A Radio Control Publication for Beginner & Advanced Modeler

GRID LEAKS

R/C DATA SERVICE

NOVEMBER DECEMBER • 1962

VOLUME 3 • NUMBER 11 • THIRTY-FIVE CENTS

SPECIAL!

ALL ABOUT TEST EQUIPMENT! THE "MUST" ITEMS AND THOSE NICE TO HAVE!

PLUS

An easy to build monitor using one of your leftover receivers—

See pages 8 and 9

Attractive Pilatus Porter scale Nats entry by Dolly Wischer of the flying Wischer family. Photo by George Wells—from AMA.

• How you can convert your Duramite servos for relayless operation—See pages 10 and 11 •

PAUL RUNGE, Publisher • WILLIAM WINTER, Editor • WITT HOLLOWAY, Art Editor • BOBBIE RUNGE, Secretary-Treasurer
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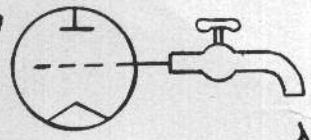
Grid Leaks At Play



Dear Grid Leaks Reader:

We want to take this opportunity to thank all of you who took the time and trouble to drop us a note concerning the last issue of Grid Leaks. We will mention some of these letters in the future issues, but for now just want to let you know that Winter, Holloway and Runge are all very grateful for the response.

Of course, as with any venture of this kind, the last issue of Grid Leaks was not without its errors! One that we'd like to mention now is the picture of the Gipsy Moth on Page 18. The first indication that we had that anything was wrong was a letter from Fred Sheplavy who was credited with taking the picture, saying, "By the way in the last Grid Leaks I was given credit for the picture on page 18. While flattering I don't deserve the credit as I did not have anything to do with it." Then a letter from Bill Northrop with the following information: "What a sneaky way of getting me to write a letter! If you haven't been told yet that Gipsy Moth on page 18 in the September-October issue of Grid Leaks is mine, all 7½ feet, and 15 pounds of it! The removable tube (bent) sticking up from the cowling is for adjusting the carburetor on the Forster 99. Ship was set aside after 61 Nats while I look for 18" props with 6" to 8" pitch. Maybe some of the G.L. readers would know where I can get some help in my search for 18 x 6 or 18 x 8 props. I hate to think of carving these!" Then in almost the same mail we received the following letter with this bit: "I am pretty sure that the picture of the Gipsy Moth is by me, taken at the Philadelphia Nats; in fact I got the negative out and it matches perfectly!" This from David Bales who formerly lived in Indiana and now is living in California.

So we hope that by presenting these three letters we've gotten the picture episode of the Gipsy Moth completely straightened out, and from the tone of the three letters involved we believe we haven't lost any friends.

One of the things that we enjoy greatly is reading the various club R/C papers that cross our desk, and while we may not mention them often, we think the editors of these club papers are due a tremendous vote of thanks from not only their fellow club members but from the R/C fraternity in general.

This is by way of introducing a summary which appeared in the Windy City Newsletter published by the Chicago Radio Control Modelers, Inc., in their October 1962 issue. Its editor, Flo Cerwin, was also the contest director for the Nationals held in Chicago this past summer.

What R/C gear was used in the 1962 Nats: Orbit (59); F. & M. (20); Kraft (19*); Min-X (16); Controlaire (15); C.G. (14); Bramco (11); Space-Control (9); Citizenship (8); Marcytone (5*); Ga-Lin (4); Deans (3); TTPW (3*); TR 4.5 (3*); ACL (3); Pullen Prop (2); Rameco (2); Micro-Mite (2); Gyro R Z (2); Micro-Tone (1); Klinetronics (1); Multiplex (1); and finally, own designed rigs (36**).

Items marked in the foregoing parenthesis with one asterisk* indicate equipment which was built from Ace R/C kits or components for a total of 30 units. The own designed rigs marked with double asterisks** total 36. It is reasonable to assume that a number of these bought some of the specialized components as supplied by Ace R/C.

These points we wish to make: 30 contestants built their own gear from kits, and 36 built from scratch from components. We feel this speaks well for the home builder of equipment, since this represents a total of 66 people in the 1962 Nationals. This makes the avowed purpose of Grid Leaks an even more important function since the builder of kit radio control equipment and scratch radio control gear is on the upswing.

Yours Sincerely,

Paul

Paul F. Runge, Publisher

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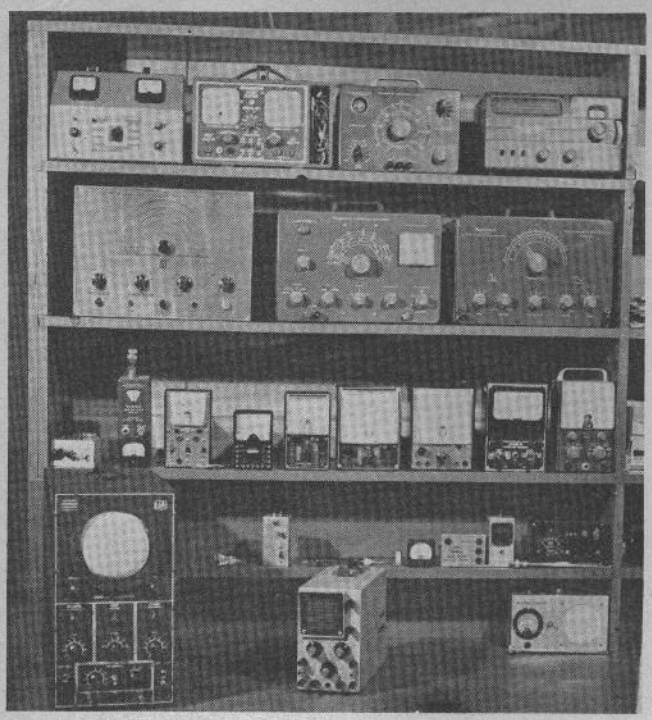
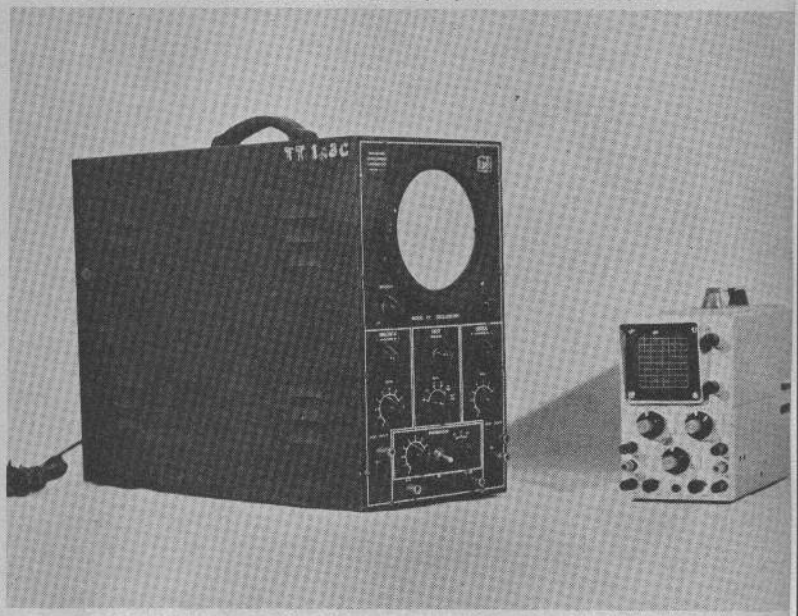
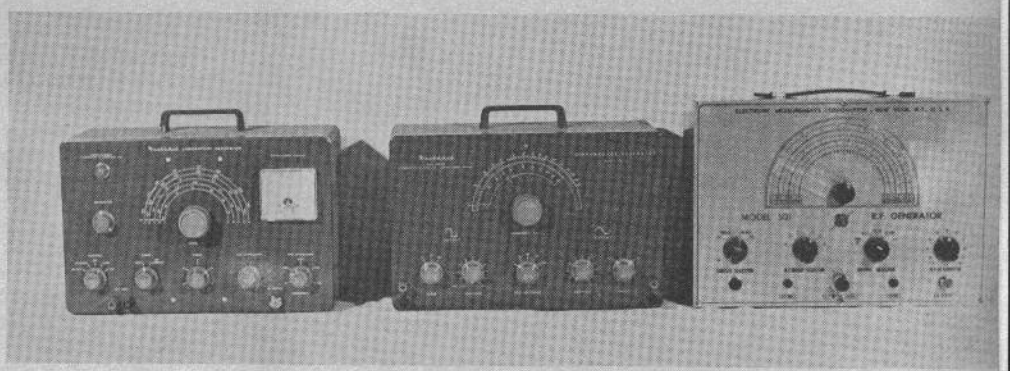


By PAUL RUNGE

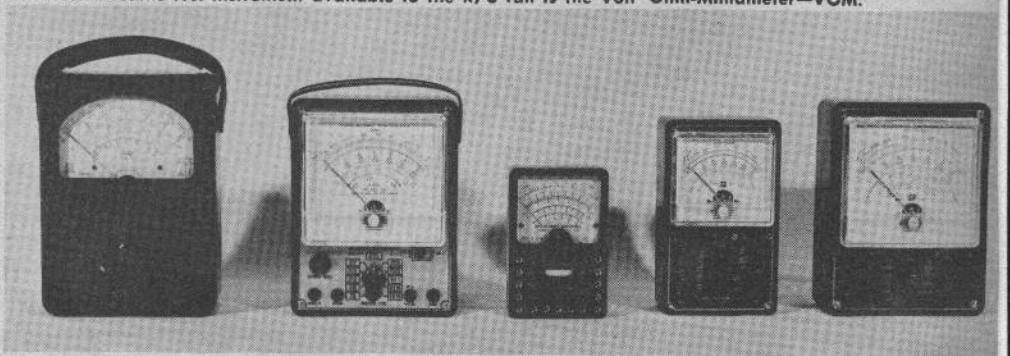
LEFT: With this collection you'd be prepared for all contingencies! BELOW: What VTVM reads on scale, Oscilloscope pictures on its screen.



TEST INSTRUMENTS FOR R/C



Signal generators, both RF and audio types, in serious fan's laboratory. Used with VTVM or 'scope. The most versatile test instrument available to the R/C fan is the Volt Ohm-Milliameter—VOM.



Without instruments of some kind radio control can be a really frustrating experience. A comprehensive rundown of those which you must have, and those which are desirable.

TO THOSE JUST STARTING OUT in R/C, or those who are still fairly new, meters and test instruments of various types probably seem like a lot of expensive extras which are really not required.

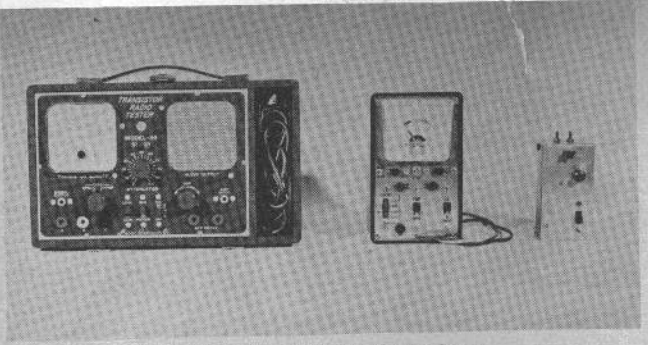
It is really amazing how much some of the old pros can do in the field of testing by simply poking about, cocking their head at a certain angle, or whacking a transmitter a certain way, but this "magic touch" is denied to most of us and so we must use the methods that bring "time-after-time" results so that we can accurately diagnose our problems, and feel the pulse and measure the blood pressures of this hobby of ours.

It is with the use of instruments that we can tell if our transmitters are tuned to peak output, if our receivers are accurately tuned in, or if that set of batteries we bought last week at the corner five-and-dime is going to stay up for our flight; these and many more bits of information can be easily obtained through use of just a few instruments which will be described in this article.

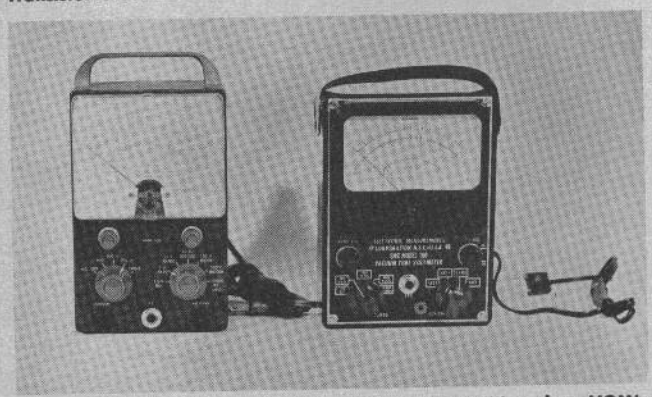
In R/C it's not enough to know that our patient is running a temperature—we've got to know how much!

For this article, we are going to divide instruments into roughly two groups: those considered necessary; and those considered desirable as you progress in the art and the hobby becomes a science.

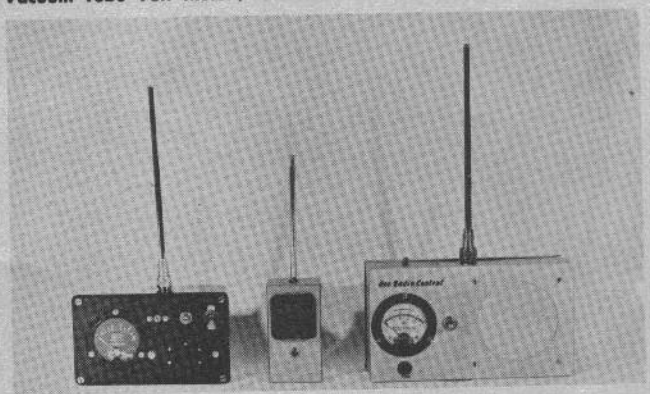
For those instruments classed as necessary, let's do a bit of looking around. We mentioned earlier that we want to be able to tell how much our batteries are putting out voltage-wise (under load, always); we also want to be able to tell when our receivers are hooked up correctly, or if there are any shorts or opens in the



Transistor checkers aid in the selection of transistors.



Vacuum Tube Volt Meters—VTVM—much more sensitive than VOM's.



Field Strength Meter reads RF put out by transmitter antenna.

TEST INSTRUMENTS FOR R/C

wiring in our installations; and we want also to be able to tune to a fine peak of sensitivity both our receiver and the output of our transmitter.

These three bits relate themselves to three separate and distinct functions that test instruments can perform for us. First, we need to measure Volts. Second, we want to check continuity or lack thereof; this is done with an Ohmmeter. Third, we want to measure both receiver and transmitter tuning generally by measuring the Milliamperes that are being drawn. These three functions are generally combined in one test instrument which has been used in electronics work for many years. This is the VOM, or Volt-Ohm-Milliameter.

While it would be possible for you to home build a unit, there are quite a few around which are very sensitive or, let's put it, as sensitive as R/C requires, and the ranges they possess are suited for R/C. If you were to do some comparison checking between the cost of these units, and the components that it would cost you to make one, it would soon be obvious that the best and most economical way out would be to buy a kit or a completely assembled VOM, instead of scratch building a unit.

A very acceptable sensitivity scale is 1,000 ohm per volt. These are in the lower priced field. Some 20,000-ohm-per-volt units are available, they are fine but a bit harder on the pocket book.

Probably the most important consideration in selecting a VOM is the ranges that it covers. Check the voltages first that are in use in R/C as a rule. Filament batteries are generally 1.5 volts. Some of the newer relayless receivers use 3 volts or 3.6 volts depending on the battery supply source. Some of the other receivers use batteries in the 9 to 15, 22½, 30 to 45 volt ranges. It is in the lower ranges that a fairly broad scale should be had. For instance, it is pretty hard to read for a 1.5 volt reading on a 50-volt scale—a 10 or 5 or 3 would be much better. On the top end of the voltage scale our transmitter batteries, especially for tube jobs, use B supplies of 67½ to 135, and some rare cases today of 180 volts. Seldom will any higher scales be needed.

For continuity, the ohms scale is not too critical. Generally, the lower priced meters have only two scales in the ohms field, and these are High and Low. The important thing, initially, is to be able to tell is a circuit "go" or "no go" as far as continuity is concerned. Of course, if the meter should have sensitive enough ranges for you to measure the values of some of those resistors that somehow lose their color code scale, this is a bonus, because as you stay in R/C, you will want to make some of these measurements some day.

In the milliamp range, generally you will need something on the order on the low side of 0-10 ma, mid range about 0-100 ma and top range 0-500 or 600 ma.

So it is obvious that a special sale of a VOM which offers only a 0 to 1 Ampere hour (1,000 milliamps) as its only ma scale is not a real bargain as far as R/C use is concerned.

If you can find one that gives DC current or ma ranges of say 0-5, 0-25, 0-200 and 0-1.2 A, with voltages of 0-5, 0-50, 0-300, 0-600 volts, and two resistance scales, at around $15 to $20.00, you've got a job that will fill a lot of your R/C testing requirements.

You can, of course, find these ranges in the higher price field, too. Some of the top brand name jobs run to $50 to $65 net for these items. So it's a question of how much your R/C budget will stand to do the job you need done.

One friendly bit of advice: If you have an option of buying a unit which has a fuse as opposed to one that does not, spend the extra couple of bucks for the fused unit. A fuse costs at most four bits. A replaced meter costs a darned sight more! And we like to feel that if we can blow up a meter, we're not the only ones that stupid!

So you have your VOM as your operating base. If your receiver requires a meter for tuning, it is advisable to make a separate pair of leads which are very short that can be put in to the circuit where the receivers instructions call for. This is easily done, but a word of caution again. VOM's, even inexpensive ones are comparatively fragile and they must be used with care on the field.

Some fellows prefer to have a separate Milliameter of the range required with its short leads mounted permanently so it can be plugged into the vehicle to measure the receiver current, and thus save the wear and tear on their bench instrument VOM. If you watch your bargains, some fairly inexpensive Milliameters can be picked up on the surplus market. These are generally of the moving coil type. The iron vane types for receiver tuning are not to be recommended since they have a very high internal resistance, and when removed from the circuit will throw the tuning off.

Some of the recent receivers suggest the use of hearing-aid sets for tuning. These are usually inserted in the circuit at a designated test point and the receiver is tuned for maximum volume of the audio tone. An ordinary inexpensive hearing aid phone of the high impedance type may be used, if your receiver calls for this tuning device.

Some builders prefer to permanently mount a milliameter in the tuning circuit of their transmitter, so they have an instant check of tuning conditions by merely glancing at the meter, instead of having to hook up their VOM when a check is desired. With the appearance of relatively inexpensive edge meters, many R/Cer's build in a 0-50 ma right into the transmitter case. Being small—Space Control's 0-50 ma job measures ½ x 1¼ and has a behind-the-panel depth of 1⅛ inches—they can be put on most of the available transmitting units today. They are generally wired in the B plus circuit.

However, many builders prefer to use a Field Strength Meter. This is an indicator which is used a few feet away from the transmitter and indicates how much Radio Frequency (RF) is being put out by the transmitter from the antenna. The milliameter inside the transmitter indicates only how much current is going into the transmitting circuit and does not necessarily give an indication of how much is being put out.

The Field Strength Meter may be a tuned or untuned RF circuit which is detected by a simple diode detector and fed into a low-range milliameter. Circuitry for such a unit is very simple and may be housed in a small box and plugged into a VOM when used. Others use a small case with surplus meters in the O-1, to 0-10 milliameter range. With a very low milliameter unit, a simple diode detector is sufficient; however, if a 0-5 or 0-10 ma meter is used, a transistor current amplifier circuit is required to get a sufficient scale reading on the meter.

In practice the FSM (Field Strength Meter) is always placed in the same spot relative to the transmitter, and then the final stage of the transmitter, including antenna loading is peaked for the greatest swing on the reeds. NOTE—Any portion of the transmitter which is related to the crystal oscillator may be tuned only by someone holding a commercial license of the First or Second Class. The Power Amplifier portion as well as the antenna loading circuit may be tuned under interpretation of the Part 19 of the FCC rules and regulations.

For bench checking in audio transmitter use, some builders also put in a speaker or headset in their Field Strength Meters to monitor the audio signal as put out by the transmitter. This applies only to audio transmitters, of course, but the day of the CW or Carrier Wave only transmitter is rapidly disappearing since they are interference prone. Range of units of this type is limited, of course, and some builders make a monitor from a receiver which is much more selective and has a greater range and can be used on the field to detect the presence of interfering signals from other R/C transmitters or other Citizens Band interference. (See Mini Monitor in this issue.)

Reference was made earlier in the voltage checking portion about testing batteries under load. This is very important, since with the sensitive VOM, if a battery is read for voltage without a load (load here refers to the normal operating function that the battery will be performing when the set is turned on) the reading will be too high and may show batteries reading all right, when in reality they are about ready to go. To test under load, either turn on the unit and test all batteries under the maximum milliampere drain they will be subjected to with the voltmeter. This will show the true condition of the batteries and whether or not they are beginning to sag. Some flyers have rigged up simple simulated load testers (GRID LEAKS, Volume III, Number 4) which duplicate the drains that are put on their batteries by filaments, B drain under signal conditions, and escapement drains when pulling maximum. ALWAYS check voltages under load.

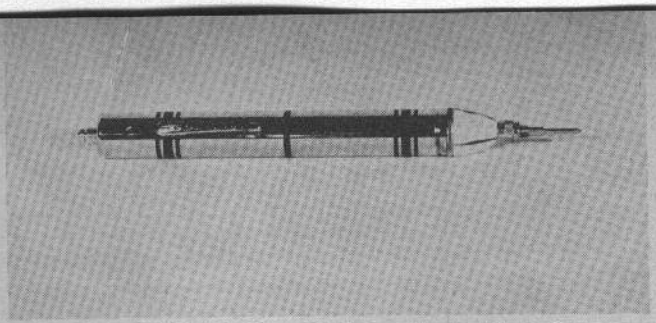
We now pass from the essential equipment to that which can be classed as desirable. Here, the field is not a simple matter of selection, but the choice depends somewhat on the direction in which the R/C fan is going. Is he beginning to use Superheterodyne circuits, is he going deeper into audio, is he designing some of the R/C gear himself? Answers to these and other questions will determine what test instruments he may consider desirable. We will cover some of these test instruments as used in R/C, and list some of the functions they perform. It would be impossible, however, to list all instruments, and all of their uses.

If you are using superhets, a VTVM, Vacuum Tube Volt Meter, is almost in the necessity class. The VTVM will take readings at the various stages of the Superhet without putting any drain on the circuitry itself. It may be used in any circuitry where any type of load such as put on by a VOM—with sensitivity of 1,000 or 20,000 ohms per volt—would "pull" the reading to reflect a situation which is not true or correct. VTVM's are not limited to these uses, but may also be used to check for capacitor measurements and hundreds of other test functions.

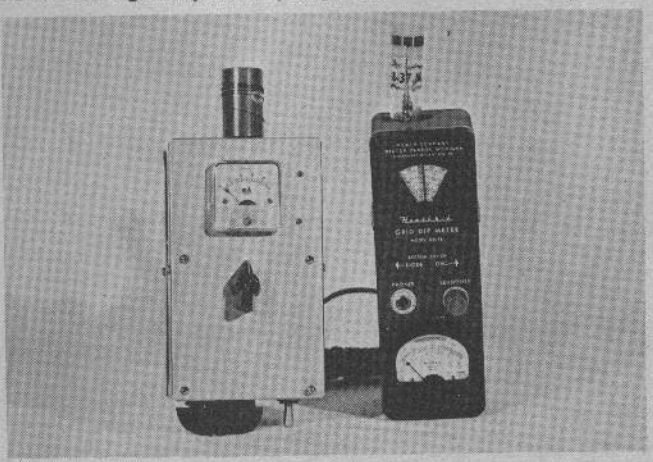
An oscilloscope will perform many of the functions of a VTVM but do it visually. The audio signal shape may actually be seen with a scope and it is easy to determine exactly what is happening to a signal as it is traced from stage to stage. Most audio signals as put out by the transmitter have a very definite wave shape or form. In the receiver these signals are detected usually in not the exact same form or shape, but somewhere along the line, need be restored to type of signal emitted by transmitter

A scope is by no means limited to this type of measurement, but may be used to compare RF frequencies and audio frequencies and determine if they are within a given range. In the case of RF this can be used to check frequencies against a Frequency Standard to determine if the transmitter is within the RF frequency prescribed by the FCC. In the case of audio frequencies, an Audio Signal Generator is required, and checks can be pulled to determine what frequencies are being put out for AF filters or what tones are required for reed units.

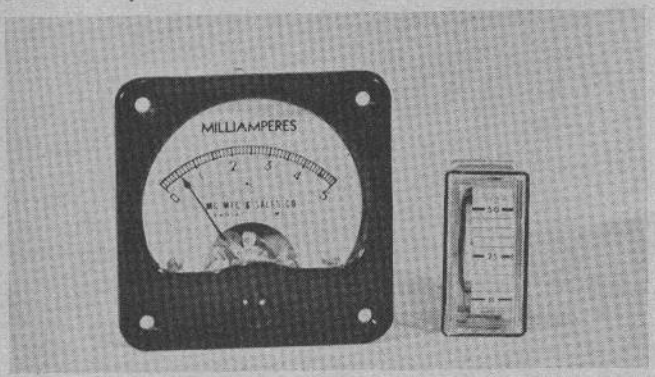
Another instrument which has a great versatility around the bench is a Grid Dip Oscillator. It's primary use is to measure whether a coil and capacitor combination is operating on the correct Radio Frequency. However, the unit can be used as a Field Strength Meter, a Monitor, a low-power transmitter, a measuring device for capacitors against known values and, with some imagination, the GDO can perform many versatile functions, particularly for the R/C builders who go at the design of equipment from scratch.



Home-made signal injector in penlight case for troubleshooting.



GDO—Grid Dip Oscillator — will perform amazing services for you.



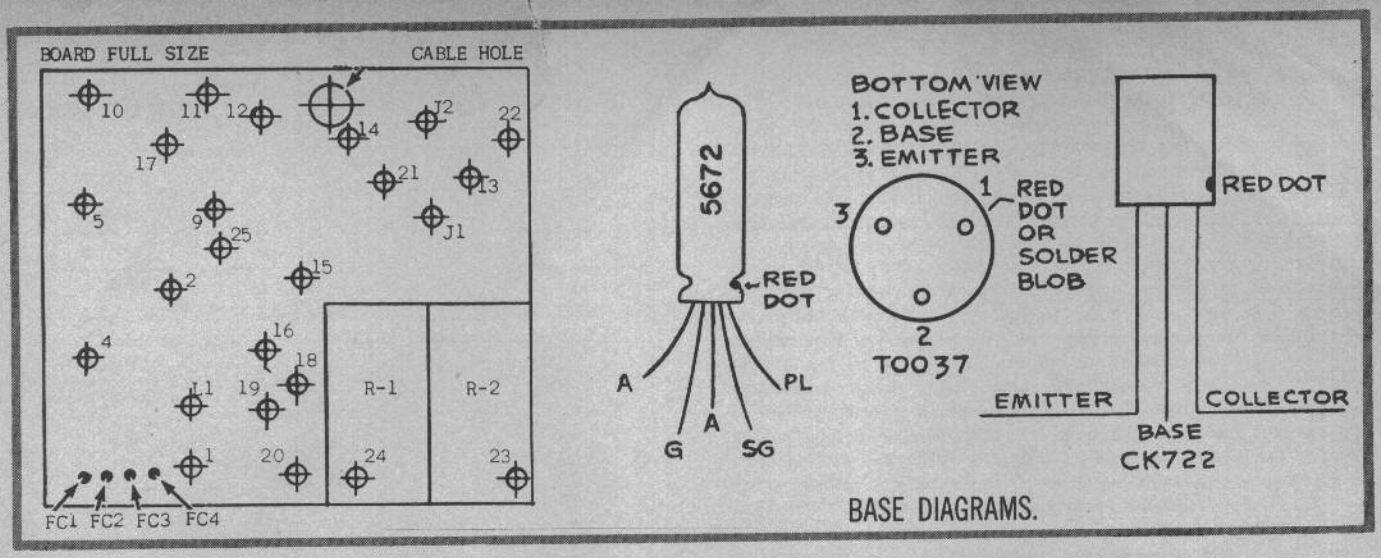
Milliameters used to tune r'cvrs, in X-mitters for constant check.

With transistors being used in increasing numbers of circuits, the use of a transistor checker is also coming to the fore. Some of these consist of adapter devices which use your own VOM. One of these was described in GRID LEAKS, Volume III, Number 9, and for most of the R/C fraternity this type is sufficient. However, if quite a bit of testing is involved, there are a number of testers which can be had in the commercial field with built-in meters with direct Beta readings on them, as well as leakage checks. Some of these also have built-in signal generators which can be used to inject signals and help trace troubles in multi-stage receivers.

Signal injectors of the home-made variety (see GL in a future issue) are a real joy to use in tracing multi-staged receivers. In practice, a headset is placed across the reed bank or escapement coil, and the signal injector probe is placed first at the speaker and its audio signal is heard. Then going into the receiver backwards, stage by stage is tried with the probe. If at any one given point the signal does not come through the headset, the trouble is isolated and can be traced to the components used in that state. Because they "splatter" quite effectively, signal injectors are also useful in most IF and also RF stages of Superhet receivers.

This list of desirable instruments could be expanded. There are Bridges to accurately measure both resistance and capacitances; condenser checkers to check for capacity in circuits and also out of circuits. Q meters which determine how efficient a given coil capacitor combination is in a particular application.

The foregoing material has been presented however, primarily to help the newcomers and novices determine just what test instruments they must have, and then depending on which way their pursuit of Radio Control as a hobby takes them. It is hoped that the explanations given will be of some help to make R/C a more enjoyable hobby. Without instruments of some kind, it can be a really frustrating experience.



BASE DIAGRAMS.

NEW!

TWIN-SIMUL LAYOUT

JOHN RAWLINGS uses conventional parts to achieve smaller Marcy Twin receiver.

WHEN IT WAS INTRODUCED several years ago, the Marcy Twin Receiver made no particular attempt at miniaturization. It offered simplicity of construction and ease of operation and two channels. It was patterned after the successful Marcy single and six.

It remained for John Rawlings of St. Louis to take the components as they were used in the original and come up with a miniaturized version. The unit could have been made smaller, of course, by going submini on the filters but John wanted to use components which were available and "off the shelf" to achieve a smaller unit.

The result is a receiver which is small, offers a tube detector, two channels which are fairly broad and therefore does not require a toroid stabilized transmitter—and even in this day of micro-miniatures has much to offer the experimenter.

John's unit utilizes both sides of the circuit base, whereas the original used only one, and thereby "shrinks" the unit down to 2¼ x 2½ inches.

This is *not* a printed-circuit type of construction, but is of the type known as point-to-point. All components end in eyelets, and jumpers are used in place of copperstrips. In this type of construction it is desirable to pre-tin the leads of each component. Just as in PC work, a soldering iron of the light type —25 to 37½ watts—is required. The use of only rosin-core solder is mentioned again as a reminder.

The schematic of the circuit which appeared in GRID LEAKS in Volume I, No. 10, is repeated for the technical minded. Study shows that it is a simple straight-forward super-regenerative detector. This is a familiar circuit to all who build their own. This detector is couple to the two transistor amplifier stages. Although there is a considerable mis-match between the tube and the first transistor, it doesn't bother the receiver since more than enough audio gain is developed. The two audio stages are coupled to the filter networks and relay stages through 4.7K resistor and .01 going to each of the stages. The relay transistors are held to cut-off until the moment the audio signal appears which is of the correct cycles per second required by the filter. When this happens, the correct relay is triggered, jumping from about .1 milliamp to over 4 for very reliable and satisfactory relay operation.

The receiver is quite fast in response to a signal and may be pulsed in either or both channels simultaneously. The filters used were selected arbitrarily and almost any selection of two filters would do the job, provided no harmonics are encountered. Channel 3 is 2400 cycles per second; channel 5 is 3400 cycles per second. The Marcy Twin Transmitter with Tone Generators appeared in GRID LEAKS Volume I No. 10. If later and up-dated circuit information is desired let your editor know and it will be provided in a future issue.

To duplicate John's version of the Marcy Twin drill the base for eyelets as follows:

3/32" hole—holes 2, 9, 11, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24 and 25.

⅛" hole—holes 4, 5, 10, 12, 13 and 21.

Insert SE33 eyelets in all 3/32" holes and fasten by using tool made of ¼" diameter iron rod and tap gently with a hammer. This will flare the bottom of eyelet so it is held firmly. Excessive pounding is not required or desirable. Insert SE43 eyelets in ⅛" holes and mount.

Drill 1/16" holes at FC1, FC2, FC3, FC4 for flea clips.

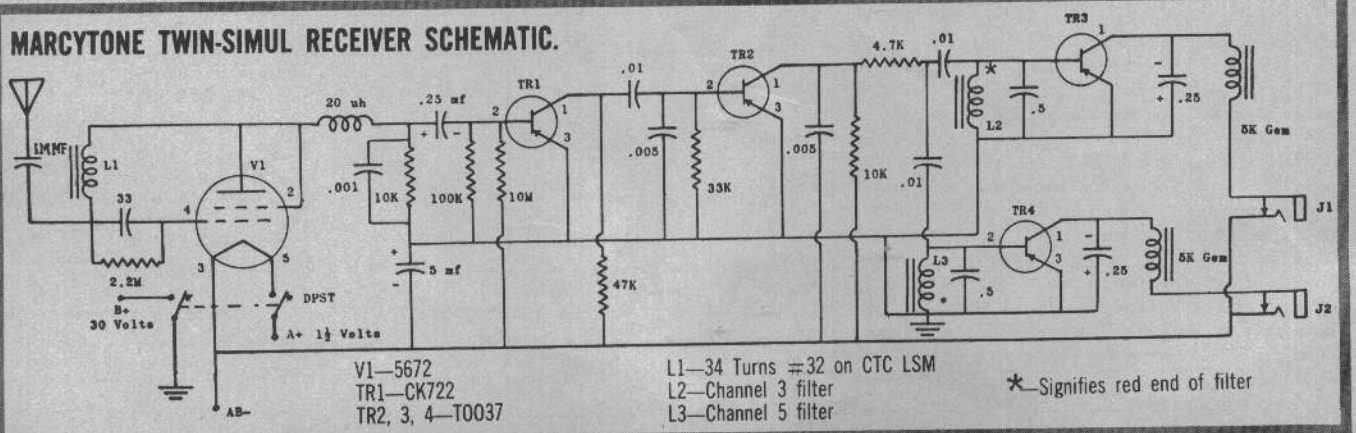
Drill ¼" holes at J1 and J2 for Switchcraft Tini Jax closed-circuit type which are to be used for tuning each relay stage.

Pre-tin all eyelets.

Now follow the steps below in order for easiest assembly. Be careful since all soldered connections may be made after all components are placed. Excess of the leads is then clipped off.

Mount coil in base with the turns on the bottom of the board in L1. Insert flea clips into holes FC1 through FC4 from the top of the board. Install jack sockets from the bottom of the board in holes J1 and J2. Install relays in positions R1 and R2 (Drill to suit relays).

MARCYTONE TWIN-SIMUL RECEIVER SCHEMATIC.



V1—5672
TR1—CK722
TR2, 3, 4—TO037

L1—34 Turns #32 on CTC LSM
L2—Channel 3 filter
L3—Channel 5 filter

*—Signifies red end of filter

COMPONENT	FROM	TO	SIDE OF BOARD
RF choke	FC 1	4	bottom
10 kΩ	4	18	bottom
.001 μf	4	18	bottom
.25 μf elec.	4(+)	5	bottom
100 kΩ	5	10	bottom
.005 μf	10	11	bottom
.01 μf	11	9	bottom
47 kΩ	9	12	bottom
10 meg Ω	12	5	top
5 μf elec.	10(+)	2	bottom
2.2 meg Ω	FC 3	top coil lug	bottom
33 μμf	FC 3	top coil lug	bottom
1 μμf	1	top coil lug	bottom
jumper	FC 1	lower coil lug	bottom
jumper	2	FC 4	bottom
jumper	2	12	top
10 kΩ	12	17	top
.005 μf	12	17	top
4.7 k	17	25	bottom
.01 μf	25	16	bottom
.01 μf	25	19	bottom
.25 μf elec.	18(+)	20	bottom
.25 μf elec.	18(+)	15	bottom
jumper	16	14	top
jumper	19	22	top
jumper	23	24	top
jumper	24	18	bottom
jumper	J1 thru 21	R1 (coil)	b to top
jumper	J2 thru 13	R2 (coil)	b to top
L2 (filter)	red end to 22	23	bottom
L3 (filter)	14–red end to	24	bottom
red wire	(+30 volts) ---	23	Bring wires from bottom of board thru cable hole to solder connection
brown wire	(+1½ volts) ---	FC 2	
black wire	(A & B–) ---	12	
jumper	12	(stationary tap of J1 & J2)	bottom
jumper	18	10	top
TR 2 T0037	collector	17	top
	base	11	top
	emitter	10	top
TR 1 CK 722	collector	9	top
	base	5	top
	emitter	10	top
33 kΩ	10	11	top
TR 3 T0037	collector	20	top
	base	19	top
	emitter	18	top
TR 4 T0037	collector	15	top
	base	16	top
	emitter	18	top
jumper	20	R1 (coil)	top
jumper	15	R2 (coil)	top

Why be "Shot Down" by Citizen-Band phone operators when you can be sure nothing is on the air before you fly—simply by modifying a spare receiver to make this MINI-MONITOR

By FRANK SCHWARTZ

A CHEAP AND SIMPLE MONITOR is something that has not been available to the R/C fan. Planes often have been "shot down" by Citizen Band phone operators and the unsuspecting flier did not have the slightest idea that there was a CB rig operating anywhere near him. With a monitor that will hear all that our average receiver will pick up, the R/C man can be sure nothing is on the air before he launches his plane.

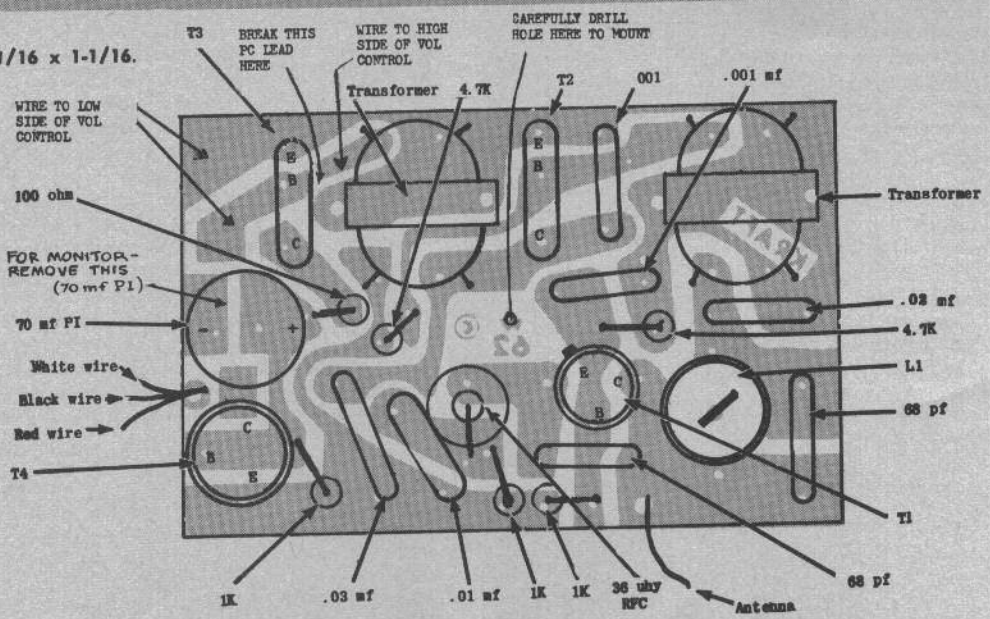
It also is handy for checking tone transmitters. Many times we have wanted to hear a tone we were transmitting on the bench when padding a transmitter or checking it out. This is it . . . you can take the Ace K3VK and with a minimum of parts make a first-class monitor that will work for months on a set of pencells.

Basically, what we did was to substitute an output transformer for the escapement coil and couple this output transformer to a small speaker. We made ours in the little aluminum box the size of the six-channel Kraft receiver. The receiver, the speaker, the volume control and the batteries are all in this case. It was a tight squeeze but we made it.

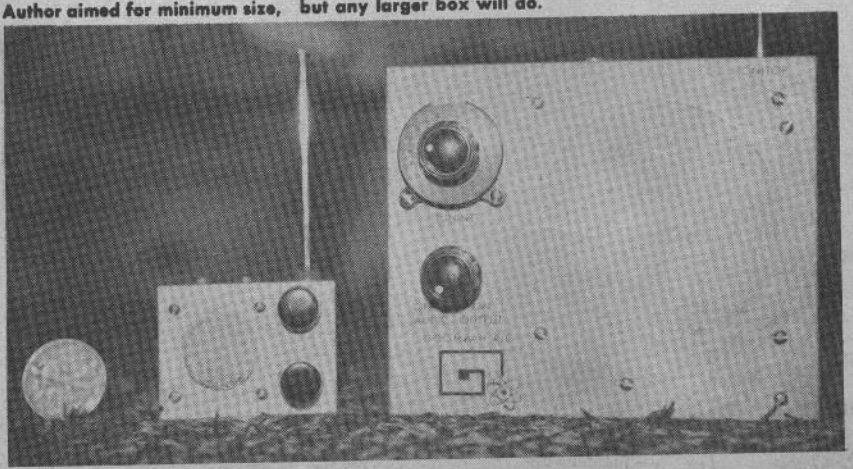
We do not suggest that you try to compress it all into this small a box unless you are prepared to do a great deal of cussing and head scratching. A 3 x 4 x 5 in. Bud Minibox will leave you plenty of room and you can use D cells instead of pencells and they should last almost . . . well, my unit has two Eveready E91 cells in it, three months old and going strong. If you use a larger case you can install a better speaker and this will give you more volume. However, the little unit with the smallest imported speaker I could find can be heard nicely outdoors 25 to 30 feet away—and all over the house, provided the kids don't drown it out!

The diagram is marked with the simple changes required. First remove 70 mfd P.I. type condensor; you will not need it for the monitor. Obtain a 5000-ohm volume control with a switch. Only one land on the board has to be cut; this is the lead from the second transformer to the base of T3. The diagram shows that your volume control now is across the secondary of the transformer and the sliding tap on the volume control hooks to the base of the transistor T3. The off-on switch on the back of the potentiometer is in series with whichever side of the 3 volts you choose to switch. In the center of the PC board is a space which can have a small hole drilled out; a 2-56 bolt can be threaded in it. In my unit I made a bracket, mounted a piece of phenolic to it and then bolted the K3VK to it for support. As a fur-

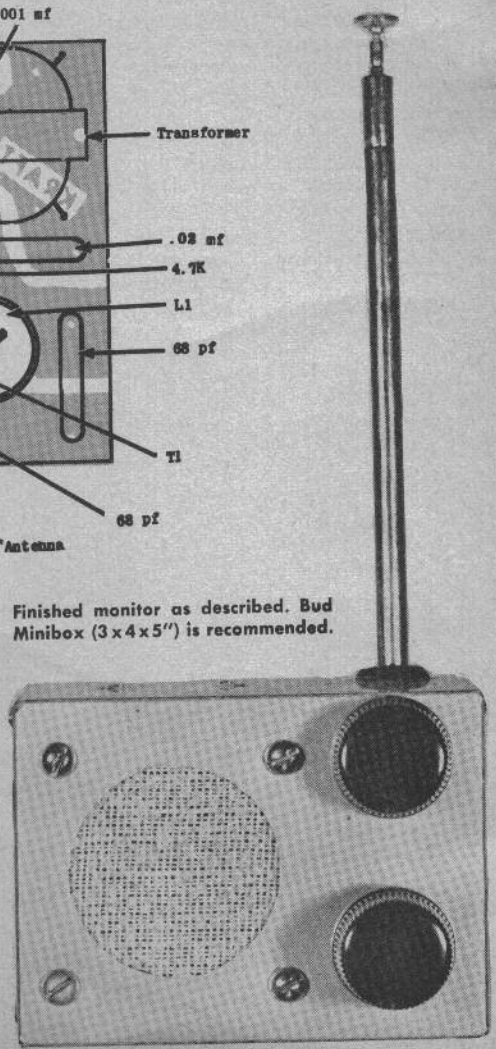
Actual size 1-11/16 x 1-1/16.

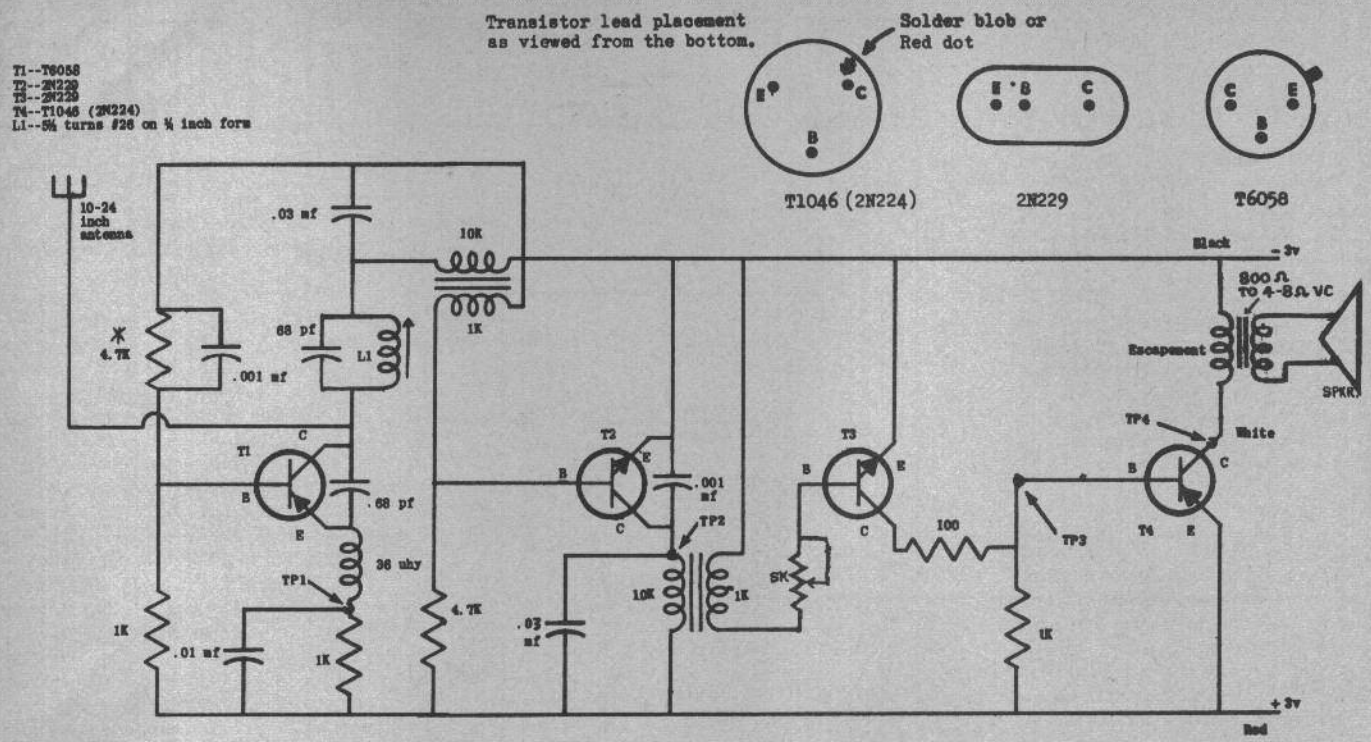


Author aimed for minimum size, but any larger box will do.



Finished monitor as described. Bud Minibox (3x4x5") is recommended.





ther refinement I "Goo" cemented in a piece of tuning wand and this came out the front panel to a knob; by doing this the unit can be tuned over the entire R/C band. Once set for your frequency you can swing the knob half a turn either way to see if any interference is present.

The output transformer was a little one from the junk box. Any of the cheap imported ones will do. About 800 ohms *impedance* (not resistance) to 4- or 8-ohm voice coil is about right; it is not too critical. Then you need a speaker of whatever size you choose. The leads from the volume control to the board are not critical, provided they are kept away from the antenna lead.

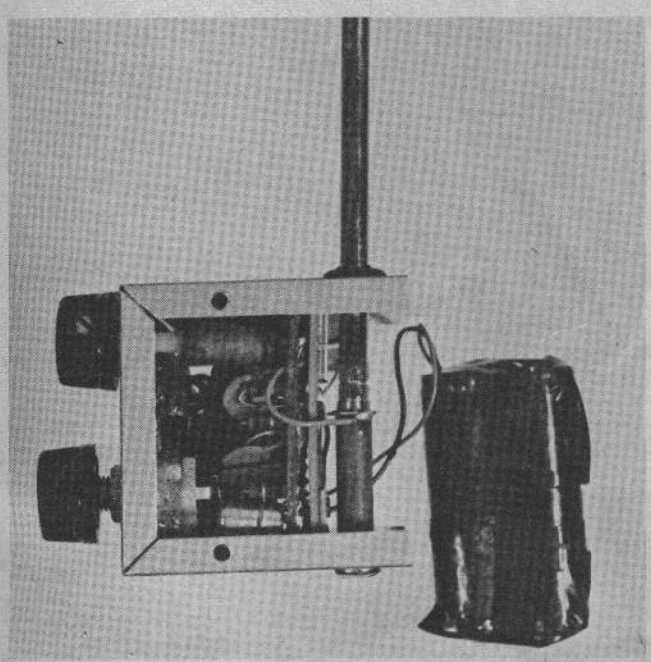
The antenna can be whatever you like. I used one of the 18" collapsable ones and ran it through a grommet in the case to a threaded nut mounted on a fibre standoff. You may want to use an insulated banana jack and plug in a piece of music wire. If you use wire be sure to put a loop in the end so you won't have a sharp pointed end sticking up.

It should be emphasized that the small size of my unit was merely because I wanted to see just how small I could make it. Yours can be mounted in any type of box or case and can be tunable, or you can leave a hole for tuning wand adjustment.

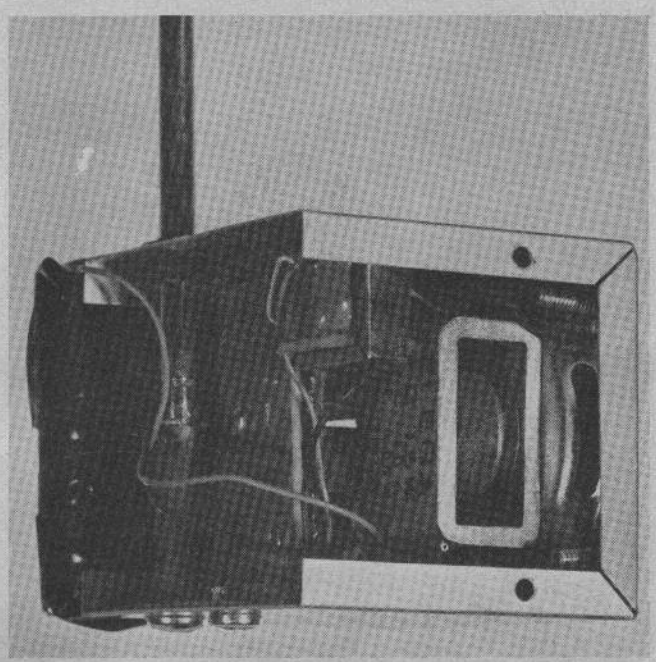
If you operate this monitor too close to another receiver, five feet or less, they will interfere with each other. This is because a superregen receiver does radiate a small signal and, although very weak, two of them up close to each other can interfere with each other.

This unit reproduces tones beautifully. Speech does not come through too well—remember it wasn't designed to reproduce speech so don't expect hi-fi reproduction or anything like it from CB signals.

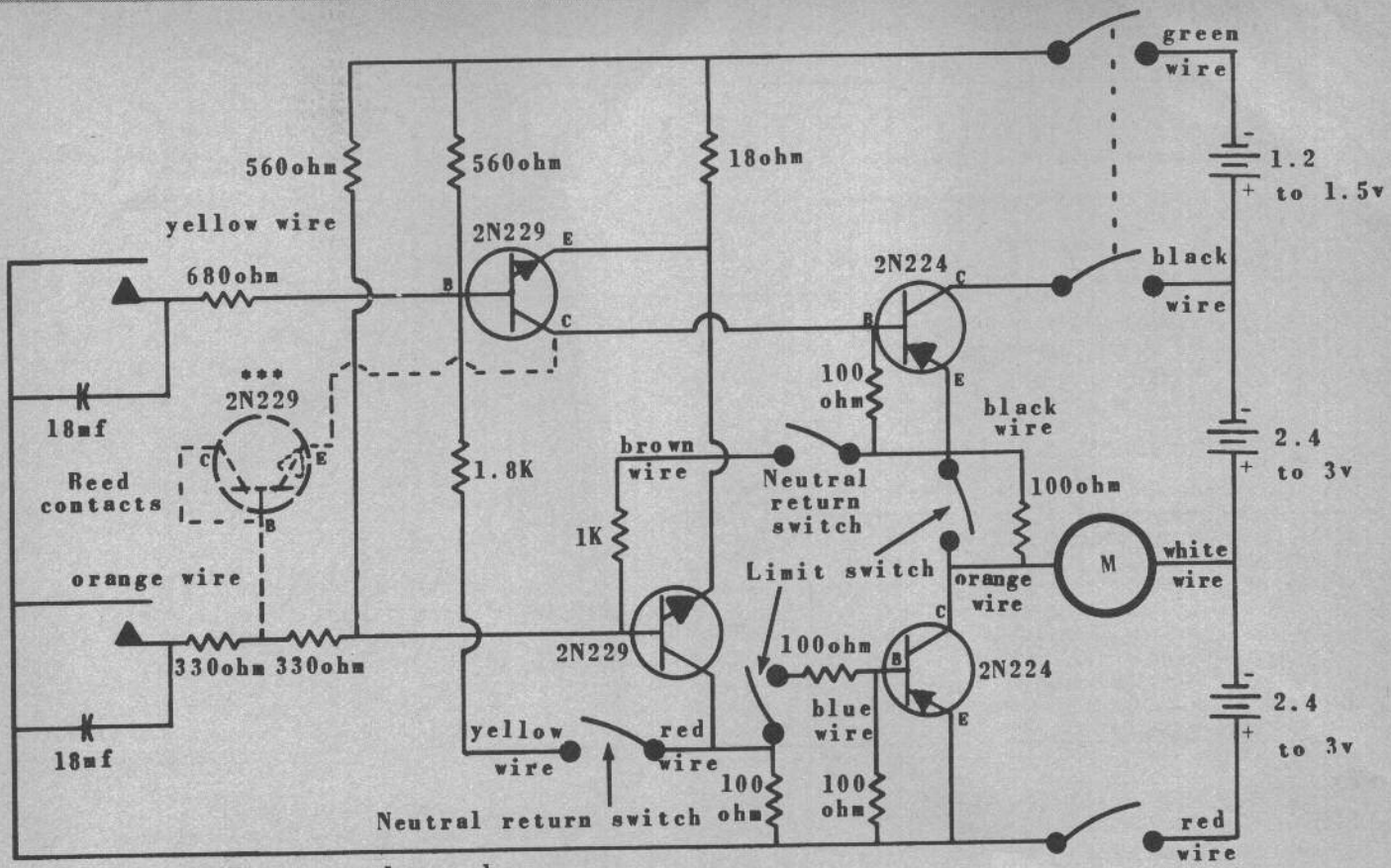
Here in Nashville, we leave the monitor on all the time and monitor the single and multi boys. We don't have to guess if the flier gave it left or right—we can hear it. Build one. I know you will like it!



Original monitor was built in box the size of Kraft 6-channel can.



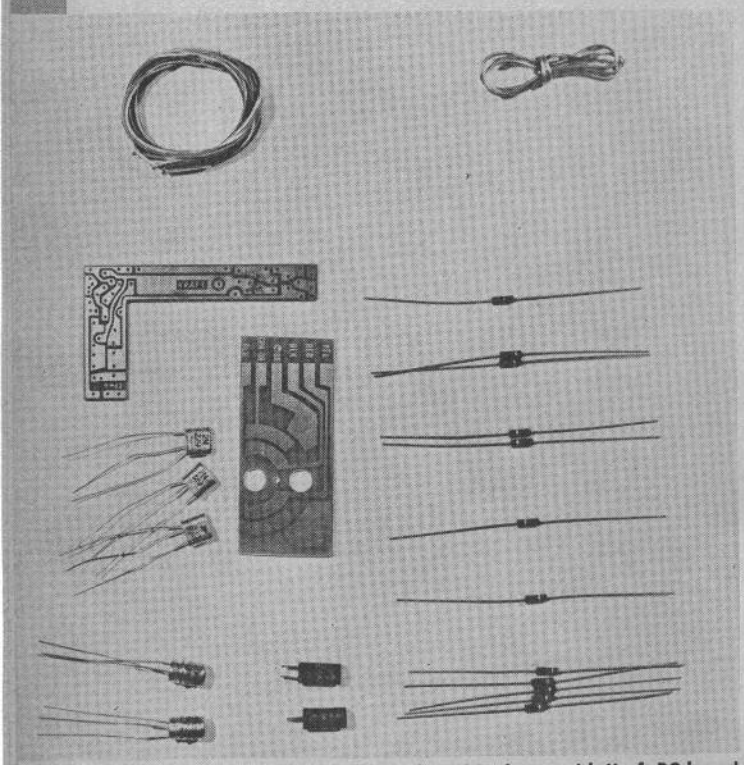
Note the speaker at right. Larger box does permit a better speaker.



Collector to Emitter voltage drop
of T2 is maximun of
.06v no load
.2v or less stalled

Motor 2.7 ohm winding
Running current 250 ma no load
Running current 800 ma stalled

TRANSISTOR AMPLIFIER



A modified Duramite printed circuit board is shown with Kraft PC board for transistorized amplification. As can be seen, the task is simple.

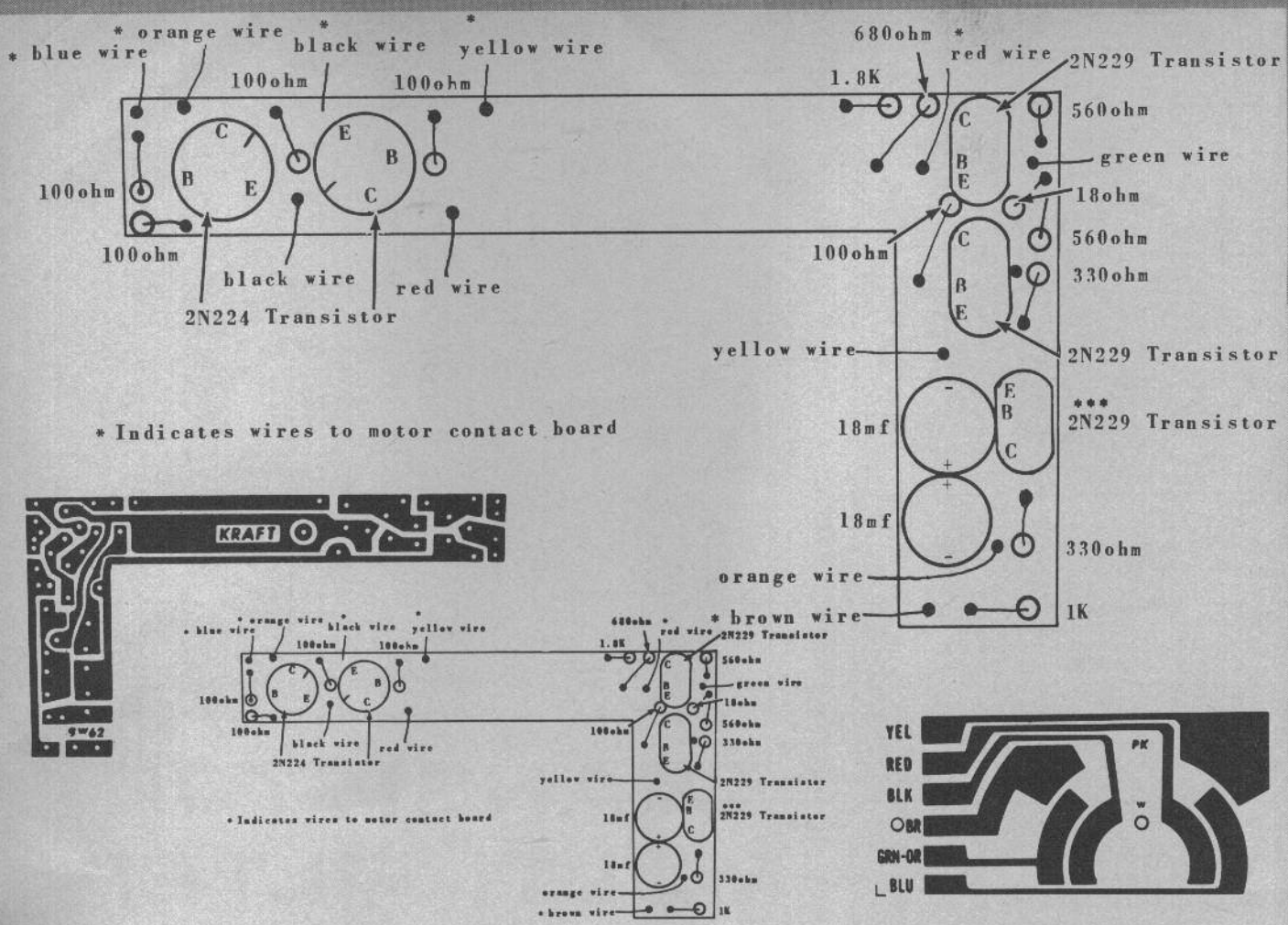
WHEN THE KSS10 WAS INTRODUCED early in 1962 for multi-channel receivers, primarily the Kraft Superhet, the response was fast and vocal from the field—why limit this servo-switching amplifier to 10-channel multi rigs—give us other guys a chance. "We've got Duramites around, we'd like to convert them simply over to relayless operation," was the word.

Here is the circuit and base for such a unit. This will allow the home builder to duplicate in each servo as desired the dependable switching action provided for in the KSS10 units. The PC board has been designed to fit into the Duramite can, and should be used with a small insulating board when installed to prevent any shorts.

Unlike the KSS10 circuit, however, something new has been added. Refer to the schematic and note the 2N229 which is being used as a diode—it is marked by dotted lines. This is the burn-out proof addition which insures that prolonged contact of two adjacent reeds will not blow the remaining transistors. On the component locating diagram it is marked ***.

The diode-connected 2N229 is not really needed in most uses. The shorting of two adjacent reeds happens so seldom in the properly connected set up—and then only for a short space of time—that the circuit shown will do nicely without them. However, the extra is shown in the circuit for those who like peace of mind, and are fearful of the possibility of this happening. (Remember the relay days? If adjacent reeds were held on one of those—it meant welded relay points! And this did not happen too often.)

With only four transistors and a minimum of components in the amplifier, the chances for something going wrong is lessened. It does mean that components must be carefully selected, however, and the transistors picked and matched. The 18-mf electro plug-ins used are special jobs and ordinary 18 mf or near value will probably not perform. The standards for these are so rigid, that they are factory picked by the manufacturer of the capacitor for



FOR DURAMITE SERVOS

Thousands of owners of relay equipment now can rejoice, for here, at last, is a simple kit with which you can convert your Duramite servos to the relayless system. Now you can have top performance at a saving.

By PHIL KRAFT

performance desired. These units have no minus tolerance, but are 18 mf plus with the dissipation factor chosen for a much greater tolerance than usual electrolytics.

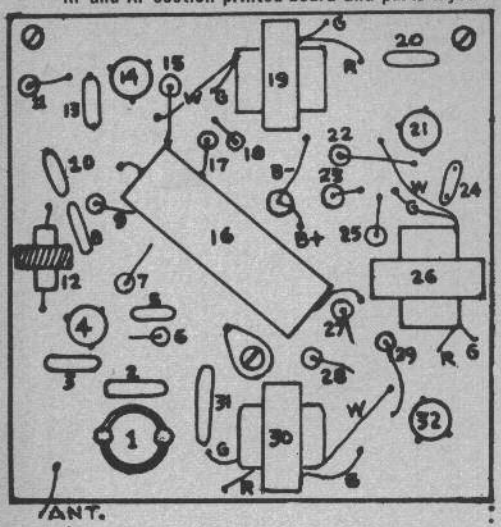
The switching board which is to be used in the servo is also shown, and the color coding of the wires connected to it from the PC board of the amplifier is identified. These should be cabled together and laid inside the case for a neat installation without any excess of wires.

Many builders of servo amplifiers have stated they like cementing the transistors down after installation to make sure that a landing a bit harder than usual does not jar them loose. In the amplifier, the transistors are mounted flush on the base—no special heat-sink preparations are used. Good soldering practice is a must, since all that is required is for the iron to stay in place long enough to flow the solder and make a good joint. Irons of 25 to 37½ watt types are a MUST.

So if you're one of many who asked for a single servo board and circuit you could use to convert your Duramite to relayless operation, this is for you. A check of the photo showing the parts required will show that the relayless changeover can be accomplished with a minimum of parts and be gentle to your pocket book, too.

Completed and wired, ready for installation in the servo can, your transistorized assembly should look like this. Photograph is exact size.

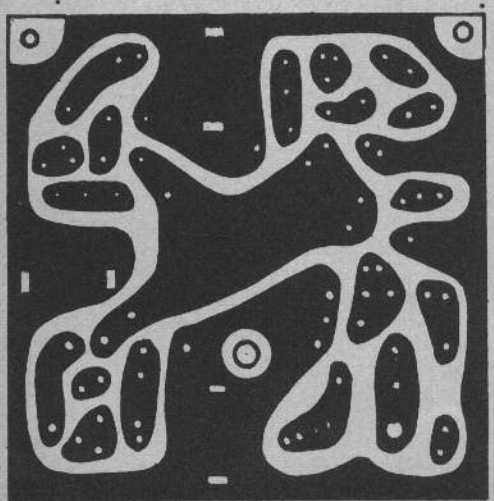
RF and AF section printed-board and parts layout

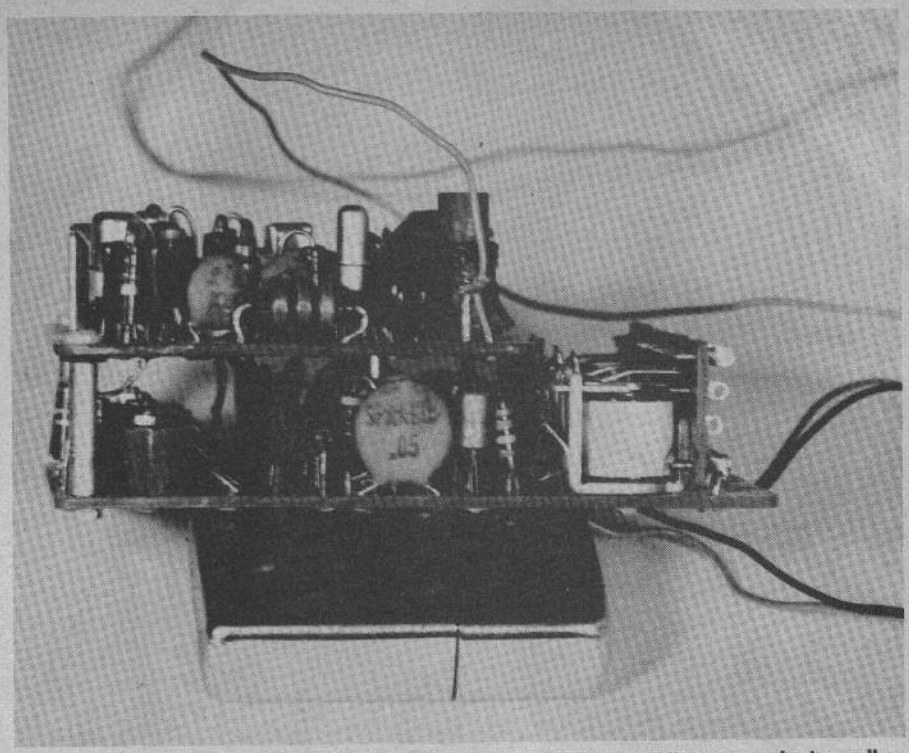


Top view of printed circuit showing parts placement Actual size

1. antenna coil
2. 22-mmf silver mica cap.
3. 10-mmf silver mica cap.
4. SB100, 2N128, A01 transistor
5. 470-mmf ceramic cap. disc
6. 27K ohm ½-watt res.
7. 10K ohm ½-watt res.
8. .001-mfd ceramic disc cap.
9. 2.4K ohm ½-watt res.
10. .001-mfd ceramic disc cap.
11. 5K ohm ½-watt res.
12. 300 microhenry rfc.
13. .04-mfd ceramic disc
14. 2N223 transistor
15. 110-ohm ½-watt res.
16. 160-mfd 6V electrolytic cap.
17. 470-ohm ½-watt res.
18. 10K ohm ½-watt res.
19. Cr 60 audio transformer
20. .0015-mfd ceramic disc cap.
21. 2N223 transistor
22. 110-ohm ½-watt res.
23. 470-ohm ½-watt res.
24. .01-mfd ceramic disc (optional)
25. 10K ohm ½-watt res.
26. Cr 60 transformer
27. 1.2K ohm ½-watt res.
28. 18K ohm ½-watt res.
29. 120-ohm ½-watt res.
30. Cr 60 transformer
31. .015-mfd ceramic disc cap.
32. 2N223 transistor

Bottom view of printed circuit board





No determined effort was made to minimize size; ultra-miniature addicts can make it smaller.

TRANSISTOR MULTI-FILTER RECEIVER

by MELVIN HALL

THIS RECEIVER is an all-transistorized outfit that uses the Rameco filters for channel separation. Type PCF filters were used and were tuned for 1900, 2100, 2400, and 2700 cycles per second. No determined effort was made to keep the receiver as small as possible. The outcome was a four-channel version with case dimensions of 4 x 2½ x 2". It weighs 6 ounces. The ultra-miniature addict undoubtedly could come up with something considerably smaller and lighter.

The RF and AF section uses 6V. The detector is similar to most of the transistor detectors with the exception of the 470-mmf capacitor from the transistors base to ground. It was found that this increased the sensitivity quite a bit. On some detectors this capacity may not be necessary. The AF amplifiers use a layout similar to the TR 4.5 but the biasing resistances are lower. This gives good temperature stability. The transformers are CR 60's or ST11.

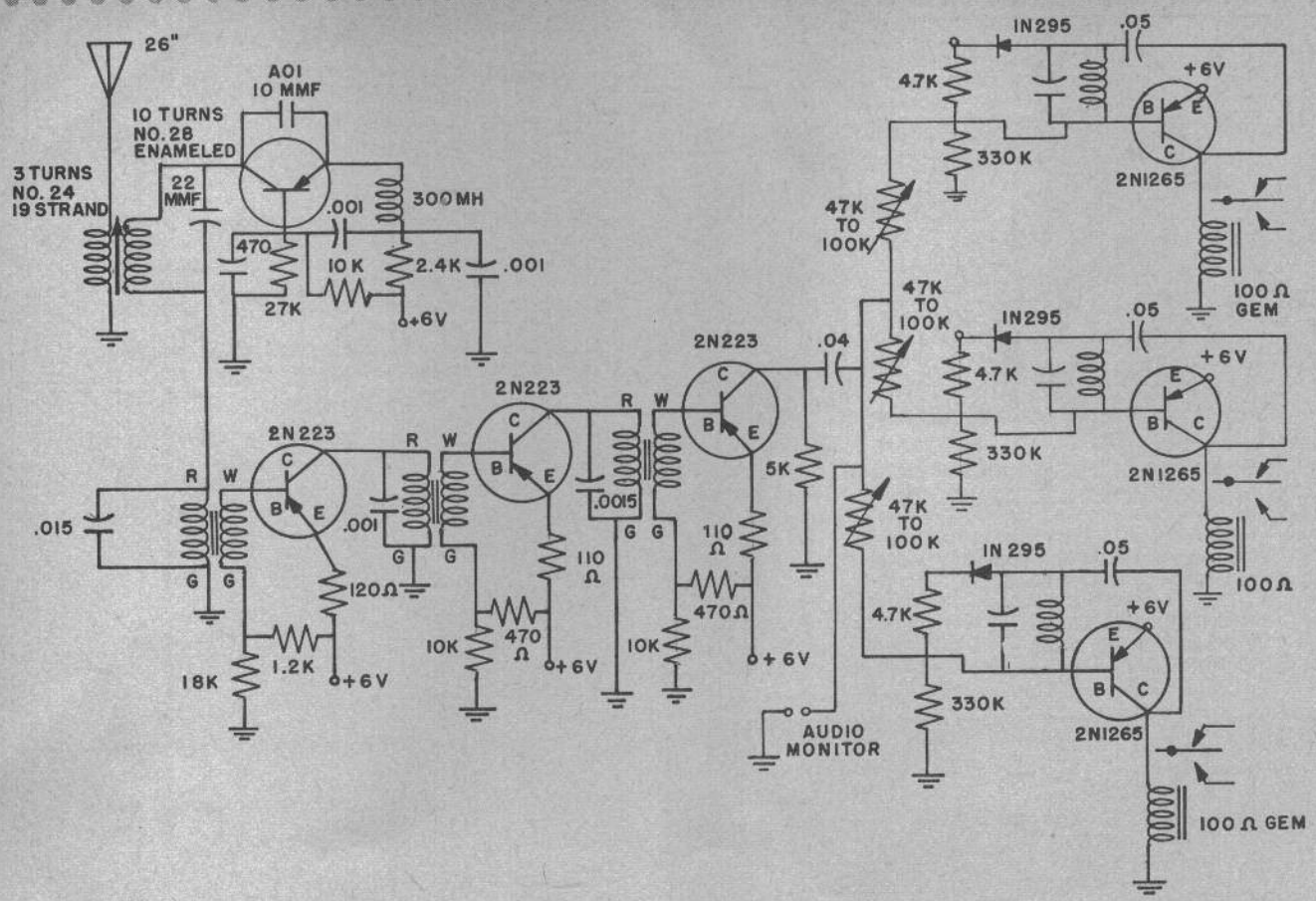
Depending on the tone frequencies used, capacitors may or may not be required across the transformer's primary or secondary. The higher the tone frequency the less capacitance required. If difficulty is experienced in getting enough gain 10-mfd 6V capacitors may be added across the emitter resistors. Also 10-mfd 6V capacitors can be placed from the green lead of the transformer's secondary to the emitter of the transistor. This gives better AC coupling to the transistor's base.

The filter circuitry is the same as supplied with the Rameco filters. It was found that operation on six volts could be had by using 100-ohm relays. If trouble is encountered getting the relay transistors to conduct properly, try varying the 330K and the 4.7K resistors. They should just keep the relay transistor from conducting.

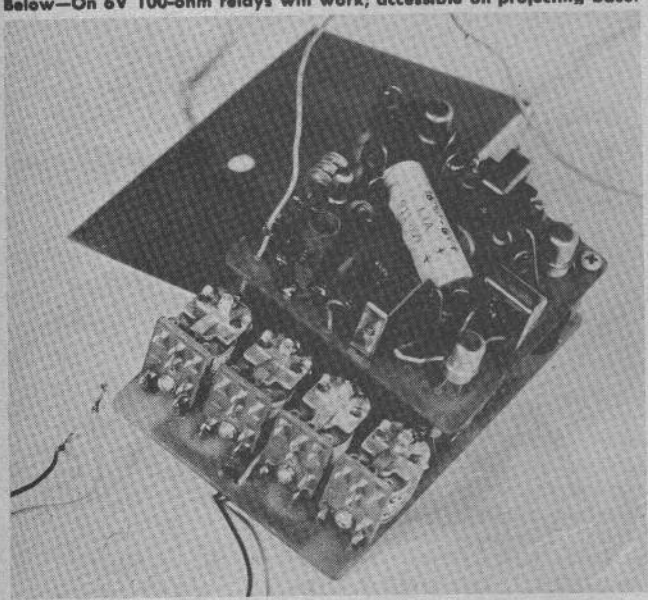
When no carrier is present the relay transistors should trigger occasionally due to the noise from the detector. Too much positive bias will cause the transistors to be reluctant to conduct when they get the correct tone. The coupling resistors were quite a bit lower than that suggested by Rameco. The reason is probably due to the lower voltage.

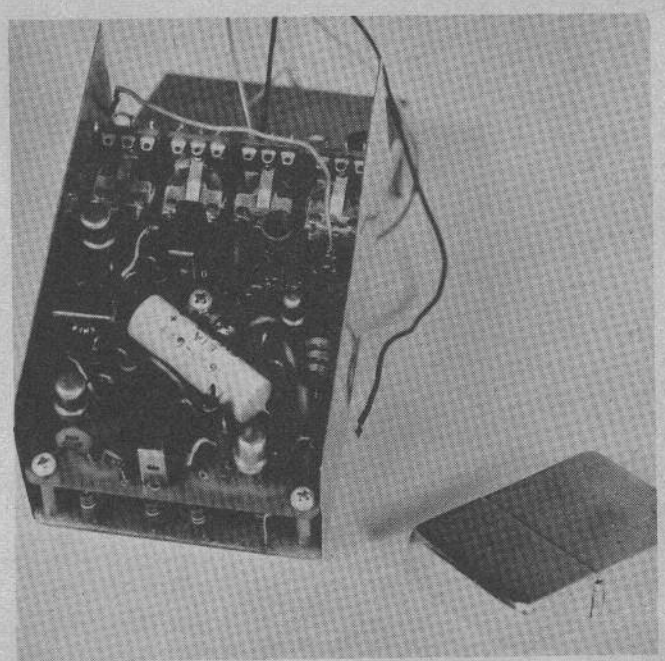
The 160-mfd 6V capacitor across the battery is not absolutely necessary but it makes the receiver work longer on dropping battery voltage as well as preventing oscillation due to a high-resistance cell.

A lower "freq" version of this receiver was tried. A low-resistance reed bank was substituted for the 5K ohm in the collector of the last 2N223 and the reeds really vibrated. It seemed to provide as much or more than the Kraft rec. The afore-mentioned capacitors will have to be added to the transformers to improve the low audio frequency gain.



Right—Can is 4 x 2½ x 2". CPS per channel: 1900, 2100, 2400, 2700. Below—On 6V 100-ohm relays will work; accessible on projecting base.





Included is a pattern for the printed circuit board along with a parts placement drawing. No pattern is included for the filter board as it will vary with the number of channels and the type of filters used.

Simultaneous operation may or may not be had. On the bench I got simultaneous operation. In the field check simultaneous was a bit sketchy. This is probably due to lower modulation level in the transmitter. I have only a single tone control box at present so the simultaneous operation was not possible without a new box. The filters pulse extremely fast. The limiting factor is the relays.

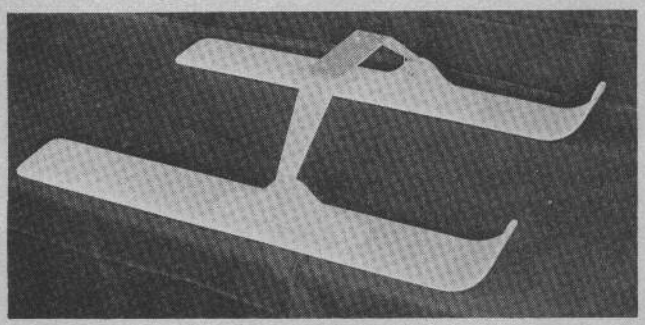
Editor's Note: *The following additional information was obtained from Mr. Hall after the completion of this article. The occasional difficulty with simultaneous can be handled by careful tuning of the tone oscillators. His transmitter is a complicated universal type in use for eight years. It is a ground-based 12-volt type, using a 6C4 oscillator, 6AK6 power amplifier with a 12AX7 class B modulator with some negative clipping. The pulsers are 6AK6's hard bottomed, to minimize interaction and the tone oscillators are transistorized Hartleys. This rig is not necessary because Hall uses it for all modes of control, reeds, TTPW, etc. The receiver in the article operates satisfactorily with the Marcytone transmitter and Marcytone control box.*

NOTE: NEW ITEMS LISTED ON THESE PAGES ARE AVAILABLE, OR WILL SOON BE AVAILABLE AT YOUR HOBBY DEALERS. OR YOU CAN ORDER DIRECT FROM ACE R/C—BOX 301 HIGGINSVILLE, MISSOURI.

what's NEW

NEW! NEGATIVE SERVICE FOR PRINTED CIRCUITS

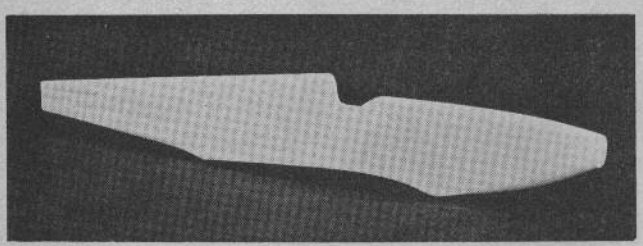
Accurately reduced photographic negatives prepared from your black and white India ink drawing on a good quality paper or hard board. Photo layouts made with black crepe paper dots and strips on white hardboard also acceptable. Drawing should be 2 or 4 times the size of the finished negative required, and corners or border indicated along with finished dimensions required. The drawing will be returned with finished negative postage prepaid. Cost $2.00 each negative. Mail your unfolded drawing with payment to: QUALITY CONTROL PRODUCTS, Box 306, Oklahoma City, Oklahoma. **Please do NOT mail to Ace R/C.**



NEW SKI KIT

Something new for the R/C modeler—Snow skis made of fiberglass and designed for winter flying and take offs from ice or snow. Made of molded fiberglass resin, the kit contains all needed material including hardware and complete instructions for assembling.

The skis assemble to a length of 20½ inches and weigh 16 ounces when complete. A Dwight Hartman kit. Price is only $7.95.



HARTMAN "GOLD RUSH" FIBREGLASS KIT—PYLON RACER—NEW!

KIT CONTAINS: Molded fibreglass resin fuselage parts. Featuring Larger Wing Fillet and Stabilizer location molded in. Instructions for assembly included. Weight 12 oz. Order HF 4 only $17.95.

FLASH NEWS ITEMS

NEW! Grid Leaks—PROPORTIONAL CONTROL

Many articles on the subject of PROPORTIONAL CONTROL have appeared in the past years in Grid Leaks. Due to continuing demand of prints of some of these, the entire series has been brought up to date and compiled in one book.

The compilation concerns itself with Rudder primarily, but also shows how to achieve motor control, galloping ghost systems, and making your own actuators, control boxes and pulse detectors.

The 60 pages of the Grid Leaks' articles, represents some of the best proportional materials ever assembled, from some of the top proportional fliers in the country.

Staple bound, the loose leaf arrangement of the publication will fit in your notebook for an invaluable aid.

GL PPC # — Only $2.00 per copy. Order yours now

Acryjel's Printed Circuit Kit.

Contains sensitized expoxi glass copper laminates in four sizes, Amberlith mechanical negatives, rapid developer, etchant, glass exposure frame, and full directions. Make your own PC boards the photographic way without dark room equipment. Only $3.95.

NEW PRODUCTS FROM MIDWEST

MODEL R/C CLEVIS

Molded of super strength nylon and vibration proof, these clevises form the link from control rod to control horns. Positive fastening action. 2 for 50¢.

BUILDER'S ACCESSORY KIT

Here is an accessory kit, containing bell cranks, control horns, clips, landing gear clips, all molded of high strength nylon, just it for the R/C fan. Package has 4 control horns, 4 bellcranks, 4 accessory clips. Only 60¢ per package.

LANDING GEAR CLIPS

Molded of high strength nylon. Available in 1/8 or 3/32 diameter. Specify size required. Each package contains a pair. Package 10¢.

MOTOR MOUNT HARDWARE

Extra long 4/40 x 2" round head bolts. Four to package. Complete with washers and hex nuts. Easy to clip to desired length. Package of four complete sets 25¢.

LANDING GEAR

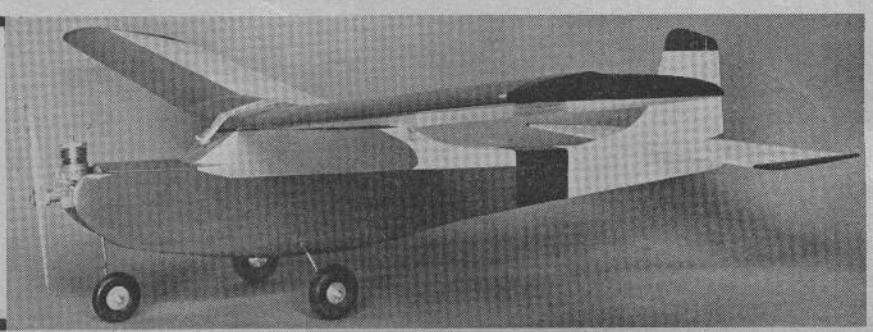
Spring wound nose gear. Fits most models. By Midwest. Designed for R/C and UC. One gear per package. 75¢.

THE "CONCORD" FROM ECKTRONICS

PERFECT FOR THE EXPERT AND R/C NEWCOMER!

"From Ecktronics comes word about their new airplane—the Concord. The plane has a 46" wing span, 320 square inches wing area, is a high wing job, designed for .07 to .10 engines. Construction is the same basic type as the Ecktronic Freedom 7, except the stab is sheet instead of built up. Ecktronics have used the fuselage crutch type of construction which just about insures perfect alignment. Model will feature provision for either radial or beam mounting.

"Comments from the field say that the Concord may prove to be better as a beginner's airplane than the Freedom 7, because of its high inherent stability." Now available at the very low price of only $8.95



FLASH NEWS ITEMS

THE "CUSTOM 12" BY KRAFT!

FLASH—The Custom 12 by Phil Kraft is available for 1963 contests season. Featuring the same Ultra High Dependability that has become the key word of the Kraft Custom series. This receiver and transmitter are housed in exactly the same case as used for the Custom 10 Superhet Receiver and Custom 10 all Transistor Transmitter. These are available only on a custom built basis and are not available in kit form.
Deliveries are from California: This will be the multi leader of 1963. The finest in radio control equipment is available from the production lines supervised under the personal direction of Phil Kraft. The Custom 12 equipment will be a hot item at the prices that are announced for it. Place your order early for early delivery.
The Custom 12 Kraft superheterodyne receiver completely assembled and checked out only $99.95.
The Custom 12 Kraft transistor transmitter is a matching RF frequency, requiring only a 9 volt battery for superb output only $129.95.

Ecktronics Package. BUY THIS COMBO AND SAVE! $ $ $
The Pace-setter transmitter, Courier receiver and Translator escapement including all of the necessary accessories except batteries. Plug and connector, tuning wand, switch, antenna, hook-up wire, etc., including a comprehensive "how-to-do-it" book. Just in time for Christmas. Only $54.95. The total if purchased separately would be $60.55.

FLASH NEWS ITEMS

DMECO LANDING GEAR

This is not a kit, instead it is a complete ready to use tricycle landing gear for radio control models.

Included in one package is a steerable nose gear, 5/32" wire main gears, finished maple gear mounts, dural gear straps plus all of the many screws, washers and hardware needed to install this landing gear in any design model.

The nose gear is completely new in design, much simpler in conception and easier to use. In addition it is over ⅓ lighter in weight while maintaining the absolute in strength!

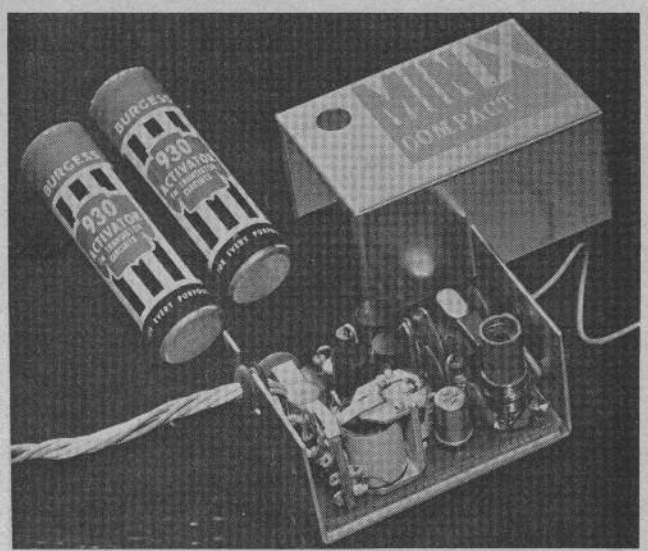
Frankly, one of the greatest assets of this trike gear is its price, we are pleased to say that we can offer the whole ball of wax for less than the cost of a good steerable nose gear alone today!

Dmeco's "Tri-Cycle" landing gear is only $5.95 complete!

2 NEW DMECO VF TANKS

Recently we have had the opportunity to improve them changing the type of plastic used for the vent holder, the new plastic does a better job in every way and been included in all tanks produced since last June. There has been a demand for two more sizes: a VF2 oz., and a VF8 oz., both ready for delivery.

NEXT ISSUE—Not in a long time have we been as excited as we are over the new Marcy PRM-1 system (Rudder-Only with Motor Control) which uses his feedback servo for proportional rudder—no waggling! Engine control is fully positionable through the entire range. First of two king-sized articles! . . . Also GL's annual bibliography of published R/C material and other goodies.



NEW MIN-X "COMPACT"
Specifications are as follows: Battery Supply: 3 volts (2 pen cells), Weight: 1¾ oz., Size: ⅞" x 1¼" x 1⅞", Idle: 4 to 6 M.A., Signal on: 28 to 30 M.A. This new three volt "Compact" receiver is outstanding value in the Super-Regen field because of its small size and weight. The new circuit is extremely sensitive, which allows that extra range necessary for novices in single channel flying. The NEW "Compact" is the smallest single channel relay receiver on the market. Smaller than the 2 pen cells necessary for battery supply. (See photo). Price only $29.95.

FCC FORM 505 TO BE REVISED

Having learned of the intended revision of form 505, inquiry was made of the FCC and the following note was received:

NOTE

FCC Forms 505, September, 1958 will continue to be accepted until December 31, 1962. All applications for Class B, C or D station licenses in the Citizens Radio Service should be mailed to: Federal Communications Commission, 334 York Street, Gettysburg, Pennsylvania.

Under Public Law 87-444 (effective April 27, 1962) an application or an amendment to an application no longer needs to be submitted under oath or notarization. However, it must be signed and dated.

Willful false statements made to the Commission are punishable by fine or imprisonment. U. S. Code, Title 18, Section 1001.

FEDERAL COMMUNICATIONS COMMISSION

Readers Write!!

KRAFT 10 SUPERREGEN AND SWITCHER

A few details on the combination of the Kraft 10 SuperRegen with the Kraft 10 Switcher.

The "trick" to successful and perfectly reliable triple operation is so simple it is amusing: Simply parallel the 18-Mfd 6V capacitor of the channel (s) that is "difficult" with another 18-Mfd 6V polarized the same way. One or two channels will be all you'll likely find "difficult," and the adjustment should be much the same as Phil Kraft suggests. Also, a battery-source common to both receiver and switcher seems necessary, with the common-negative absolutely essential, whether the receiver has power-converter or separate B-plus source. Interaction, not a factor with the Kraft Superhet and Switcher, becomes important with the Super-Regenerative, and will appear to be antenna-sensitivity at close range. A separation of one inch (mounted in same compartment with one inch of "foam" to separate these units) is entirely satisfactory, though several distances were tried. "Back-to-back" will not work, especially on six-meters, without this separation. "Antenna sensitivity" disappears completely with reasonable care in mounting, as above.

The above units were used in conjunction with Duramites in which the only alteration was to install the Kraft switcher-plates for SN. Power is not noticeably different from relay operation, nor is speed, and these are used to operate **big** control surfaces (4½ x 30 elevator, 4 x 13 rudder, 2 x 2 x 14½ ailerons) on the ancient test plane, the old Super Buccaneer. Many flights have been racked up, and the reliability of this equipment is fantastic.

As you know, it's been well over 105 degrees in these parts, and the Kraft gear doesn't notice it even with fast and frequent operation. Range is all you say it is, so is battery-life. Tell the six-meter guys to spread the coils about one wire-diameter between each turn for maximum field strength, and they can ground-test at one half-mile. For vibration (old long-stroke 60's do shake 'em up a little) the Deans reed-bank can be altered without bending a reed by slipping a two to five-thousandths shim under the reeds, thus giving greater pole-clearance. Drive becomes a little harder, but adjacent-reed drive is cleaner, and vibration then becomes no problem, packed tightly or loosely, just so it is vertical in the aircraft. This does raise the entire frequency-response slightly, so be sure your transmitter will cover it.

The above is contributed, in whole or part, to you for GRID LEAKS, or whatever use you may find for it in developing the fine Kraft gear to even greater versatility. It was my thought in developing the combination that a **good** lightweight multi system could be worked out with the Super Regen, and there's still room for them on "six," for the guys who put forth the effort to get a license.

I am still experimenting with various changes, and will be glad to inform you if anything of significance turns up.—Hank Hay, Oklahoma City, Okla.

BEST CLEANER

Like the new concept of GRID LEAKS. Keep it up. Incidentally, we have a new club going in our area; Rockaway Valley R/C. R/V R/C, almost poetic, eh! Charles Kenny, 19 Dogwood Road, Boonton, N.J. is the contact man—15 active fliers.

Ran into a great cleaner for aircraft at a get-to-gether in Delaware. Material is Carbona Rug and Upholstery cleaner—comes with a plastic dispenser and sponge for 98c. The liquid is mixed with 12 parts of water in the dispenser. It foams up when used and when wiped off all oil and other assorted debris is gone. It helps to shine the paint and doesn't remove any of it at all. Best I've used.—Art Schroeder, Rockaway, N.J.

EXIT 3B4 – SUBSTITUTES FOR

Sorry to hear that Raytheon is dropping the 3B4 tube. They don't seem to be very sympathetic to our cause! There may be some other possibilities which I'll list here if you care to chase them down.

1. CBS-Hytron, Salem, Mass. The Hytron 3B4 is considered to be better.
2. Mullard (England) DL-98 is equivalent to 3B4.
3. Marconi, Osram, Greco HD-30 is equivalent to 3B4.

I'd be interested in any success you have with these sources since I have no substitute for the TTPW final. In the meantime I'll consider some other tube for any new transmitter final. It will probably be the 3A4. Any reports of dropping it also?—Walt Good, Bethesda 14, Md.

COMMENT FROM OKINAWA

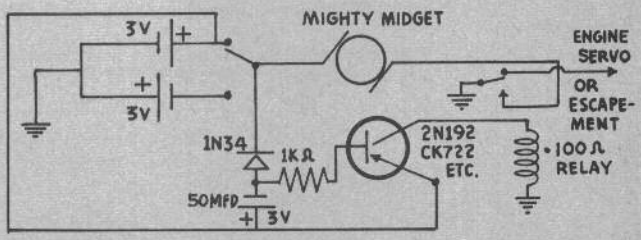
I certainly do like the "new" GRID LEAKS; although there was no real great change made, it seems to be more readable. (He had not seen Sept.-Oct.) The new type is certainly a help, and I know it must help you express your feelings better in the individual articles. The article on Acryjel was very fine and I expect to use my kit in ways that I hadn't thought possible because of it.

The R/C flying here on Okinawa has been rather slow lately. We have had three typhoons in the last three weeks. It's hard to get a model out of the house in 100-plus-knot winds, much less fly it! We did manage to get out last Sunday and get in several good flights. Lt. Hostetter, a new arrival to our little circle, managed to get in several good flights with a Vagabond powered with an Enya .06 with throttle. He has an "ORIENT" single-channel receiver installed, nine-volt power and very good range and sensitivity. It is a relay-type tone rx and measures about 3 by 1¾ by ¾ ins., very light, and sells on the local market for $12.00.

Have built up one of the P.O.D.'s from the latest GRID LEAKS, but haven't hooked it into an airplane yet. Hope it works out as I certainly do like the size and cost involved. I am at work and have a CL-44, Canadair, due in with 50,000 pounds of cargo to be offloaded. Thanks again for the help with the box.—William R. Cooksey III, APO San Francisco.

ANOTHER GL PLUS

I enjoy GRID LEAKS very much although most of it is way over my head. I think that it is through your magazine and its policy of exchange of ideas by the people who have a knowledge of radio that the development of new and better equipment for commercial sale is made possible so that R/C for people like myself, who make up most of the R/C'ers, is easier and much more reliable.—Newt Stanfield, Milwaukee, Wisc.



NOTE ON PLESSIER'S CIRCUIT

I have tried Mr. Plessier's Circuit and find it works very well. I would, however, suggest eliminating the 1N91 diode and separate battery as illustrated. The performance remains unchanged. (RE: POD by Francis Plessier Vol. 3 #5 GRID LEAKS)—G. G. Wallingford, Kingston, Ont.

PROPOMATIC "NOISE" CURE

I built the Bates servo (Volume 3 #8) the day after receiving my GL, installed it and had five fine flights yesterday with a K&B-powered Esquire. The engine has the venturi bored out to accept an Enya .15 throttle and works nicely. It seems to me that the Bates job should do a nice bit for the proportional boys.

Here is a tip for what it is worth. I had some "noise" from my Propomatic servo interfering with proper engine control, especially in the no-signal condition. This was cured by bonding the servo frame (at the point where the two built-in capacitors are soldered to it) to the negative side of the receiver.
—Fred Sheplavy, Albert Lea, Minn.

HE'D LIKE TO SEE

I've been an enthusiastic reader of GRID LEAKS from the beginning and, being a proportional fan, I especially enjoyed Vol. 3 No. 9 with all those pulse goodies.

Being a Class I and II flier like most of my fellow club members, I enjoy articles like Jim Shows' Proportional Control for R-O. It was well written and well presented. Most of the 8- and 10-channel triple-simul articles are away over my head so I pay little attention to them. I could get interested in Space Control but for the price.

I'd like to see some how-to-do-it articles on getting the most control from one channel. I've been flying Galloping Ghost models for five years and having a ball with them.

Since we don't go to contest wars as often as we'd like, some articles by more successful Class II fliers on what they use and how they use it would be interesting. Trouble is that as soon as someone dreams up a new wrinkle for the Mighty Midget he starts tooling up to sell them at $15 each.

We can't forget the beginners either. Short cuts in building, bug hunting, field problems, wiring, etc., are problems that bother us all, especially the beginners.—Norman Delaney, East Liverpool, O.

TEST EQUIPMENT KITS?

Think you are missing the boat on not carrying test equipment kits. A lot of R/Cers I talk to say, "I would build my gear but no test equipment is available."

Then I explain that a guy building a superhet saves enough by building it to buy the kits for the test equipment besides gaining the knowledge of trouble shooting his own set (assuming you are not a rank beginner.)

What I do have in mind does not retract from your strictly R/C line, nor does it involve any extra kitting. You will find that you can get kits for multi-tester, VTV Meter, Grid Dip Meter, Capacitor-Resistor checker, etc., from outfits that are proven, like RCA, PACO and EICO. These kits are not junk—many feature best P.C. work, and 1% resistors and capacitors.

I think the multi-tester and VTVM kits most important.
—Bob Gaede, Townson, Md.

Editor's Note: **By co-incidence Publisher Paul put together this month's lead on Test Equipment. To which we'll add that if you obtain a tube testing kit you'll probably flip when you get around to testing some of the tubes in your transmitters. The experts could not fix our JSH superhet—no wonder, the tester found a bad transmitter tube! A check of old and new transmitters in the shop revealed the causes of several fly-aways to have been X-mitter tubes.**

RELAYLESS PROPORTIONAL TIPS

Am pulsing the Kraft K3VK receiver and Add-On Switcher, using C&S Electronics Mark V magnetic actuator. I am using a Holland Hornet .051 on the front of an old Thermic 50 glider with a built-up fuselage. The nose was cut

back to balance the R/C gear. I am having a ball and our club members (CORKS) will bear this out.

However, I feel that a few words of caution on pulse with relayless equipment are in order. First, the C & S Septallette actuator. The instructions state that stops must be used with the unit. **These instructions mean what they say!** And this goes for bench testing, too, as well as in the plane.

Because I failed to mount the sponge stops I had the magnet come loose on the shaft and I thought one of the driver transistors had gone haywire. So I bought an extra—which I did not need! For stops I finally settled on fine-grained very soft sponge about ¼-in. thick. This also helps to bounce the actuator back to center. The stops are **musts** since you can only get into trouble without them. From one who knows: Don't touch a battery to the Septallette without stops!

Fortunately, I was able to locate my troubles—it wasn't the transistor!—but it required a day's hunting and then it required work that an amateur tinkerer could do. Had instructions been followed, it would have been a lot simpler.

I also thought I had battery troubles—and range troubles. Pencells just did not do the job, and even the manganese cells went down fairly fast. Finally realizing that in pulse the actuator was drawing almost 200 ma constantly, I figured it was unfair to ask the batteries I was using to supply what the Septallette required. (With the K3VK and AOS, this means 200-ma **constant** drain!) So, I switched to nickel-cadmium batteries; and now I'm doing eight or more flights of 10 minutes or better without any trouble! The batteries I used were the Burgess 450-mah pencell type.

If any of the GL readers are interested in my installation, I'll be glad to send a sketch of my R/C Thermic 50. I'm using my old Simpl-Simul but for rudder only, and having fun. I'd like to see some one try a combination like this: The Nomad with an .020, along with a Mark III Septallette and K3VK and AOS combo—using nicads, of course.—S. E. Wolverton, Columbus, O.

Publisher's Note: **S. E., we believe a lot of readers would like to see your Thermic 50 installation, how about sharing it? Your letter contained so many answers on the relayless pulse question we felt it advisable to quote it at length. From letters we've read we have a hunch many a relayless receiver user is blaming equipment when his troubles are very similar to yours—and his answers just as easily (?) found as yours. We hope your letter will save some headaches.**

Your letter points out to us some very simple facts: 1. Read instructions thoroughly. 2. Understand what kind of loads you are putting on batteries and don't try to pull more out than they're capable of producing. 3. If you choose to ignore the first two points above, don't blame the equipment you're using! Something else is wrong—and you've got just one guess.

●

CONVERTED KRAFT III

I just built an .049 Mini-Mambo and since there were no small 53-mc receivers on the market which were small enough for it I successfully converted a Kraft Mark III.

For the coil, I took a SPC2 form and cut 3/16 of an inch off the end so it would fit in the case. I then sawed the threaded slug in half as it was too long. I then wound the coil on the form using 14 turns of No. 30 gauge enameled wire. I changed the antenna coupling capacitor to 1 mmf, the RF choke to a National R-33, 10 mhenry choke. You have to enlarge the hole for mounting the choke so the choke fits closer to the board and then it will clear the cover of the case. I still use the 6007 tube. This tube works no better on 53 MC with 22½ volts than it does in other circuits so I use 30 volts on it. Otherwise, I made no other changes in the Mark III. All checks indicate it has good range and works as good as the other Kraft receivers.

—Roy Cartier, Winchester, Va.

MODIFIED KRAFT SINGLE

I just built a Kraft single-channel receiver using all the different ideas that could be incorporated into one receiver. I pass them on for comment.

First, about a year ago, John Phelps, Manager Application Engineering for General Electric, was in St. Louis and we were out flying together. He said that the Kraft receiver used a red dot (1-20 mc core) in the coil form and said that changing this made a different receiver. I could not find a 20-50-mc core for the form but was able to obtain a CTC SPCII-C-2L coil form from Newark. This was wound with 36 turns of #30 wire as per Kraft instructions.

This change allows tuning from relay drop-out through max to relay drop-out of about 1½ turns using a 47-uuf capacitor as a grid capacitor. The receiver is not as sensitive to hand capacitance with the new coil as it was with the old one.

The second change was to eliminate the .01-mf capacitor from the base of the first transistor. This increased the quench frequency from 25 kc to 35 kc. I also dropped the plate resistor from 39K to 22K ohm because this was the value used by Phil Kraft in his multi-channel version.

The third change was to replace the 2N224 transistors with 2N217 (this was suggested by Rod Iwan of McDonnell Aircraft), the primary reason being that they are more uniform. I have leak checked some 25 of these using a 22.5v battery and a milliammeter. The leakage current ranged from .4 ma to .7 ma for the entire lot. The 2N224's I have checked the same way ranged from .5 to 1.5 ma. After changing the transistors, I found it necessary to change the emitter bias resistor of the second transistor. I substituted a pot for this resistor and adjusted the no-carrier idle current to between 1.1 to 1.3 ma, then installed whatever size resistor the pot indicated.

This combination gives me a receiver that may not be capable of rejecting a 27.255-mc signal while tuned to 26.995 mc, but **very** few superregens will anyway.

The advantages are a receiver that is easy to tune (no fishing pole type tuning tool required to eliminate hand capacitance), stable (once tuned it has not been retuned although it is checked before each flying session), and good current change (.6-ma idle current with carrier to 4.7 ma with tone). This receiver now has 15 flights without a missed signal. I flew it almost out of sight, in a Milt Boone Charger, and returned it to the flying field with absolutely no loss of control.

I have since done this same thing to a couple of other receivers for friends and they are having the same success. I would appreciate any comments you have on the changes and any pitfalls that might pop up.

—Luckett M. Smith, Webster Groves, Mo.

●

OPTIONAL AILERON WITH ESCAPEMENT SWITCHER

The coupled Aileron Switcher for a VariComp (Volume III, No. 7, March-April GRID LEAKS) can be wired to the aileron servo to give optional aileron actuation. Use the extra control circuit available in a cascaded VariComp pair to operate a switcher escapement (SN type, modified by addition of brass wiper contacts). The switcher alternately opens and closes the common (white) lead to the servo batteries. The above system has worked very reliably in a Royal Rudderbug using a home-built relay-type switcher. The printed circuit you have described should be quite an improvement over the latter.

The "aileron uncoupling" is found particularly desirable to eliminate over-controlling during precision part of the AMA Pattern.

—Bob Nicodemus, Walkersville, Md.

R/C Rules Proposals for 1963

Among the numerous rules proposals put before the AMA Contest Board's Radio-Control Section by Section Chairman John Worth, seven were approved in what is called the "initial study period." The proposals so passed *do not* now become actual rules. Rather, and in accordance with procedures found in the AMA's Rules Revision Guide, this initial approval simply means that the approved proposals will now be printed as required in that organization's official magazine *Model Aviation*.

A six-months waiting period is compelled, during which individual AMA members and groups interested in R/C, having opinions pro or con on the seven proposals, will have opportunity to make these feelings known to their Contest Board Section representatives. There are 11 of these Section people, one for each AMA District. The names and addresses of present members are printed in the 1962 Rules Book.

After the six-month membership consideration period, Chairman Worth will again poll the other members of his Committee and that vote determines whether the proposals stand or fall as rules.

It should be noted that six months carries us well into 1963 and it is hoped that the rules changes and additions, when finalized, will be ready for the 1963 season. It is obvious that those who do not give consideration to these proposals now, as possible, if not probable, rules to become effective at the 11th hour in 1963, may be taken by surprise. It would be well, therefore, to examine carefully NOW what these proposals might mean to you in the near future if approved.

GRID LEAKS suggests that you keep extra copies of any communications sent to your District Contest Board R/C member, just in case the imminent AMA annual elections result in some changes in the Contest Board alignment. Newly elected CB members also will be listed in a near future *Model Aviation*.

22.4 (C). Change this section completely as follows: "The Radio Control Pattern Event shall be divided into the following three classes, based on axes of control: Yaw, Pitch and Roll.

"Class I—Planes controlled about Yaw axis only. Class II—Planes controlled about two axes: Yaw and Pitch. Class III—Planes controlled about all three axes: Yaw, Pitch and Roll."

22.4 (C). 3. "Engine speed control is permitted in all classes."

22.8. Add to this section an additional sentence: "No engine restarts are permitted after the first maneuver—engine restarting is permitted only within the first three minutes of allotted time and only prior to scoring of the second maneuver."

22.9. Revise first sentence of this section to read, "The highest score for the total of two best flights shall be the winner." Also, revise the fourth sentence to read, "In case of ties, the third best flight scores of the contestants concerned shall be used to determine the winner (if only two flights have been scored during normal contest time, the highest single flight score of the contestants concerned shall determine the winner)."

23.5. Pylon, substitute the following in place of a., b., c.: "Maximum engine displacement of .20 cubic inches, with a minimum wing area of 38 square inches for each .01 cubic inches of engine displacement. Examples: .049—186 sq. in.; .15—570 sq. in.; .09—342 sq. in.; .19—722 sq. in."

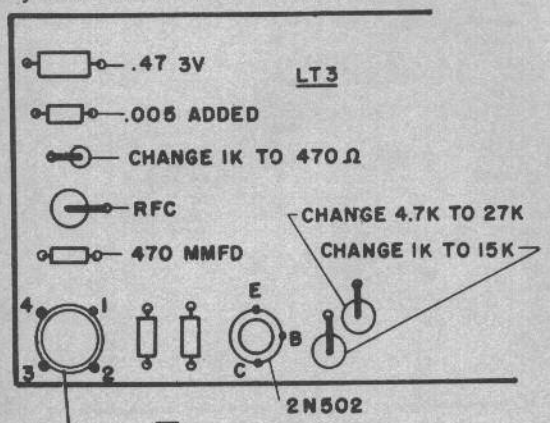
24.4. Scale, add to this section, the following: "At contestant's option, the Flight Plan (24.9) may be flown as the Qualification Flight at the same time. In fact, it is recommended as a time saving procedure."

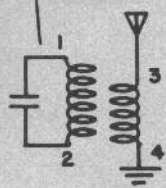
24.13. Scale, delete from this section, the words: "and Multi-Motors."

BITS AND PIECES

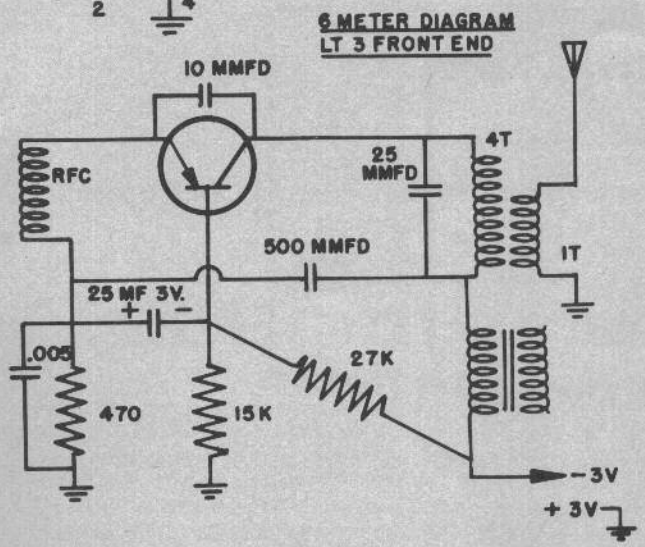
EDITOR'S NOTE—Many readers have indicated that this feature has a practical usefullness that transcends the casual interest value. Do you have a tip that might help your fellow R/Cer? Sketches or drawings should be drawn as completely and neatly as possible. The "cleaner" and more detailed your "copy" is, the better the job GL can do in putting across your idea. Material should be sent direct to Grid Leaks (Bits and Pieces Dept.), Box 301, Higginsville, Mo.

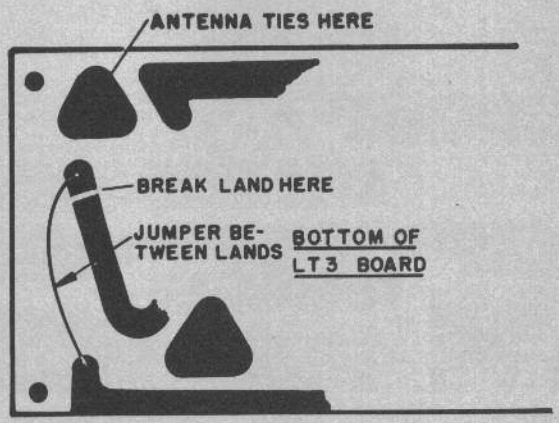
LT-3 FOR SIX-METERS
by Frank Schwartz—Nashville, Tenn.





NOT TO SCALE!





■ I HAVE THREE LT-3's working fine on six-meters. Here's the conversion:

Change the transistor to a 2N502 Philco.

Change the coil to a CTC 7/64-in. dia. lug paper (SPC1-4L) and wind four turns #28 starting and ending on two lugs next to each other. Wind a one-turn antenna coil of the same wire (enamelled) about 1/64th of an inch away from the other winding and tie the start and ending on the other two lugs. The first coil should be down at the bottom of the form.

Change the 1000-ohm resistor which goes from RFC to ground to a 470 ohm. Also, put a small .005-mfd condenser across this resistor. It may be necessary to drill a new hole and move the new 470-ohm closer to the RFC in order to drill two new holes for the .005 condenser.

Change the 1000-ohm resistor in the base of the transistor to ground to 15000 ohms.

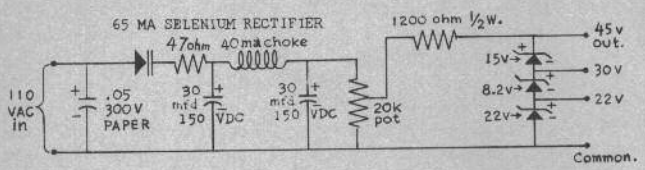
Change the 4700-ohm resistor right next to it to a 27,000-ohm resistor.

Change the T1324 to a 2N502. Be sure to note where the base, collector and emitter leads go, since the 2N502 doesn't have the same base layout as the T1324.

Remove the 1.5-mmfd antenna condenser. Break the land from the coil lug which ties the 470-(or 500) mmfd condenser to the coil lug. See drawing. Run an insulated jumper from the coil lug to ground.

Tie an antenna about 24 inches long to the antenna coil lug which is on the land nearest the corner of the board.

Incidentally, I tried 2N384's, and a half-dozen other so-called high-frequency transistors in this circuit and none did anywhere near as well as the 2N502. I don't recommend using anything else, although I understand a 2N741 is especially good.



ZENER DIODES FOR VOLTAGE REGULATION
by Dale Springsted

■ ONE OF THE MORE recent developments in the semi-conductor field is the ZENER DIODE. After reading an article or two on these units, it was soon realized that this type unit might have several applications for radio control as applied to models whenever voltage regulation of a high order was required.

Being in the repair end of the business, where lots of bench testing is required and regulated voltages would be handy, it was decided to try these small units, to see how they performed. A small inexpensive selenium-rectifier power supply was assembled, using these diodes in the output as control for the voltage. The supply has now been in use for well over 2 years, operating all types of receivers from single-channel carrier to 10-channel reed units. No problems have appeared to date.

The voltage supplied to the units on test is actually better regulated than the normal voltages as received from battery power. In fact, this last item is the only area in which the supply leaves anything to be desired. If one wishes to check operation at voltage levels under that of the tap voltages it is necessary to use an extra potentiometer as a voltage divider to do so.

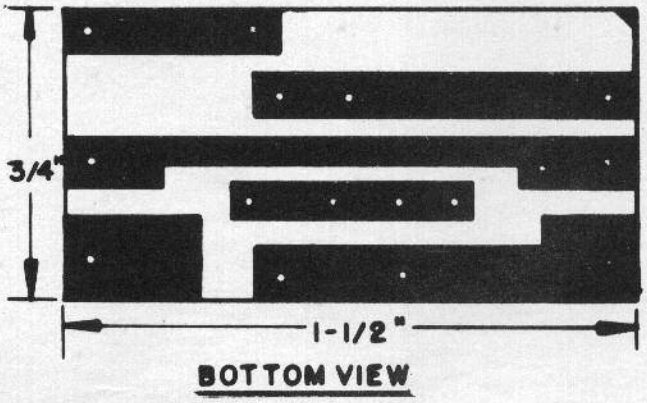
The unit presented here is about as simple as can be made. Actually, it has not been built according to the best practices as outlined by the manufacturer, but since no trouble has developed, it is presented as used. No attempt has been made to describe the operation or reasons for same, since this material is readily available from any of the manufacturers of these diodes, and the papers may be obtained on request, free of charge, describing the characteristics, etc. much better than can be done here.

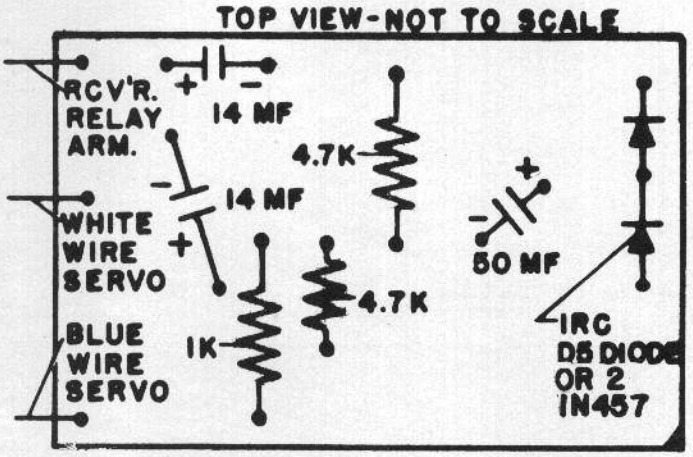
BITS AND PIECES

Attention Contributors to Bits and Pieces: For any item used in this department, GRID LEAKS will award a one-year subscription. If you already have a subscription, it will be extended at its termination for one more year. Subscriptions also given for photos or drawings used in Readers Write dept.

PC BOARD FOR MARCY SERVO SWITCHER

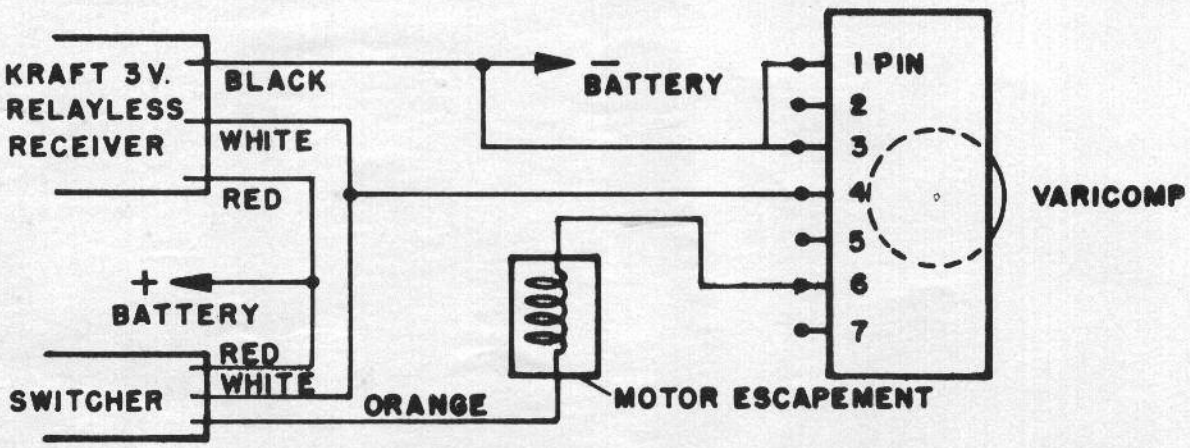
by Bob Bates, Lincoln, Neb.





QUICK-BLIP ENGINE CONTROL WITH KRAFT RELAYLESS AOS SWITCHER KIT, AND BONNER VARICOMP ESCAPE.

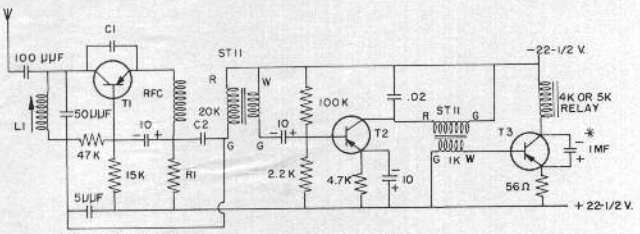
by Bob Bates, Lincoln, Neb.



As can be seen, the few parts required should not come to much over $15.00. The diodes used in this unit were made by Motorola and were of 1-Watt rating. (Motorola parts number 1M15Z, 1M8.2Z, 1M22Z; at the time of purchase these were approximately $3.00 each.) The only part of the unit that requires any adjustment is the 20k pot. Set this by placing a 4500-ohm resistor across the 45-volt Zener tap to represent a 10-milliampere load and simply set the pot to provide an input voltage that would give this load the proper rated 45 volts. It has never been necessary to reset this so a tapped resistor could be easily substituted for this once the proper value is determined. The no-load voltage at the pot was approximately 70 volts in the case of the original unit. This high voltage is the result of the relatively poor regulation of the selenium supply, which sags badly as load is applied.

Other uses can be found. A couple that occur are as regulators for multi-vibrator modulator supplies where it is desired to hold the frequency closer than sagging battery supplies; in a receiver where two battery voltages are required, the Zeners could be used to obtain the lower voltage from the higher voltage supply. Other users will likely discover other applications for these little units.

Reference material may be obtained from the Motorola Co., Inc. 101 So. Salina St., Syracuse, N.Y.



BILL OF MATERIAL

L1 - 7 OR 8 TURNS OF NO. 26 ON 1/4" FORM.
T1 - 2N247 RCA T2 - 2N224 PHILCO
T3 - 2N224 OR ANY GOOD PNP TRANSISTOR.

C1 - 7 TO 10 µµF
C2 - 220 TO 470 µµF
RFC - 250 µH MILLER NO. 6181 T.V. PEAKING COIL.
R1 - ADJUST FOR PROPER IDLE 2K TO 12K.
* FOR PULSE, FOR ESCAPEMENT USE 4MF.

TRANSISTORIZED KRAFT RCVR

by Jack Busch—Ann Arbor, Mich.

■ MY TRANSISTORIZED KRAFT receiver works so well that I thought your readers would be interested in it. With a plastic case, the layout shown, and a 22½-volt battery it is lighter than most 3-volt receivers. I also believe you get greater reliability and range with 22½ volts than with 3 volts. (I'll probably be shot down for that opinion.) Also, it will not overload. I actually put the transmitter antenna against the receiver antenna without any ill effects.

Without carrier it draws 1.8 to 2.2 ma, with carrier a steady 1.2 ma; with tone 5.5-6 ma.

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GRID LEAKS

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TO

C. A. DESS, JR.
4002 MONITOR DRIVE
HAMPTON, VIRGINIA