255 mc)

TRANSISTOR

2 2N224 Philco

SWITCHES

1 Push button switch
1 DPDT toggle switch
1 DPST toggle switch

SOCKETS

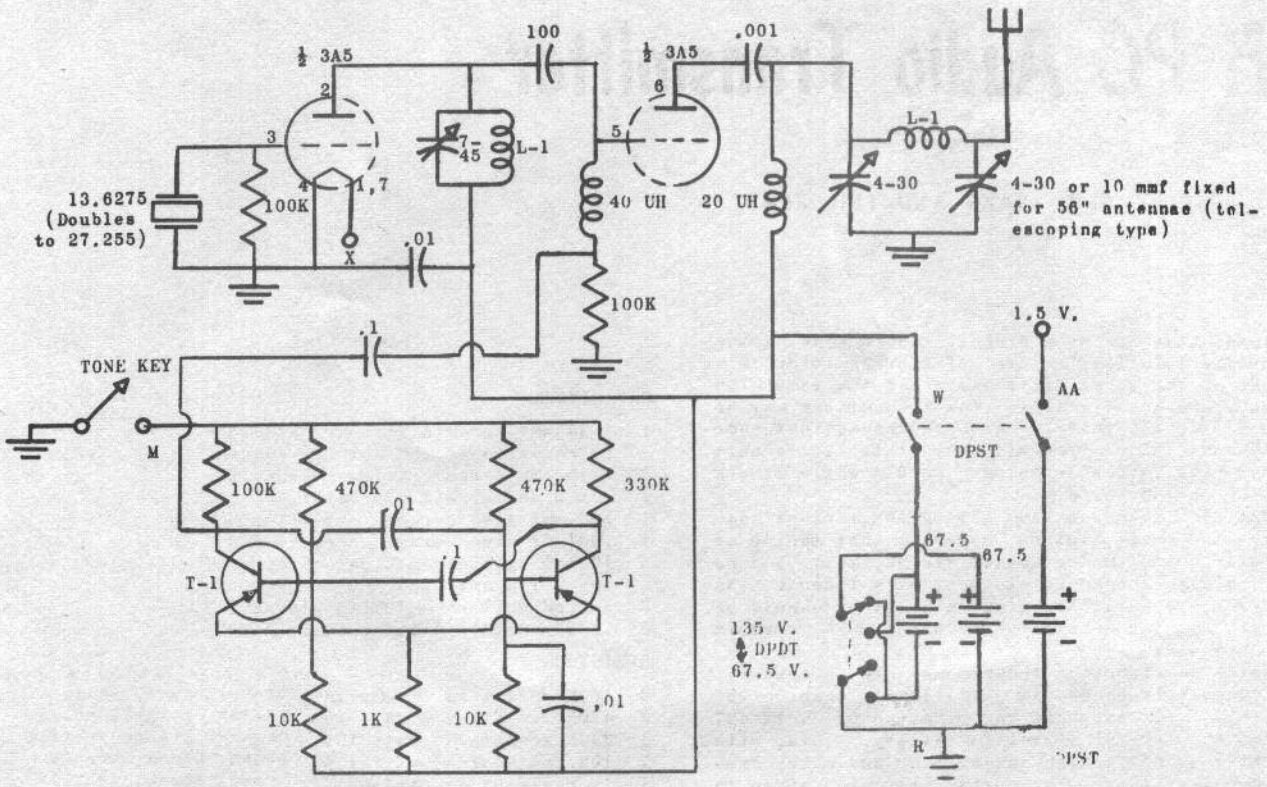
1 Crystal socket
1 Tube socket - PC type

WIRE

9" #24 stranded black, red, brown, blue, grey

MISCELLANEOUS

1 56" antenna telescoping with mount
1 Aluminum box 3" x 5 9/16" x 8"
1 Printed circuit board - 1/16" linen
4 Battery connectors snap type (for Eveready #467 or equivalent 67½ volt B battery)
1 Battery plug for Eveready #742
4 Sheet metal screws 1/4 x 4
4 2/56 x 3/4 volts and nuts
2 4/40 x 1/4 bolts and nuts
4 1/2" x 3/32" I.D. brass tubing


100
½ 3A5
.001
½ 3A5
L-1
13.6275
(Doubles
to 27.255)
100K
.01
40 UH
20 UH
4-30
4-30 or 10 mmf fixed
for 56" antennae (tel-
escoping type)
100K
.1
1.5 V.
TONE KEY
M
W
AA
DPST
100K
470K
.01
470K
330K
67.5
67.5
T-1
T-1
.1
135 V.
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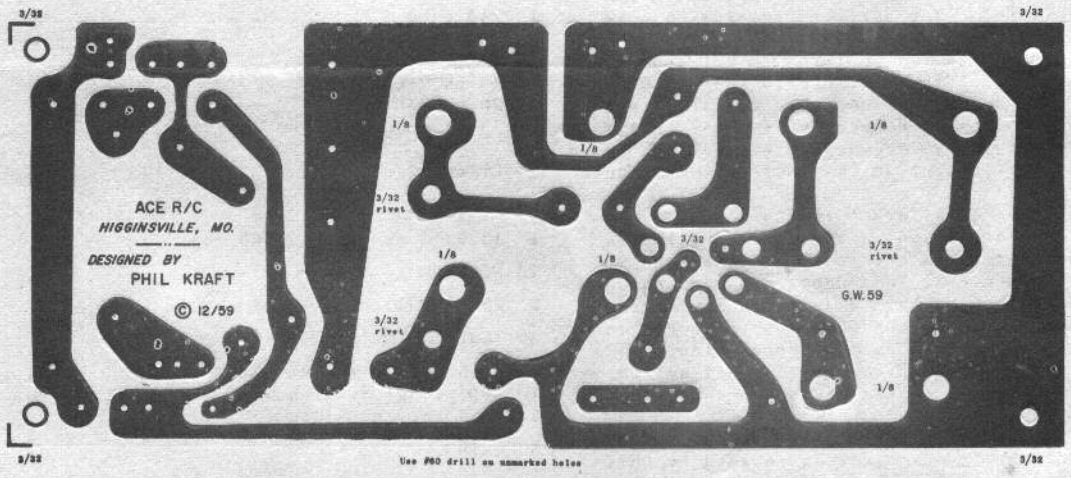
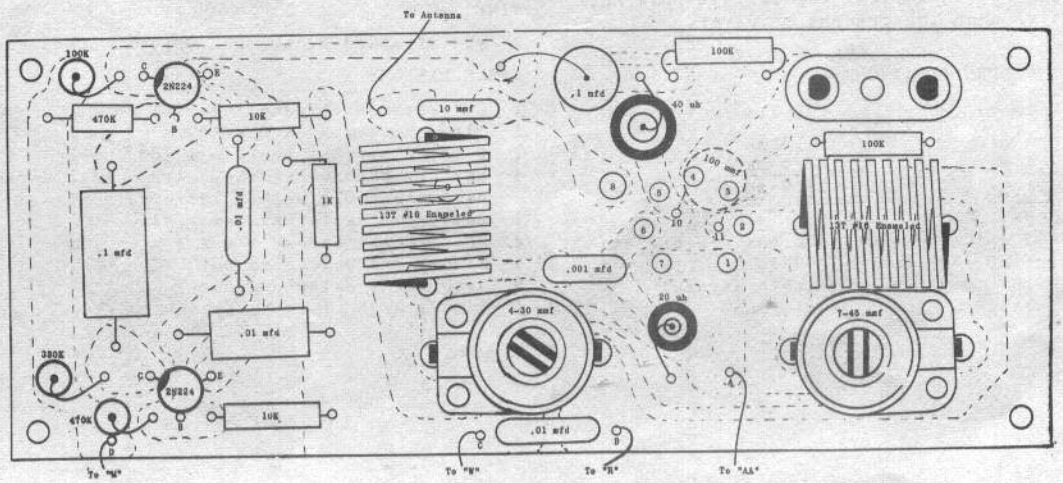
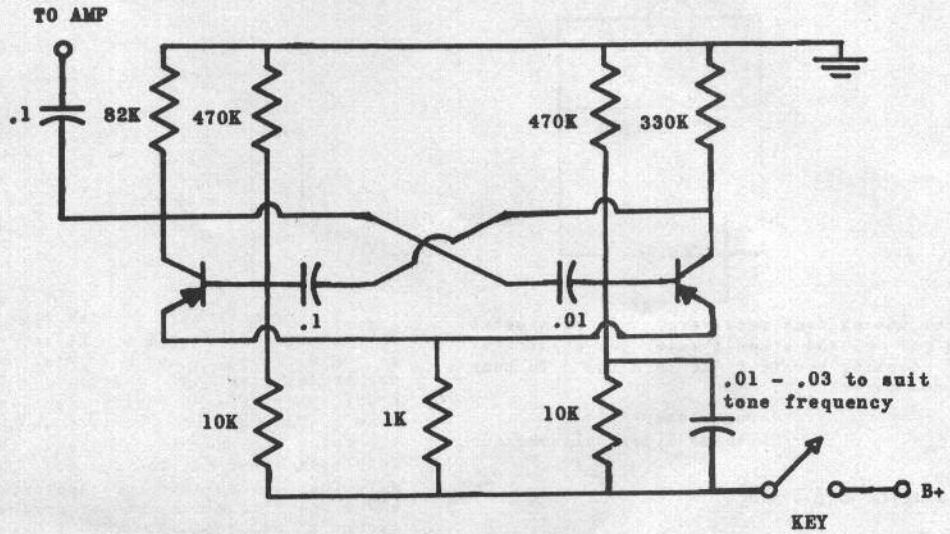
67.5 V.
10K
1K
10K
.01
R
DPST


3/32
3/32
ACE R/C
HIGGINSVILLE, MO.
DESIGNED BY
PHIL KRAFT
© 12/59
1/8
3/32 rivet
G.W.59
3/32
3/32
Use #60 drill on unmarked holes


To Antenna
100K
2N224
470K
10K
10 mmf
.1 mfd
100K
40 ub
100 mmf
.01 mfd
1K
.137 #18 Enamel
.1 mfd
.001 mfd
20 ub
4-30 mmf
7-45 mmf
.01 mfd
330K
2N224
470K
10K
.01 mfd
To "M"
To "W"
To "R"
To "AA"

SINGLE CHANNEL MODULATOR

LOW DRAIN ALL TRANSISTOR CIRCUIT



With the increasing favor of audio receivers of the Kraft type being very evident in radio control these days, the demand has come for a good simple modulator which may be used with many of the existing MOPA transmitters.

With the help of Phil Kraft who developed the Kraft receiver, such a circuit has been evolved on the PC base which is shown full size.

It utilizes printed circuitry for ease of assembly although this is not required or absolutely essential. Straight wiring may also be used.

It requires a minimum of parts, is fairly simple and straightforward to build and hooks directly to the B supply through a key of your transmitter. Up to 135 volts may be used.

The output is fed directly to the grid of the amplifier tube. It may be necessary to use an RF choke in series here to keep the RF from feeding back into the modulator.

The modulator will produce tones from 300 to approximately 600 cycles per second, depending upon the size of the capacitor as shown on the schematic and layout.

The unit may be housed in a small plastic box 1 5/8 x 2 1/4 x 1 inches and contact cemented to the interior of the transmitter cabinet. Brass stand-offs may also be made from brass tubing about 5/32" in diameter and 3/4" long using screws to hold through two holes as shown in the upper portion of the printed circuit board.

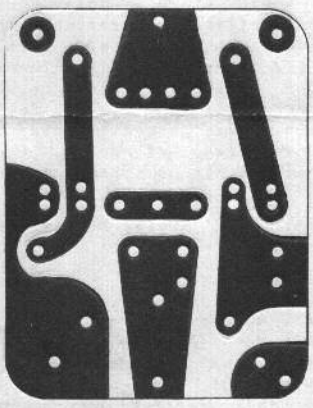
The CK722's are so mounted that the red dots are on the outside in both cases. These are shown by heavy lines on the parts layout. Lead #1 in both instances is on the outside of the chassis.

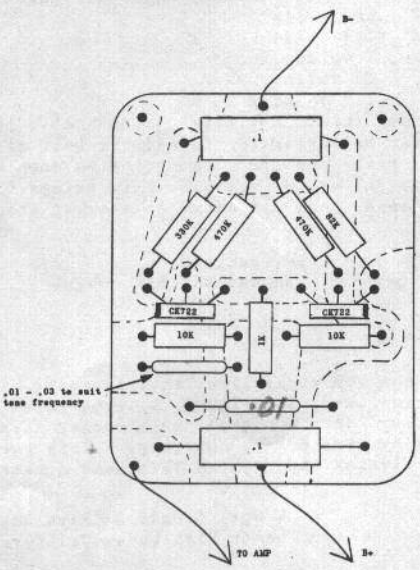
This little modulator has an advantage over other modulators in that it does not add to the A drain of the transmitter unit since it uses transistors entirely.

Printed circuit boards and complete kits will be available for those who want to make their own.

The CK722 transistor is shown but the Philco 2N224 seems to work equally as well as do most of the available transistors in the audio range.

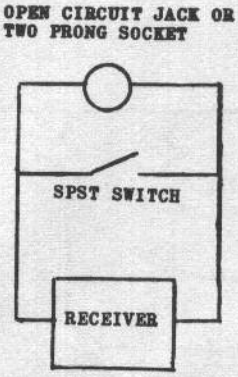
If you've been wanting to go to audio but have been hesitant to buy a special transmitter, or have been hesitant because the modulators looked fairly complex, try this little beauty and get a unit which will operate many of the existing tone receivers available today.





BITS AND PIECES

TUNING TIP



Try this for tuning tone receivers. It eliminates the possibility of closed circuit meter jax opening or chattering and causing receiver to lock in. To tune receiver, turn the switch off.

Jerome Asner
Oklahoma City, Oklahoma

DETERMINING AUDIO CPS

Concerning an item on the "Bits and Pieces" page of a recent issue of GRID LEAKS in which it was explained how to determine the cps of an audio transmitter using known frequencies on the piano, it seems to me to be more practical to purchase an inexpensive chromatic pitch pipe at a music store. This item is easily carried, and it is often more reliable than a piano which could be quite far out of tune. Furthermore, if several receivers are to be worked from the same transmitter--a transmitter with a variable tone adjustment--it is simpler to change the tone in the field with the use of a pitch pipe. I have personally used this method successfully. The user must, of course, know the frequencies of the given pitches he expects to use.

Douglas Ward
Irwin, Pennsylvania

MARCY BATTERY TIPS

The Marcy Twin Simul outfit is the first radio I have ever built and I have had very good luck with it. I have all the "Grid Leaks" that have been printed and they have been very helpful.

Marcy sent me this information. I thought you might like it on his system. Minimum battery voltage:

Transmitter "B"	110 volts
Transmitter "A"	1.1 volts
Tone Generator	7 volts
Receiver "B"	24 volts
Receiver "A"	1.2 volts

He also sent me this: A little trick that helps add life to receiver batteries is to add two half-size pencells in series with the "B" batteries as soon as they have dropped to 27 or 28 volts. This brings "B" voltage back up to 30 and it seems to stay up about twice as long.

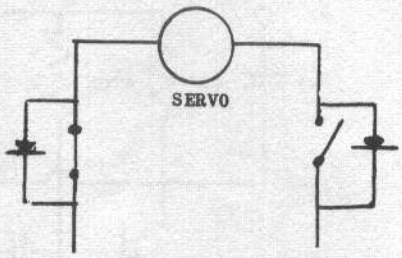
R. Bergold
Wauwatosa, Wisconsin

CHARGING SILVERCELS

I have some news you might like to know about Silvercels. In charging them, I've found, by experimenting with them, that they take a charge much better if you shake them up good by hand before charging. This keeps the plates from flaking and makes them take a charge much better.

M/Sgt. Dennis G. Reynolds
North Highlands, California

PROPORTIONAL AND LIMIT SWITCH TIPS



I currently have two Ace rigs (Commander and TTPW WAG) in operation although neither one is exactly stock. To begin, first, I had a Trixter Beam and an Ace Commander transmitter and receiver. I was tired of flying rudder only via an escapement--so I borrowed a pulser from my WAG unit and put it into the Commander box using the relay to key in and out the B+ to the 3A4 tube. Both pots stick out the front. The rate pot is set to give the fastest rate the receiver and relay will stand and I use the width pot for control. No other changes except a F4 type of 1.5V A battery is used. The receiver was changed by using a 3Q4 tube and a 22 mh RFC. This tube stage is followed by a transistor amplifier stage using a 2N123 (I had this on hand). A 6 mil current change is normal. I also changed the relay to a double pole double throw and, by cross over use, a single set of VO.500's at 6 volts to run a Mighty Midget servo. This rig has now been in use for over a year and I have had a "ball" with it. Try it sometime.

A tip for a limit switch using the SPDT micro switches as sold by Ace. Split a double switch. Then, using one side, place a diode across the switch. (See sketch.) This will allow current to flow in one direction and not the other. This means that your switch can be thrown and no current will flow to your servo, etc. Yet, when the polarity is reversed, current will pass through the diode permitting the servo to operate in a normal manner.

Frank R. Parsons
Lexington, Massachusetts

TRANSMITTER MODIFICATION

Have a couple of Simpl-Simuls out with TR 4.5. Sure makes a neat combo. Transmitters are modified MarcyTones. The guys really swear by them. I just have them throw a 270K resistor in series with the pot and you can cover the TR 4.5. Put a shorting switch across the resistor and you cover from about 400 to the top of the Marcy range.

Red Costlow
Minneapolis, Minnesota

MONITOR

I have the first part of a Marcy receiver here on the bench, that is, minus the coil tone filter and relay. I have it hooked to a 5" speaker. I believe I told you that I have picked up 10 meter broadcasts from all over the states plus many foreign countries. The thought occurred to me that such a rig might be useful at the field as a sort of monitor. Perhaps you would have an idea as to an additional amplifier section, another transistor stage of amplification that is to cover any interference on 27¼? By the way, I have had this set running for the past 4 months on an old 22½ volt B and 2 used pencells and only the other night had to replace the old pens. It is on every night for about 3½ hours so you figure it--pens were only down to 1.1 volts!

Bill Kenyon
Manlius, New York

WE BUILD THE KRAFT RECEIVER KIT

BY DALE SPRINGSTED

The most recent addition to the Ace receiver line is the Kraft single channel tone receiver. This little beauty offers much to the R/C addict who is interested in a small, very reliable unit of the single channel tone type. The complete receiver with its battery power supply will weigh in at a nice reasonable figure of slightly less than 4 ounces. Include an extra pair of pencells for escapement operation and the all up weight is still only five ounces. This figure make it quite applicable for use in the smallest of R/C models. The fact that it is so light and small should in no way reflect on its performance, for, in this sense, it is a veritable GIANT. The following figures are pretty hard to match. Filament drain is 13 ma. A single pencell will thus power the single tube for about 24 hours. Plate supply drain under carrier on operation is only about .8 ma so the unit has a relatively low idle and long life can be expected from a small plate supply battery.

Fairly high relay current, actually close to 3.6 ma through the windings, allows a nice thumping relay action, so the armature adjustment is not a critical factor for stable operation. As kitted, the unit will not pulse overly fast, thus a minor change is required to achieve faster pulsing with but little loss in relay current, and, for the dyed in the wool pulser fan, a modified circuit allows the fastest pulse following anyone would wish. It has been found in excess of 15 cps in recent tests.

The range of these receivers has been checked and in one specific case, ground range was in excess of 1.6 miles using a 2 watt transmitter. Normal range as checked by this writer is 4000 feet from a 3 watt transmitter.

In addition to this, the unit does have some frequency bandpass response and it likes audio frequencies in the range of 350 to 600 cps, with response dropping off both above and below these figures. This, in effect, gives some measure of interference protection from Class D phone operations. Further, testing on this facet of the unit will be carried out during the coming summer. If all this does not enthuse you to try one of these little gems, then nothing else will!

As kitted, the unit is easily built so I shall not dwell overly long on assembly facts, but would like to suggest a few items, some of which are frequently overlooked or forgotten by some builders.

First, check all of the components possible prior to beginning assembly. For instance, it is only the work of a minute to use an ohmmeter to check the continuity of the transformer windings. It is much easier to replace or repair BEFORE application than after. If you have a transistor checker available, it is nice to check the leakage and gain of the individual transistors and be able to select ones that will work best in various stages of the unit. The builder should remember to solder the ends of the tank coil windings also, since the coils are supplied wound but not soldered. A quick check on the relay coil continuity is also in good order as well as the tube filaments. We must assume the resistors and capacitors are in order and the writer seldom finds anything to give trouble in this portion of the components anyway.

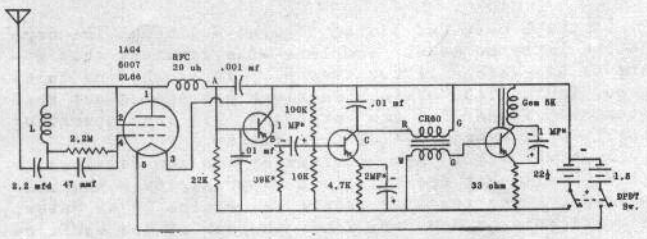
This receiver is built in the printed circuit fashion, thus, a small HOT soldering iron is a must. The Ungar type soldering pencil is perhaps the nicest and handiest for this job. Use a good grade of radio solder of 60% tin and 40% lead for a job that winds up wich nice shiny professional appearing connections.

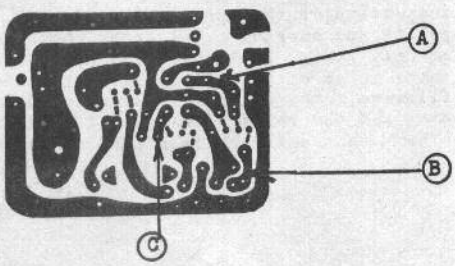
Let's assume that you have a transistor checker and can get a relative leakage versus gain rate for the individual transistors supplied in the kit. The first stage likes a low leakage transistor and since the gain of this stage is always less than one, the lowest leakage and lowest gain transistor seems to work best here. The next transistor to select would be the one showing moderate leakage and highest gain. This transistor is used for the relay stage or the last one in line. The remaining transistor is used for the voltage amplifier. The transistors used are all CK722 and thus may be expected to have current gain figures in the order of 20 to 40 beta. I would caution a builder now that no transistors of high leakage can be tolerated and, if one is used, the result will be a receiver of high idling current and/or faulty operation in the form of a fixed 4 ma current indication.

Under normal condition, the above selection of transistors will result in a receiver of no signal idle condition of 1.4 ma and signal on idle condition of less than 1 ma. These figures can vary by as much as 20% depending on the exact values of transistors used, without affecting the overall operation.

The extremes, I find, are generally as follows: Reading the total plate current of the unit, a receiver with very low leakage transistors will idle with no signal at about 1.2 ma and drop, on signal application, to .7 ma. Conversely, a receiver with higher leakage and gain transistors will idle as high as 2.25 ma with no carrier while dropping to 1 ma under carrier on conditions. When the leakage value extreme limit is reached the receiver will idle at 4 plus ma and refuse to drop on carrier application.

In the first paragraph, we spoke of the fact that the receiver, as kitted, does not pulse well; and this is true. However, at the very slight sacrifice of a .5 ma or so of relay current, the unit can be made to pulse quite rapidly. All that is necessary in the way of alteration is to replace the 5 mfd capacitor across the relay windings with a new capacitor of 1 or 2 mfd value. The rule of thumb to follow is to go no lower than is required for the fastest pulsing speeds required. If this simple change is not sufficient to satisfy the pulse addict, then, by changing several more resistors and capacitors, the pulse rate can be raised to a high value. No circuit changes are required, thus, simply removing and replacing the old components with new values results in a receiver having good relay action as well as pulse speeds of a very high rate. The accompanying schematic notes the required changes. (Marked *)





To give the builder some indication of what typical measurements to expect, the following chart has been complied from various notes. These measurements were taken on different receivers built by different people and, unfortunately, by two separate VTVM's. Yet they are typical of the standard Kraft receiver.

Receiver A was built by Mr. Harrison Morgan, WISSK--not from kit--and is the original schematic unit on 50 mcs. 1AG4 tube.

Receiver A-1--same receiver after modification to schematic #2.

Receiver B was built by Mr. Morgan for 27 mcs operation from kit. 6007 tube.

Receiver C--measurements taken from receiver after service work had been accomplished. Builder Mr. X. Standard kit on 27 mcs. 6007 tube.

Receiver D was built by author to the new pulse specifications for 27 mcs operation. 6007 tube.

	Receivers				
	A	A-1	B	C	D
AC volts peak to peak at check point A--no signal.	.3	.5	.4	.23	-
AC volts P-P at A with carrier	.29	.4	.375	.23	-
At A with tone	.8	1.2	.5	.25	-
At B--no signal	-	-	-	.375	-
At B--with carrier	-	-	-	.36	-
At B--with tone	-	-	-	.375	-
At C--no signal	-	-	.5	.7	-
At C--with carrier	-	-	1.2	.375	-
At C--with tones	-	-	13.2	9.2	-
Relay current only ma.--no signal	2.2	1.5	.5	-	-
With carrier	.016	.014	.031	-	-
With tone	3.6	3.6	4.0	-	-
Total plate current at point X--no signal	3.0	2.5	1.3	1.1	.7
With carrier	1.0	.8	.9	.75	.7
With tone	5.0	4.6	4.7	5.0	4.5

Of the 5 sets of listed figures--although the compilation is by no means complete--the receiver that appears to be average is receiver B. In truth, the total current indications of this receiver are just about what is commonly found in the standard kit when operating properly with average CK722 transistors.

Receivers that are received at the Ace Servicenter of the Kraft kit are all given approximately the same treatment. The test procedure is basically as below. The Servicenter, however, finds the use of the oscilloscope as a major troubleshooting tool much better than the use of the VTVM, However, with the chart, one should be pretty well able to pin point the difficulty using the test meter instrument.

Inspection of the parts and soldering, checking for poor joints and shorts. The first check is for continuity of all basic parts that can be done with a simple resistance meter of any sort. The parts checked are the tube filament, the coil, the transformer primary and secondary and the relay winding. If these are all found good, then the receiver is placed on test with voltage applied.

One of two conditions is usually immediately apparent if the unit is still faulty. Either a high idle of 4 to 5 ma appears or the idle current looks normal but will not rise on signal. If either case is apparent, then each of the transistors have any two of their leads unsoldered, effectively removing each one from the circuit. The power is again applied and the current of the first stage only is noted. Normal reading is about .275 to .3 ma read on a 1 ma full scale meter. The action is checked visually with the scope under three conditions--signal off, signal on, and tone on.

The first transistor following the tube is then resoldered in place. Again power is applied and the output of this noted on scope again under the three conditions mentioned. The total plate current drain at this time should be approximately .45 ma. If the total drain is higher than .7 to 1 ma, the first transistor likely is quite leaky and will require replacement.

When this stage is working, the voltage amplifier, second transistor, is resoldered and, again, the scope is used to check the output pattern under all conditions. The total plate current drain will now be approximately .7 to 1 ma. Again, if the drain is very much higher than this, a leaky second stage transistor would be suspected.

Now the last transistor is resoldered and again, we check under the three conditions--only this time paying attention to the plate current totals which will now indicate proper operation. If the plate current total goes down to at least 1 ma in the carrier on condition and rises to 4.5 or 5 ma with tone, we are then satisfied the unit is proper except for a range check which is performed with a very weak transmitter that has a variable output. The average builder can use a grid dip meter to accomplish this function using the slight curreng drop found when the carrier is turned on as an indication. You can be sure that this is a positive range check since this slight drop is indicated by the squelching of the regenerative hiss in the tube section of the receiver.

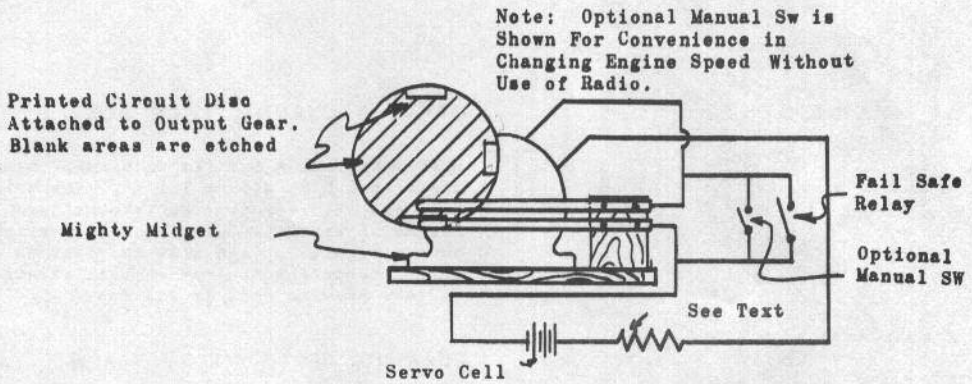
In closing, the author would like to say a couple of words on service findings that are most common with this unit. First and foremost is damaged transistors. It is purely a speculative idea but it seems apparent that the builder, after turning power on the units, if proper operation is not gotten, immediately must do some prodding about perhaps with the power supplied etc. prior to shipping the unit for service. The difficulty that may have been caused by only one leaky transistor is then amplified to result in damage to all of them.

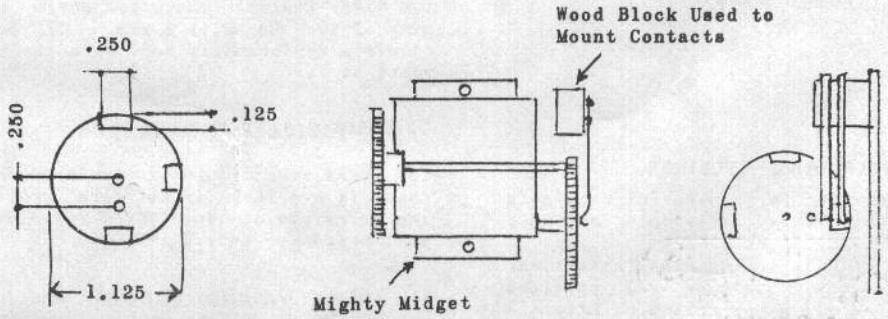
Also, the next most common source of trouble is an open primary or secondary CR60 winding. Of the many transformers handled here, we find upon unwrapping that only one out of many has been faulty.

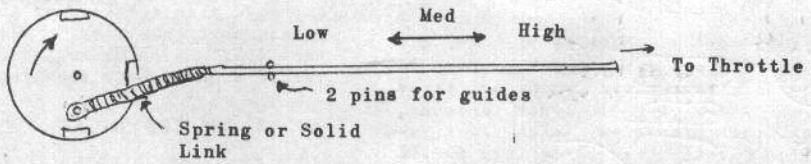
The average method used to strip the leads of tnis transformer is likely at fault since too short a lead length is found on the usual homebuilt receiver. To properly strip the covering from the flex wire, the lead length can be about 1" to 1¼", the excess lead length is simply doubled over and causes no difficulty in the operation of the unit. The wire MUST be left long enough to be held while stripping since the actual transformer winding material is only about .001 inches in diameter and of very soft enameled wire thus only requires ounces of pull to part it.

Careful attention by the builder in checking these parts prior to installation would in many cases turn up these faults, but we can only caution that care is required with any of this subminiature radio equipment since, although it is quite rugged after installation, it can be easily damaged by improper handling

SIMPLE THREE POSITION MOTOR CONTROL







Don Clark, 4202 Brookfield Drive, Kensington, Maryland, has used the device described below for about three years as a means of actuating a Bramco throttle. It is fairly easy to build and has proven to be rugged and reliable.

In the stopped position, the circuit to the motor is open because of the etched-off areas on the contact disk and the "N.O." failsafe relay contacts. However, when the failsafe is activated and the relay contacts are momentarily closed, this completes the circuit and the motor turns the disk. When the failsafe relay contacts re-open, the circuit is still completed via the contact disk until it rotates and one of the blank areas comes under the contact. The circuit is then broken and the motor, which has changed your engine speed, is stopped until the relay contacts close again. It is only necessary to close the relay contacts briefly, usually less than a second, to allow the disk to rotate so that both contacts will be on the copper clad portion of the disk. The motor indexes itself to the next position and stops.

Don uses the usual three-position motor control for high, medium, and low speeds. Any number of positions may be used, however, with the only limitation being the number of etched spaces you can get on the disk.

Don found that a double gear was necessary in order to keep the rotating speed of the disk down and also to provide enough torque to overcome contact pressure and still operate the throttle reliably. A dropping resistor is shown in the schematic and may be necessary depending upon the voltage used, contact pressure and throttle linkage. A conventional means of double gearing the Mighty Midget motor is used and is not described. (DCRC Newsletter July, 1958)

The contact disk is made out of printed circuit board (one side only). You may etch the disk or, with care, you can cut the small areas out with a razor blade. The crankpin is mounted on the disk and you can make the throw whatever length you need, provided it clears the contacts.

In mounting the unit in his plane, Don chose to use a spring to change the driving crank motion to a translation motion of the linkage to the throttle. A solid link may be used in place of a spring.

The spring has an advantage in that an adjustable stop was mounted to the Bramco so that the spring pulled the lever arm against the stop in the low speed position. This provides a uniform and adjustable low speed position. This, of course, is helpful only if you are still using one of the standard Bramco throttles. The spring selected must be stiff enough to pull the throttle back but weak enough so that it will stretch when the stop on the Bramco is reached. Don chose one out of a Walsco spring assortment.

DC/RC Newsletter

WHAT'S NEW?

ALPHA TECH TRANSMITTER AND RECEIVER

Alpha Tech's T-300 transmitter is a powerful hand-held tone transmitter with detachable telescoping antenna, keying button, plus built-in pulser socket. Socket is wired for connection to pulser or external batteries. 100% tone modulation. Sturdy, handsome red anodized case. One hand operation of power switch. Crystal-controlled. Conforms to FCC authorized Class C Citizen's Band. Shipped with 26.995 crystal unless otherwise specified.

Batteries required are 1½ volt A, Burgess 2D; two 67½ volt B, Burgess XX5; one 3A4 and one 3A5 tube. Size is 2 3/4" x 4 1/4" x 8". Weight is three pounds and three ounces with batteries. Transmitter includes antenna, male plug for pulser/external batteries, tubes and crystal, complete instruction manual, less batteries. $39.95

The Alpha Tech R-300 receiver features what is said to be the world's strongest assembly. Fiberglass component board, specially designed aluminum case. Attractive red anodized scratch-proof finish. Size is 1 1/4" x 1 7/8" x 2 7/8". Weight is three ounces. One 1½ volt pencell for A and one 30 volt for B is the recommendation. Complement is one 6007 tube, two high gain transistors. Circuit is compensated for temperature variations and transistors are bias-stabilized. Trans-tone circuit uses 250 milliwatt transistors and finest miniature electrolytic capacitors to deliver stable and reliable performance. Low idling current means long battery life. .8 ma idle. 4 to 5 ma on signal. Antenna 24" whip or wire recommended. Non-critical tuning. Will follow faithfully the fastest pulsing. Comes completely assembled with 7 pin plug--ready to operate. Must be used with an audio transmitter but the use of the Alpha Tech T-300 transmitter is recommended because it will take full advantage of the Alpha Tech's high selectivity. Due to its high Q tube detector design, the receiver displays an amazing ability to separate radio signals from nearby frequencies. This feature is normally available only in heavy, expensive superheterodyne type receivers. However, Alpha Tech units have been successfully used for two-at-a-time model airplane flights with no interaction. One receiver is tuned to 26.995 and the other to 27.255 with transmitters to match. Completely assembled. $39.95

MARCY 6 CHANNEL STICK BOX

MarcyTone stick box is in a small hand-held case which measures 2 5/8" x 4" x 1 1/4". The unique box holds the pots and plugs into the transmitter to convert to six channel operation. Gives positive stick action for left down, right, up and slow and fast on motor speed. Has strong centering neutral on both sticks. Unwired but it is very easy to do. In kit form $17.95

DURAMITE SERVO NYLON SCREW

Due to many requests, we are making available through Ace Radio Control the nylon screw which is an integral part of the Duramite servo. If, for any reason, yours requires replacement, here is a source where you can buy yours at 15¢.

TRANSISTORIZED MODULATOR

The transistor modulator featured in this issue of Grid Leaks is available in kit form. All components including transistors, capacitors, resistors, and printed circuit board are only $6.95.

ONE HENRY AUDIO TOROID

Now available is a 1 henry audio toroid which is tapped at 1/3 of the DC resistance down for use in the transistor modulator sections of the upcoming Kraft triple simultaneous transmitter. Also may be used in circuits of the Orbit type disregarding the center tap. Complete toroid wound. Easy mounting. Only $6.95

ABC 2 AMPERE NICAD

Add a two ampere hour nicad to the growing family of available surplus batteries and you have an ideal battery to use with transistor power supplies in a hand-held transmitter case. This is another in the ABC series offering fully rechargeable life-time batteries and is almost completely maintenance free. Will provide a continuous power source at an extremely low overall cost. 1.2 volts. 2 ampere hour. The ABC battery may be charged from one cell of an automobile battery.

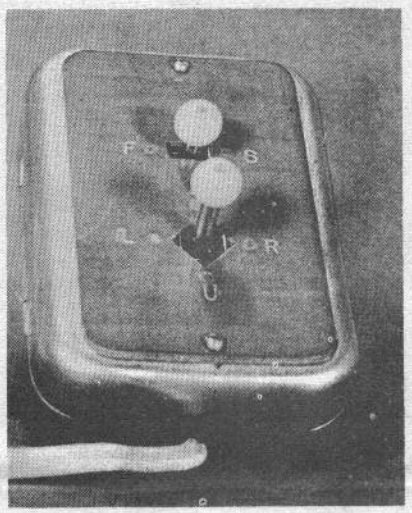
Nothing else--not even a meter is required. Recharging may be done at any stage of the discharge cycle. These are removed from surplus equipment. Original cost to the government was quite a bit higher than our price.

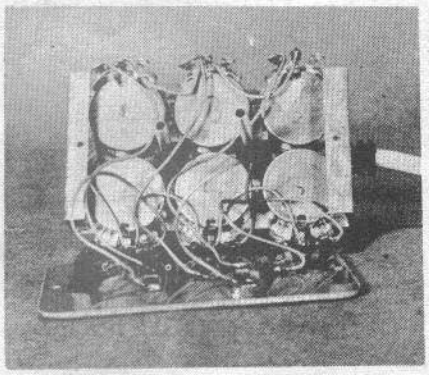
ABC 2 ampere hour measures 1 1/8" x 4" x 5/8". $5.95

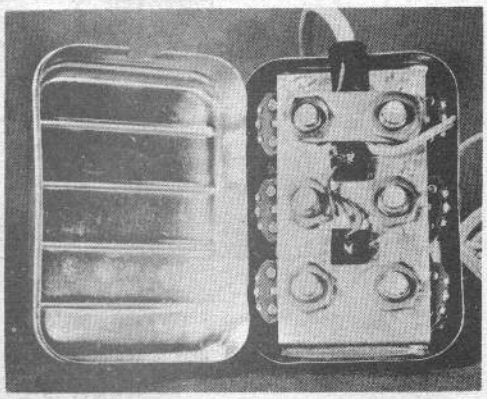
SPACEMASTER SERVICE

The Spacemaster receiver has been found by many to be compact, light weight with 1 3/4 ounces, low power consumption with 22½ B and 1½ A batteries, excellent range, and will take fast pulsing for all proportional systems. The only disadvantage has been heat and cold temperature drift. Now, AERCO has come out with a modification to make this an "all weather" receiver with guaranteed temperature compensation from those freezing days to 110° in the summer. AERCO will modify your Spacemaster receiver for a $8.75 price and return it postpaid. Their address is AERCO, Box 786, Delair, New Jersey

MaRCy Stick Box







Many requests have been received for a stick type box which could be used with the MarcyTone 6 channel receiver because, as one user writes, "When you use the push buttons, you look like a nervous typist when you try to maneuver the plane."

Don Inkmann, brother of Marcy--the developer of the MarcyTone system, has developed a little 6 stick box. The heart of the box is an aluminum soap box which measures $2\frac{1}{2}$" x $4\frac{1}{2}$" x $1\frac{1}{4}$". It's of a convenient size which may be easily carried in the hand and plugged into the transmitter by a cord and phone plug.

This unit may be used with a metal pot holder as well as a stick holder, as shown in the drawing.

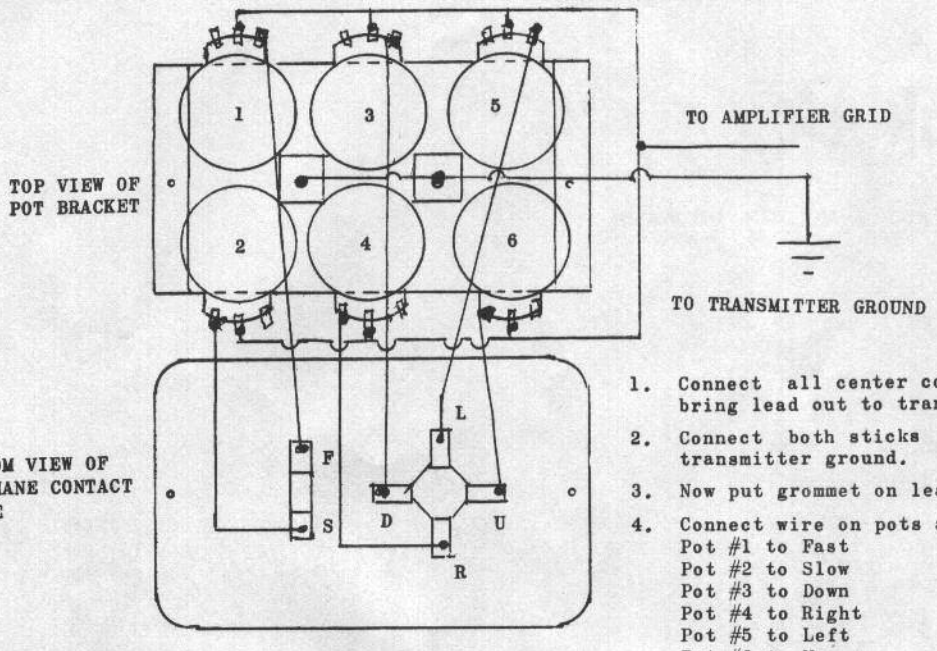
The sticks are simply brass tubing 5/32" O.D. which are punched into holes in cubes of hard rubber 7/16" x 7/16" x 1/2". The hole is deliberately kept small so that a press fit is had for the brass tubing. This whole unit is then press fitted into the square holes that you see in the drawing for the template of the pot bracket. This provides for a strong self-neutralizing action and makes for a very adequate mount of the sticks. The top 1/16" synthane material is eyeletted with sheets of contact brass at all contact positions so that, by moving the stick either left or right or down or up or slow or fast, contact is made with the appropriate pots then for this command.

A small plate also shown as used for an anchoring cable to anchor the cable as it comes from the various pots to go into the transmitter. This box is fairly complicated to many without the proper equipment but boxes will be available separately, completely punched and ready to go for use with your pots. Manufactured by Don Inkmann and will sell for $8.95.

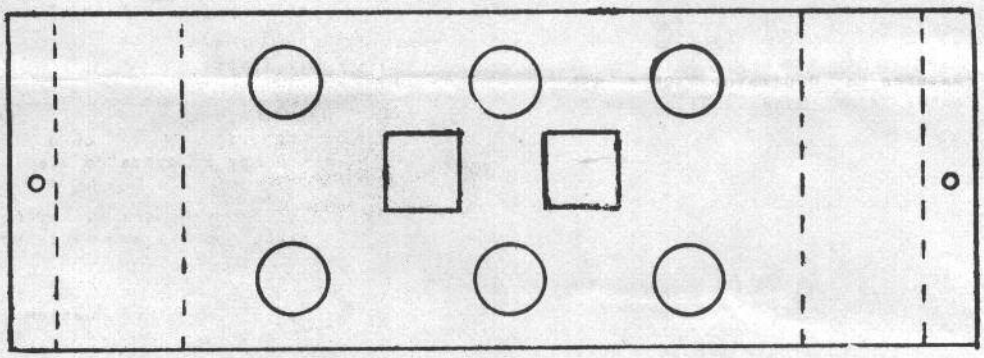
The pots that are used in the regular MarcyTone 6 channel control box must have their shafts cut shorter so that they will fit into the box.

Tuning is simply done by opening the back cover and tuning the appropriate pots. The diagram of the pot and wiring of the pot is self-explanatory. In practice, then, the synthane base, with its contacts, is laid over the slot which is cut in the top of the box and fastened.

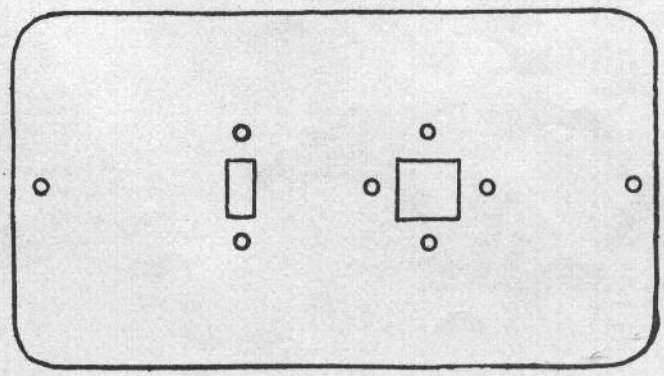
Wiring is completed with pot bracket held away using flexible leads. Wiring is done so that the contacts on the circuit boards are each contacted to the proper pot. A study of the wiring diagram will help. Synthane lid and pot bracket are then mounted with self tap screws to the soap box.

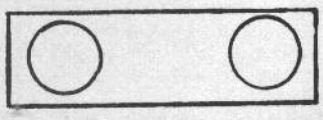


1. Connect all center contacts on pots together and bring lead out to transmitter grid.
2. Connect both sticks together and bring lead out to transmitter ground.
3. Now put grommet on lead out wire and connect plug.
4. Connect wire on pots as indicated in pictorial.
   Pot #1 to Fast
   Pot #2 to Slow
   Pot #3 to Down
   Pot #4 to Right
   Pot #5 to Left
   Pot #6 to Up
5. Bring transmitter lead out between pot 5 and 6. Now put plate on pots 5 and 6 and tighten down with extra nuts. This will keep wire from pulling out.
6. Let's go flying! --Happy landings!



BRACKET. MAKE OF METAL. HOLDS POTS AND RUBBER FOR THE STICK. BEND AT DOTTED LINES TO MAKE A U SHAPE. FULL SIZE.





FULL SIZE CABLE CLAMP

FULL SIZE TEMPLATE FOR 1/16 SYNTHAN COVER. CONTACTS OF BRASS ARE EYELETTED TO THIS

RC Bibliography for 1959

INDEX COVERS RC IN MODEL MAGS

1959 saw many articles of radio control interest published in the model magazines and, in order to make these more valuable as reference material, Grid Leaks is performing a service by compiling a bibliography of these. Look under the appropriate heading to find the article that you wish to locate.

While our staff made every attempt to include most of the major articles and schematics, no guarantee can be made that all were included or that they are 100% correct. It has, however, been checked and double checked and is as infallible as human frailties can make it.

R/C PLANES

Bi-Fli R/C by Phil Kraft
A Bi-plane using engines at .15 to .19 displacement. Designed for rudder only, multi-channel or Mickey Mouse setups.
MAN, 10-59, p. 16

Blue Boy by Paul Palanek
Slab fuselage .15 motor job. Designed for use with single channel equipment.
FM, 8-59, p. 11

"Cicada" Land-Phibian by Hoh Fang-Chiun
While not designed as an R/C plane, it is possible, because of the roominess of the cabin to make this into a 1/4A job. Features a .020 motor, 28½" wing span, 126 square inches wing area. Weight is 5.9 ounces less R/C gear.
AM, 12-59, p. 26

Crusader by Harold DeBolt
Low wing for R/C--not for the beginner.
AM, 8-59, p. 24

The Gasser by Ken Willard
Designed for a .09 for pylon racing. A handful of lightning.
MAN, 6-59, p. 12

Houdini
.15 plane--low winger. Takes almost any radio gear and is recommended for beginners.
MAN, 8-59, p. 14

Low Ender by Dale Root
35 power multi.
AM, 3-59, p. 12

Multi Bug by Walt Good
.35 dual proportional.
AM, 1-59, p. 25

Ramblin' Wreck by H. Donald Brown
A combat R/C plane designed for .15. Quick and easy to assemble and to repair.
AM, 12-59, p. 18

Stunt Runt by Richard Bause
1/2A ROG ship with 2 controls and acrobatic flight possibilities.
FM, 4-59, p. 13

The Twin T by William O. Hershberger
America's championship radio control pylon racing plane.
ATMA, 1959, p. 48

R/C RECEIVERS

*Dual Proportional Relay-less Receiver by Neil Delafield
GL, V2 #3

Grogan's Micro-X Transistor Receiver by William Grogan
Shows this extremely small unit utilizing an SB103 and transformer-less coupling. Printed circuit wiring.
GL, V1 #10

*Hybrid CW Receiver by John G. Burdick
GL, V2 #3

*Improved Mini WAG
Improvement by Robert D. Dickerson of the circuit which appeared in the 1959 Air Trails Model Annual using 1AG4--1AG5--1AG4.
AM, 12-59, p. 30

Improved R/C Performance on Technicians 220 mc Band
By John W. Hamblin, W3TIK
Run-down of improved receiver and pulser circuitry.

*The Kraft Audio Receiver
Printed circuit layout.
MAN, 3-59, p. 59

Marcy Twin Simul Receiver
Detailing a very simple two channel receiver either channel of which may be operated simultaneously.
GL, V1 #10

The Mini WAG Receiver by Robert Dickerson
Famous WAG circuit using sub-miniature tubes for low filament drain.
ATMA, 1959, p. 68

More Notes on the TR 4.5 by Red Costlow
GL, V1 #9

New Kraft Receiver Base
Simple re-design allows use of the more conventionally available CR60 transformer for very popular audio job.
GL, V2 #2

PC Tech Two
GL, V2 #1

Pearce 8 Channel Receiver by Dale Springsted
Shows a printed circuit board and component layout as used for the popular Pearce receiver which appeared in January, 1958 Model Airolane News.
GL, V1 #10

*Plohr Audio Receiver
Not a construction article--merely a schematic.
AM, 8-59, p. 44

A Proved Superhet by Dick Jansson, Part I
A front end to make the TTPW, reed receivers, or almost any audio selective enough with 10 KC selectivity. Crystal controlled.
MAN, 10-59, p. 24

A Proved Superhet by Dick Jansson, Part II
A continuation of the article which appeared originally in the October issue and shows how to use the preselector with a variety of receivers of the audio type --reed, WAG TTPW, and single channel audio receivers.
MAN, 11-59, p. 24

*Pullen's Relay-less Output Circuit for Tone Receiver
AM, 5-59, p. 33

*Reed Receiver by Pete Bliss
GL, V2 #2

Reed Receiver and Transmitter Adjustment and Operation
By Jack R. Albrecht
GL, V2 #2

*Superhet--Submini Tubes--Crystal Controlled
By Leonard Chioma
MAN, 10-59, p. 27

Super Selective Radio Control Receivers
Advanced circuitry only. All-transistorized superhet front end.
AM, 6-59, p. 20

Tech Two 27 by Howard McEntee
A two tube transistorized receiver. Uses only 22½ volts B and 1½ volts A.
AM, 4-59, p. 20

*Toronto Reed Receiver
While not a construction article, this does give the printed circuit board.
MAN, 2-59, p. 29-30

"Ulti" by Al Doig
The ultimate in radio control systems? The beginning of a super-duper control system which has a feed-back type servo modifying the Bonner so that it will follow the stick without any waggling of surfaces. The single channel receiver and transmitter are shown in this issue. A subsequent issue will show the triple channel.
AM, 5-59, p. 24

"Ulti" Multi Radio Control System by Al Doig
Continuation of the original single channel article which appeared in the May, 1959 issue of American Modeler and shows how to add triple proportional control to both receiver and transmitter as discussed in the May issue.
AM, 7-59, p. 28

We Build the Commander Receiver by Dale Springsted
GL, V2 #2

We Build the PC Tech Two by Dale Springsted
GL, V2 #1

"Why's and How's" of Simultaneous Control
By Eric Von Valtier
Here is circuitry for Bramco 8 channel receiver and 8 channel transmitter for the home builders.
ATMA, 1959, p. 52

R/C TRANSMITTERS

Audio MOPA Transmitter for TR 4.5 by Dale Springsted
GL, V1 #8

*Kraft Transmitter
MAN, 4-59, p. 28

MarcyTone Twin Simul Tone Generator
Shows easy method of converting the standard transmitter to twin simul operation.
GL, V1 #10

Marcy Twin Simul Transmitter
Shows the changes required to convert present Marcy equipment for twin simul operation.
GL, V1 #10

Numac-II by Howard McEntee
A complete construction article showing how the old Mac II may be converted to an MOPA type transmitter and also modulator for audio operation as well as CW.
AM, 10-59, p. 23

Solo Mac by Howard McEntee
A complete construction article on new MOPA transmitter using one 3B7 dual triode tube--no neutralization required--hefty batteries used--meets new FCC specs.
AM, 9-59, p. 21

"Ulti" by Al Doig
The ultimate in radio control systems? The beginning of a super-duper control system which has a feed-back type servo modifying the Bonner so that it will follow the stick without any waggling of surfaces. The single channel receiver and transmitter are shown in this issue. A subsequent issue will show triple channel.
AM, 5-59, p. 24

"Why's and How's" of Simultaneous Control
By Eric Von Valtier
Here is circuitry for Bramco 8 channel receiver and 8 channel transmitter for the home builders.
ATMA, 1959, p. 52

Multi

Gilding the Lorenz MOPA Transmitter by Dale Springsted
Shows how to add a simple modulator to this circuit.
GL, V2 #3

*Mobile 6 volt MOPA Transmitter by Leonard Chioma
GL, V2 #3

R/C BOATS

"Evarts" by S. Calhoun Smith
Destroyer escort for radio control. A super detail scale job.
AM, 5-59, p. 16

"Evarts" by S. Calhoun Smith
Destroyer escort for radio control. A continuation of the article begun in May issue of American Modeler, showing detail.
AM, 6-59, p. 56

Fireboat by Walter Musciano
Two speeds forward, half speed stern, proportional steering, pumps water.
MAN, 4-59, p. 19

The Mostest for the Leastest
Shows a two-channel MarcyTone receiver installationin a small boat.
GL, V2 #3

Small Boat Radio Control
An article showing installation in a small aluminum outboard.
GL, V2 #3

Starting R/C Model Boating
A comprehensive article on the overall picture of R/C boating and some excellent suggestions.
AM, 9-59, p. 26

R/C VEHICLES

Radio Controlled Cigar Box
GL, V1 #8

R/C Greyhound Bus
GL, V2 #1

CONTROL INFO

Adding Rudder Trim to Simpl-Simul by John Worth
GL, V1 #10

Adjustable Push Rod
FM, 3-59, p. 36

*A Relay Eliminator
AM, 2-59, p. 37

Bonner VariComp, DeBolt Servo Combination
FM, 3-59, p. 36

Clutch Servo for Use with Needs of Proportional Rigs
By Geoffrey D. Pike
Shows simple adaptation of Mighty Midget Motor on clutch principle.
ATMA, 1959, p. 76

Delafield Dual Proportional System by Neil Delafield
GL, V1 #8

*Fail-Safe and Motor Control System
Utilizing an auxiliary relay in a circuit.
AM, 5-59, p. 46

Full House Servo Conversion by John R. Tucker
Shows how a simple printed circuit disc for the CitizenShip servo allows full house action.
GL, V2 #2

Grogan Pulser - Single Channel
GL, V2 #1

Grogan's TTPW Pulser by William Grogan
Using a relay-less type pulser.
GL, V2 #2

Howard Bonner's R/C Delta "Suds" by Frank Dazey
Not a complete installation article but a general idea.
MAN, 12-59, p. 22

How to Fit a Rudder Escapement by Peter G. F. Chinn
Showing typical installation of the super Aerotrol escapement.
ATMA, 1959, p. 66

MarcyTone Twin Simul Pulsers
GL, V2 #1

*Mighty Midget Activated Aerotrol
FM, 3-59, p. 35

*Motor Control Circuit by John Worth
Designed primarily for Simpl-Simul or other pulse systems.
AM, 12-59, p. 30

New Multi Control for Bonner Servo by Donal D. Kavanagh
GL, V1 #8

R/C Servo, 3P2N by Gene Thomas
FM, 3-59, p. 14

*Rotary Switch Beep Box
AM, 1-59, p. 4

Simple Servo for MarcyTone by Don Pagel
GL, V1 #8

Simplified Radio Control Proportional Pulser
By Howard McEntee
Mechanical pulser system. Very simple low drain.
AM, 3-59, p. 24

*Simpl-Simul Auxiliary Controls
Schematic to show how two additional controls can be gotten from the Simpl-Simul.
MAN, 8-59, p. 28

*Soltow's Servo
FM, 8-59, p. 26

Steerable Tail Wheel
AM, 2-59, p. 37

Stick Control for Simul 8 by Dale Springsted
Shows how to make a simple control out of snap-action type switches.
GL, V2 #2

Tomoser Fail Safe Gadget
FM, 3-59, p. 37

*Tone Monitor
MAN, 8-59, p. 28

Transistorized Engine Control for Simpl-Simul
By John Worth
Shows how an extremely simple auxiliary control may be added to the versatile Simpl-Simul system simply and easily. Vacuum tube jobs do not work here.
GL, V1 #10

VariComp Switcher by Ralph DeCecco
5 channel operation of two VariComps by just adding two simple contacts on the servo. Construction article.
MAN, 8-59, p. 29

*Visual Simpl-Simul
Check of relay.
MAN, 1-59, p. 36

*V-Tail Control
AM, 1-59, p. 52

GENERAL

Battery Charger
Simple modification of a commercially available charger so it may be used with meter, warning light, and a pot to charge virtually any battery.
MAN, 9-59, p. 27

Build a Monitor and FSM
GL, V1 #9

Dawn to Dusk
Report of Endurance Attempt by G. F. Chan.
MAN, 2-59, p. 19

Dawn to Dusk by Edward J. Lorenz
Rounds up tests on radios and batteries.
MAN, 3-59, p. 15

Dawn to Dusk
Series of articles on the Endurance Attempt.
MAN, 4-59, p. 26

Design Considerations for Manufacturing an R/C Transmitter and Receiver by Joe Curtis
Goes into detail on the problems encountered by a manufacturer in coming up with a new tone transmitter and tone receiver. Schematics shown.
GL, V1 #10

Fail Safe Tone Receiver by Neil Delafield
GL, V1 #9

Filling out Form 505
GL, V2 #3

Gramps & I
A very entertaining account of the beginner in R/C.
MAN, 7-59, p. 26

How to Fly Dual Proportional Radio Control
By Dr. Walter Good
AM, 2-59, p. 20

How to Observe and Measure Quench Frequency of a Super-regenerative Receiver by Jerry McGeorge
GL, V1 #9

Indoor R/C by Ken Willard
A recap of very small models flown indoors.
MAN, 5-59, p. 18

It Takes a Heap 'O Help to Set a Radio Control Distance Record by Dick Everett
AM, 9-59, p. 18

Meters Are Musts in R/C
GL, V1 #9

Meters, Internal Resistance, Shunts by Jerry McGeorge
GL, V1 #8

*Monitor for Tone Transmitters
MAN, 4-59, p. 34

1959 Nationals
GL, V2 #2

National Radio Control Championships
Run-down at Glenview
AM, 1-59, p. 12

New Look at Batteries by Fred Stong
Report on Alkaline type batteries, nickle cadmium.
MAN. 3-59, p. 35

New Look at Batteries by Fred Stong
Second in series of articles on nickle cadmium cells including construction of battery boxes.
MAN, 4-59, p. 18

The New FCC Regulations by Doris & Ed Yulke
MAN, 1-59, p. 28

*Nicad Battery Charger by John Jundt
AM, 12-59, p. 50

PC Board for Borges Relay Eliminator by R. A. Konkle
GL, V2 #3

*Power Converter Changes
GL, V1 #8

Printed Circuit Wiring for R/C Use by E. J. Lorenz
Beginning and introductory series of articles on how to do this advancing in radio control.
GL, V1 #10

Radio Control Articles Appearing in Street & Smith Publications.
A complete index going back to December, 1937 that appeared in Air Trails, Air Trails Pictorial, Young Men, and American Modeler up until 1958.
ATMA, 1959, p. 62

Radio Control in England by Howard Boys
GL, V2 #2

R/C at the Nats by John E. Snope
A report of the 1959 Nationals.
FM, 12-59, p. 24

R/C Bibliography for 1958
Compilation of major articles.
GL, V1 #8

Rector's Monitor
AM, 4-59, p. 33

Silk Screening Printed Circuit Boards by E. J. Lorenz
GL, V2 #1

Simple PC Bases
GL, V1 #8

Superhet Receiver by Leonard Chioma
GL, V1 #9

Testing Diodes with an Ohmmeter
GL, V2 #1

Testing Transistors with an Ohmmeter
GL, V2 #1

What They Flew in Radio Control at the Nationals
A complete run-down of 170 different planes at the Chicago 1958 Nationals giving complete information as to the event, place, points, plane, span, engine, tank, control system, receiver, transmitter, frequency, keying and remarks.
ATMA, 1959, p. 56

"Why's and How's of Simultaneous Control
By Eric Von Valtier
Here is circuitry for Bramco 8 channel receiver and 8 channel transmitter for the home builders.
ATMA, 1959, p. 52

COMMERCIAL EQUIPMENT REVIEWS

Bramco 27¼ Multi-channel Sets
Up to 10 channels.
AM, 9-59, p. 54

Controllaire Receiver
Features 1AG4 detector, 2N224 transistor for current rise, hard-tuber.
AM, 10-59, p. 48

KT127 by Lafayette Radio
AM, 12-59, p. 48

Versatile Spacemaster
Aristo's new tube and transistor receiver.
AM, 7-59, p. 54

LEGEND

AM - American Modeler
ATMA - Air Trails Model Annual
FM - Flying Models
GL - Grid Leaks
MAN - Model Airplane News

* - Schematics only _____

VOLUME 1 OF GL RERUN

Due to numerous requests, all 10 issues of Volume I have been re-run and are available at 35¢ per copy. Because of the fact that the press run was much smaller, these are higher priced than the original. Use convenient coupon below.

Grid Leaks--R/C Data Service
Higginsville, Missouri

Enclosed find _____ for the following copies of Vol. I

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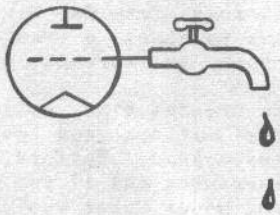
Grid Leaks At Play



We're rather proud of this issue of Grid Leaks which is being made up in the last month of 1959 which has seen a lot of advancement in radio control.

We're bringing you our annual bibliography which is an index of all major R/C articles that appeared in the major American publications and which provides a good index for most of the R/C that was published during the year.

Some readers might think we are a little "Kraft-happy" this issue but there has been no receiver in R/C history which has met with such unprecedented success and acceptance by the R/C fan as the Kraft. While the schematic of the original Kraft transmitter appeared in Model Airplane News, 1959, Phil Kraft has done considerably more research and has come up with an even better modulator and we're happy to present his newly revised transmitter plans in this issue. The next issue will present the revised Kraft receiver which has been re-worked to include the Nashville plug-in type electrolytics. Some other minor circuit changes have been introduced but, all in all, the circuit remains basically the same as shown by Dale Springsted in this issue. We are presenting this article by Dale Springsted because there is much meat in it and also because we feel that many of our readers will want to change over their existing Kraft receivers made from the Model Airplane News plans or the Grid Leaks plans to a faster pulsing type unit.

We are in receipt of a letter from the FCC mentioning the fact that Form 505 is hard to get because it is expensive. It places the burden for securing this form directly on the person who wishes to take out the license so if you've bought a kit or a transmitter within the past several months and have not been able to get a Form 505 from the manufacturer or from any of the dealers, we would urgently suggest that you write to the Secretary, FCC, Washington 25, D. C. and ask for Form 505 so it may be filed by you with them.

It behoves all of us to make sure our transmitters for Class C circuits are registered for the very simple reason that it will help in our fight to obtain additional frequencies. The AMA has petitioned for additional frequencies and it's up to us to get behind the AMA so these frequencies may help us to cut down on the interference which is becoming worse because of the Class D telephony stations and it will not lessen as time goes on. It will get worse!

That is one reason there is so much demand for audio type receivers because, while they, too, are subject to some interference, the interference is less pronounced than it is with carrier type of receivers.

We received the KC/RC Contacts the other day and want to toss in this very challenging statement from them to stir up a debate. Won't you write us your opinions on this? We'll get in touch with D. C. Stephens who is the editor of the KC/RC Contacts.

"The DC/RC Newsletter reports that George Austermann is "flying the pants off a single channel proportional, feed back system described by Gerry Herzog at last year's symposium. He says he can get feedback elevator, too, but hasn't hooked it up yet. System uses no relays but gobs of transistors." Which sort of brings to mind the recurring big question: Will it be humanly possible for the average modeler even to handle a full house proportional or "ulti" system? Or would variable throw R-E-A and possibly throttle be simply too much to control satisfactorily from a distance? Especially in a stunt type airplane?

"One of the surprising things in the last Nats was the fact that Walt Good--certainly one of the finest proportional control flyers--couldn't match the smoothness of the (full throw) Astrohogs' recoveries to straight and level flight even after excellent maneuvers. Right where the fineness in degree of control movement of proportional systems ought to shine was where the piloting troubles seemed to appear. Is it the principles of proportional that are simply out of reach? Or maybe the actuating devices are not strong enough to hold the desired surface setting? The aerodynamics of the aircraft? Or perhaps proportional methods in general have not yet been exact enough under flight conditions to make possible the same trimming effects that "beeping" of full throw servos and the slow reactions of a plane that "stays in the groove" will produce. Feed-back servos and exact signalling methods might be the answer. Neutral positions could be every bit as exact in feed back systems as any other way. And, if the full throw pilot can see or can learn that so much down trim is needed, why not the feed back flyer? And wouldn't the feedback servo be an easier way to get an exact, predictable reaction from the plane than accumulative beeping--or, as Doig calls it, "nervous proportional". We'll never know until we try!"

We are on the track of a simpler "ulti" type system and are exchanging correspondence with the designer on it and we hope to have something in the future issues of Grid Leaks about this simpler system which uses regular Marcy filters instead of hard-to-wind and expensive toroids.

From across the seas--from Ron Moulton, the editor of Aeromodeller--comes word that there is a plan there to start a radio control magazine and they are wondering if there would be enough support to warrant publication of such a specialized radio control model magazine.

They're, at the present time, soliciting information only and are not asking for subscriptions but we feel it's a good idea that you definitely get in touch with Ron at Aeromodeller, 38, Clarendon Road, Watford, Herts, England let him know if you feel such a publication would be warranted and if you would like to possibly subscribe to it.

Aeromodeller and Model Maker would then, in the future, if this plan went through, no longer carry any articles on radio control as they do now. We quote from Ron's sheet, "Our filing cabinet is positively bulging with interesting and informative articles on radio control--far more than we could ever release through the space available as a fair share in our existing magazines. We have a grand team of experts lined up for the three main classes of radio control namely: 1. The out and out beginner who must be led gently through his first designs by simple step-by-step articles. 2. The middle man who is progressing, perhaps, from rudder only to his first multi but still needs more guidance. 3. The expert who knows far more than we do but would welcome an exchange of ideas withother fellow experts where ever they may be."

If you think this would be a good idea, why don't you drop them a note and answer the following questions: 1. Are you interested in radio control? 2. Do you build such models? 3. Do you build your own radio control gear or buy it ready to use? 4. Do you operate single or multi? 5. Do you class yourself as a beginner, moderately advanced, or expert? 6. Do you belong to an R/C club? 7. Are you under 18 or over? We feel such a publication has merit.

Won't you share your circuits and ideas with us? To the many of you who have sent in circuits and have not yet seen them, please be advised that they are still filed and will be used in forthcoming issues.

Yours very sincerely,

Paul

Paul F. Runge
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