DETAIL PRINT FILE

NUMBER 1.

INDEX

STATIC (QRN)

(Reprinted from MRL 'Oscillator' #6 and MRL 'Radio Builder' #7 and #8, now out of print.)

A frying, or grinding noise in a set may be internal (functional) or external (atmospherical). To distinguish between the two, remove the Ant. and ground wires from the set while the set is playing, preferably off a station in a blank space. If the noise stops, you can be sure it is not in the set, and has its origin outside.However, the only exception to this rule is a bad Ant. or ground connection or the Leadin has a break.The Ant. must not touch buildings, wires, towers, trees, etc., and all joints must be well soldered. A bad connection on a water-pipe or a ground lead will also give a bad frying noise. However, if your Ant. and ground are in real good shape - their removal will tell you at once if you have static or internal noises.

There are two classifications of static. First, the charge of Electricity at rest, which is found on every object in the Universe, large or small. Second, the kind we find in the atmosphere. Lately we have termed various Electrical noises as "man-made-static." These include motors, power leaks, vibrators, loose joints, etc. This latter type, however, is Dynamic, or artificial Electricity and not termed static.

Static is Electricity at rest. Whenever a negative charge of static is placed on an object - another is lurking near with a positive charge, and vice versa. If Amber is rubbed with silk the Amber is said to have a positive charge, and the silk a negative. Each will pick up tiny bits of paper, etc. Following is a list of materials arranged according to the Electrostatic series,i.e, the one nearest the start is positive with respect to the one just after it:

Positive - Cat's fur - glass - paper - flannel - silk - cork - metals - Ebonite - sealing wax - Sulfur - hard rubber - **Negative.**

Heat and friction develop static in most solid bodies. I have seen paper coming from the Calender of a paper machine, after being heated by various rollers and suddenly cooled, so saturated with static that it would make your hair stand up if you stood under it. We'd hold our arm under it and watch the hair raise up. Sometimes you've noticed that when you ran your finger over a certain Voltmeter glass from zero to top of scale, the hand raised 2 or 3 pts. Also it may have remained there for some time until the charge leaked off. One of the worst problems some printers have is with static. One page rolls up while the next may go sidewise, etc. It may reach a point where the plant has to shut down. Now they sell Ebonite, or hard rubber rods that are placed over the paper feeder to neutralize it.

The best illustration of a statically charged body is a fixed, or variable condenser. Suppose we have 2 plates - one with a positive charge and the other a negative. The space between the plates is called the **Dielectric.** This may be Mica, glass, wax paper, oil or air. Around each plate there is a space called the **Electrostatic field.** In this field we find the **Electrostatic lines of force** similar to a magnet. When the current reaches sufficient **Potential** (strength) to break thru

Continued on next page.

the Dielectric, we have a Disruptive discharge. When this occurs we find our static Electricity has changed to Dynamic, or artificial Electricity. This is fine for oil, or air condensers, but when it breaks thru paper or Mica condensers - we politely buy a new one! There has developed a nice little Carbon path between plates - all ready for the next surge of Electricity to travel. This makes a complete, or partial short. So much for static as concerns solid bodies.

What worries the Radio listener most is the atmospheric disturbances, often termed "strays, static or QRN in the International abbreviations." We never hear static - but only its disruptive discharge. This may take the form of an incessant frying noise or a violent burst caused by lightning. Lightning is just a small condenser discharge on a million-to-one scale. The discharge of static has a duration of about 1/35,000th of a second. It has no stationary frequency, occurring as well on low and hi F. waves in Radio. Ordinarily it is more powerful than DX stations. A Radio set that scans the continent can pick up a dozen Electrical storms and small bursts of static by the thousands. Static is worse in warm weather during sunset. Static is also characteristic of changing weather conditions - either from cold to warm or vice versa. This type is the usual frying sound - with occasional bursts of heavy static lightning flashes.

Altho static is a symbol of summer time - it has also occurred in winter. This usually results from dry snow or hail- the charges being built up on the surface. We know of an instance where a listener drew a 1½" hot spark off his Ant. during one of these dry snowstorms. Hail is also an excellent creator of static. Many times the author, aboard ship, has heard a rushing sound, gradually becoming louder - and after 1 or 2 minutes the hailstorm was upon us. Anytime during this rushing sound, fat sparks could be drawn off the Ant. series cond. as it kept up its "snapping" from plate to plate. I know of one winter around Xmas, that dealers were unable to demonstrate a BC set between Santa Barbara and San Diego, Calif. due to a heavy roar of static. As said before, a sudden change in weather will also produce static in winter as well as summer.

Sandstorms have a wonderful tendency to produce static and R one of the worst offenders in the summer. Other windstorms are in direct proportion to the amount of dust and sand particles carried in the wind. You probably know how the Cyclone is accompanied by lightning.

During summer, in some localities, the air seems to be alive with static. In the Tropics during hot seasons you can draw a continual 1/16" spark off the Ant. You can feel it with your fingers - but most of all, just think how powerful it becomes in an amplified receiver. My last trip on a ship, thru the Tropics even cured me of a 2-tube set on 600 meters, the static was so strong. There is a continual leakage between clouds that become charged in warm weather. Off Mexico, every nite during the warm season, the heat lightning between clouds is almost perpetual, and is brown, due to dust particles in the air.

Meteors and falling stars have a tendency to generate some of our static, depending on their size and nearness. You can make this test on a summer nite with a sensitive Radio. This is caused by dissipation of heat and the throwing off of dust particles as it is burned up in the air.

Another peculiar form of static, the author is very familiar with happened on the S/S "Atlas" in 1921-22. The Radio room was 'midships and the large 4-wire Ant. 300' long, ran over the stack. Whenever the whistle was blown a sudden rush of static would flow thru my Ant. with sparks on my series cond- enough to give a good shock. Static from the whistle was steady but from a hail storm it built up. Whistle static was very annoying there as it was blown every 50 sec.

Edison once said "static will never be eliminated from a Radio set as it operates on all freq. at once. "So far he is right. Many complicated devices have been used by some of the major companies to lessen its effect, but never entirely cutting it out. The most practical method at present seems to be the use of a tone control, preferably placed in the output circuit. This accents the low tones while higher tones like static are lessened in volume. Usually a 50K variable resistance in series with a .05 mfd. fixed cond. between Plate and ground of the last tube will suffice. Another method is by de-tuning the station a little as the carrier wave has a tendency to amplify the static during its trip. By lessening the volume on your set much static noise is cut down. Sometimes a 100K resistor across the Ant. and ground will help to bypass some of the static. An indoor, or short Ant. also lessens the static effect, especially the local type. By placing a speaker in another room, apart from the listeners, much can be done to improve reception.

Lightning is a gigantic disruptive discharge. A lightning flash may be several miles long. Tests made by the Bur. of Standards reveal currents of 2900 to 25,000 amp. and billions of volt pressure. Lodge estimates a mi. long flash to contain 5 billion volts. Naturally, moisture has a decided effect upon this assumption. Lightning flashes are made up of a series of discharges - going back and forth between cloud and Earth - the total occupying less than .1 sec. For this reason they appear to the eye as a single flash. The first break in the dielectric (air) is always the strongest. Once the air is ionized, weaker currents are allowed to flow over this path. Ionized air is due to the chemical Oxygen (O) being changed to Ozone (O_2). The wind may shift this ionized path to such an extent that flashes, having a forked appearance which seemingly strike 2 objects at once- are really 2 different discharges.

Thunder is seldom heard over 15 or 20 miles, whereas artillery fire may be heard over 100. Sound travels a mile in 5 sec. To find the distance in miles from the lightning flash - count the number of seconds between a flash and thunder, and divide by 5 to get miles away.

Sheet lightning appears between clouds and is never accompanied by thunder. Ball lightning is a phenomenon not explained. St. Elmo's fire, occurring on the masts of ships, steeples, etc. is really not considered lightning, but is a form of static leakage.

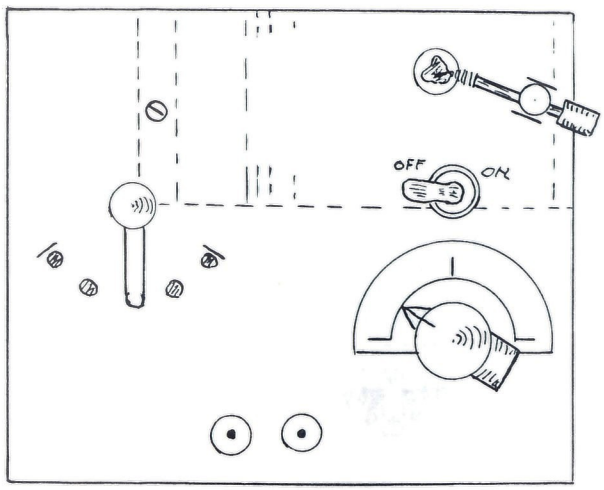
Oil tanks seem to be the best targets for lightning, according to records, 42% of their fires are from this cause. You can see large metallic rods running up from large oil tanks which are lightning rods. Barns, stables, granaries and out-houses are next with 21% of fires due to lightning. Telegraph, telephone and Electric light stations are next with 10% of fires. Rough estimates show about 1500 persons affected by lightning each year - of which 1/3rd are killed and balance affected for life. Roughly 3% of fires in U.S. are due to lightning, and about 1.7% of the deaths recorded.

Lightning may strike anywhere, but the only safe place is under ground, in a steel bldg., or a room surrounded by wire netting. Lightning rods are 50% safe. Records show that when lightning strikes a house, usually 50% of the occupants are affected. It is always better to be inside a house during a storm than in a damp field, near fences, under trees or out-houses. In a house dangers are greater near chimnies, stoves, phones or other metal parts.

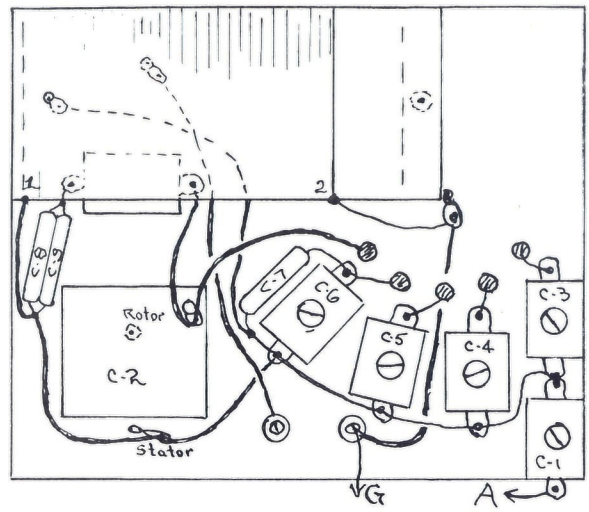
A house, having a Radio Ant. is always more secure than one without. This allows static to leak off to ground, provided the Ant. is grounded. But the Ant. cannot take care of heavy discharges. The Ant. should be run to ground, outside the window, with a heavy knife switch, for a quicker path. A heavy Copper wire or several smaller wires twisted together must be used and run to a ground pipe below at least 6' into the ground. The knife sw. may be replaced with a lightning arrester with equal results. Put the arrester on the window sill.

MRL N° 37-PUSH-BUTTON CRYSTAL SET.

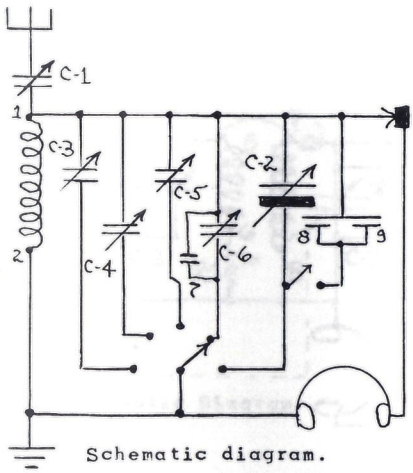
DP 1



Front panel view. Scale ½" - 1"



Pictorial rear panel wiring diagram.



Schematic diagram.

A Detail Print by Modern Radio Laboratories

PARTS LIST.

C-1. 3-15 mmfd. Trimmer.
C-2. .00035 Variable condenser.
C-3-4-5-6 25-280 or other Trim.
C-7-8. .0001 mica condensers.
C-9. .00025 " "
1 Compo. panel 1/8 x 5 x 6.
1 1¼" Bar knob & scale.
1 Switch lever.
5 " points; 2 stops.
2 Phone tip jacks.
1 Knocked/down Xtal stand.
1 Steel galena or Diode.
1 S.P.S.T. Toggle switch.
1 MRL #37 Coil (or text).
1 6-32 x 1¼" BH screw & nuts.
5' #20 solid Hookup wire.
2 Fahnstock clips for A-G.
Hardware, solder.

This novel little crystal set is very interesting to operate. While it is termed "push-button" we have substituted a lever to make it even quicker to change stations. You are at liberty to use as many points as necessary to cover your major stations.

In principle it is the same circuit as shown in **MRL HB-25** but we have made a few slight changes to make it more flexible and efficient. The .00035 variable condenser has been put on the #5 point. Besides, the .0001 and .00025 micas combine to make .00035. When the switch throws them in parallel to the variable you double the capacity of the latter. This gives a greater coverage along with a Hi-capacity/Lo-inductance ratio, which usually helps selectivity. Changing C-1 to a lower capacity than the original has added selectivity to the set.

Lay out the panel according to drawing, using ½" to 1" scale. Mount the coil last - when every thing else is wired up, as there are only two connections on it.

Coil. On MRL 2XM Celluloid form 2" dia. x 4½" long, wind 90 turns #24 DCC wire. This makes it tune a little sharper than #22. Start from the end with the small ring in order to keep the coil at a Hi-Q (efficiency). By means of the 1¼" Binding head screw, set the coil to the rear so it clears all the parts. Adjust and tighten the nuts with a wrench so coil stays put.

Be sure to mount trimmers so they may be adjusted from the rear. By the time they are all wired up - they will be fairly rigid and easily adjusted.

The trimmers can be found by experimenting. If not enough capacity on a certain trimmer just shunt a .0001 mica, or another trimmer across it to hit the desired station right. When laying out the trimmers- hook up points 1 and 4 first. Then, adjust C-1 until it works best on 1 and 4. If you change your Aerial later, you'll have to re-adjust C-1 to balance up the set. Now go ahead with #2 and #3 points, or more in case you decide otherwise.

If too close to a high-powered station it may be necessary to eliminate the ground connection.

It is s good idea to make up a scale to mount below the switch points so each station call may be printed on it. Also addition of the station's frequency to the scale may help.

While a Crystal diode may be used, we prefer the Steel galena as it makes the stations tune a lot sharper. If not bothered by too many stations - any Crystal diode may work OK, and eliminate adjusting. However, for any DX stations we prefer Steel galena crystal with a fine catwhisker.

The variable condenser may be eliminated, but we feel it is better this way. It makes a real compact Xtal set, and may be put into a small cabinet if desired. If a crystal set is made too small it loses its efficiency because the coil is too small.

A good 50 ft. Aerial may be used. However, any type is OK, but each time you change be sure to re-adjust C-1 trimmer.

You are probably acquainted with the operation of a push-button Auto Radio. One can shift stations in a flash. Put this little set, with a good set of Earphones, alongside your bed at night. You may easily shift back and forth each 15 minutes during a station break and see what Ur favorite stations are doing before losing much of a program.

If you'd like a little Short wave and Police on this set - U may tap the coil in the center. That is, bring the ground connection up to the midpoint of the coil. This can be done with a S.P.D.T. toggle switch so it can be shifted back to 2 again. There are many endless combinations in this business!

Placing a .002 mica condenser across your phones will lower the tone. This is the same principle used in tone controls for the Grid and Plate circuits of a regular tube set.

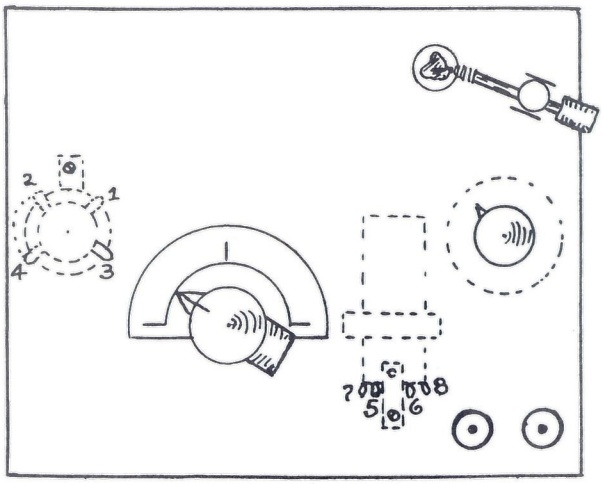
If by chance you should set one of the trimmers on a DX station, you may have to readjust it now and then, due to the varying of the station or shifting of the set, trimmer, or other parts.

We would like reports on DX properties of this set. It has good possibilities when shifted to short waves.

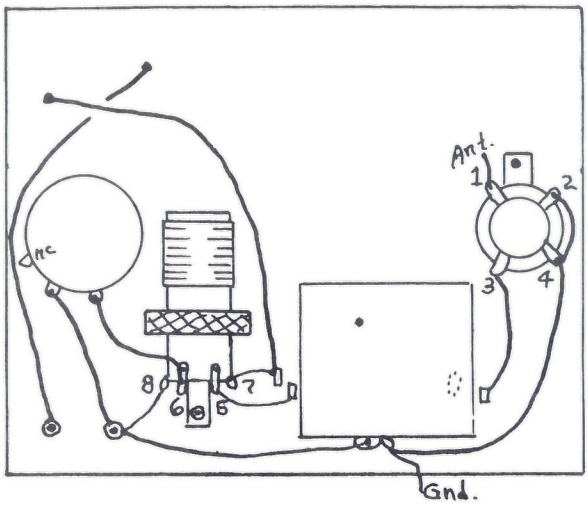
A fixed Carborundum & battery in series may be substituted.

MRL Nº 33. VARIABLE SELECTIVITY CRYSTAL SET.

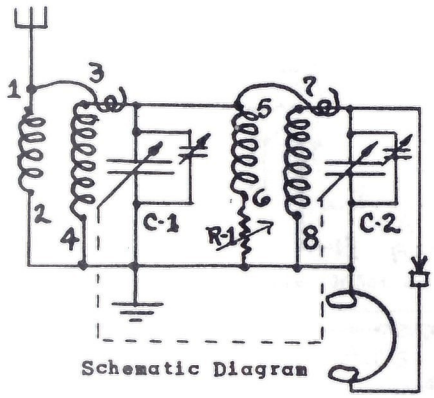
DP 2



Front panel view. Scale ½" - 1"



Pictorial rear panel wiring diagram.



Schematic Diagram

A Detail Print
by
Modern Radio Laboratories

MRL Plans for Busy Hands.

PARTS LIST:

1 AC-DC Ant. or Det. Coil (1-4).
1 AC-DC Detector Coil (5-8).
1 2-gang .00035 Var. Condenser with trimmers (C-1,2).
1 50,000 ohm Vol. Control, less switch. (R-1).
1 Small pointer knob for V.C.
1 1¼" Bar knob and scale.
1 Crystal stand & Steel galena. (or) Diode & no stand.
1 1/8" x 5" x 6" Compo. panel.
2 Fahnstock clips for A & Gnd.
2 Phone tip jacks.
3 ft. #20 Stranded Hookup wire.
Screws, solder, etc.

This #33 Crystal set circuit is the same as our HB-25. However, the layout has been given quite a bit of consideration to make it a good set.

The base has been eliminated as everything may be mounted on the panel. This lessens some of the work in wiring, and makes for more efficiency in the end.

The size of the panel has been changed to a 5" x 6" Compo. altho it may be larger if desired. You may want to use a larger variable condenser than we have used. It is easy to lay out, using the ½" to 1" scale.

Mount the variable condenser on tight, with flathead screws. Then, cement the scale down with Heavy cement or Rubber cement. Hold it off at a distance to get it on straight.

When assembling a set always be sure the parts are fastened down good and tight, before you start to wire up. Use a good hot soldering iron and yank each of the joints to make sure they are good. Make your leads as short as possible. Be sure to use a Rosin core solder, as an acid core will short the connections and prevent set from working.

The coils may be mounted at right angles, altho it isn't absolutely necessary as some good coupling is needed between them.

In AC-DC coils, the one with the largest honeycombed primary is the detector coil. In the far country you may use (2) detector coils for more pickup and volume where selectivity isn't an issue in reception.

Different manufacturers of the coils may arrange their lugs differently, but it is a good idea to place the "hot" sides as (3) and (7) farthest from the primaries. When the set is working, reverse (1-2) and (5-6) for the best volume on weak stations or a weak signal generator. Then you may take two short pieces of hookup wire and solder an end of each onto (1) and (5). Now wrap the loose insulated wires around the leads to (3) and (7) respectively. This gives hi-gain, as used in midget sets. It is also the principle used in the Loopstick. The more turns, the more transference of energy. You'll want to balance this operation up with the amount of selectivity desired in your location.

The variable 50,000 ohm Volume control is preferred to the fixed resistor in our original circuit. In this way you get a different degree of selectivity at will. There should be a way to adapt this feature to other sets - due to the varying conditions under which they are worked. The switch on a volume control isn't necessary. It can readily be seen how the addition of more resistance will tend to "lift" the (5-6) coil up away from the ground. This tends to isolate the tank circuit (3-4) and (C-1) and make it more selective from not being shorted out. This is the principle of the switch in our numbers 2, 2-A and 8 Crystal set tuners to get selectivity.

If trimmers do not come with the variable condenser it will be necessary to add them across the circuit. To operate properly it is necessary to have the variable condenser sections track. Adjust them on a station around 1000 kc and you will find it'll align very well on the band.

Any type of crystal may be used. If using a Carborundum, in series with a 1½ volt flashlight battery, be sure to cut it out of circuit when not in use to save your battery. If you desire a Diode, of any type, mount two small Fahnstock clips behind the stand. The Diode may be clipped in and removed easily. A Diode will broaden the set a little but the difference may be offset by changing the volume control. Try reversing the polarity of the Diode, or other crystal, on a weak station to get the most volume. When tuning in the weak stations on any Crystal set, it is a good idea to re-adjust the catwhisker once the DX station has been located. This will put the set into a more sensitive condition than any output meter, or other tester is able to do.

Almost any type of Aerial may be used. If using it as a portable use lots of Aerial. In some cases the ground may be eliminated. Use 6" leads, soldered to Fahnstock clips for the Aerial & Ground connections to the rear.

The set may easily be placed in a cabinet, as all controls are from the front panel.

15 ONE-TUBE D.C. RECEIVER CIRCUITS.

DP 4

MRL

PARTS LIST.

C-1 2 Plate Midget Variable Cond.
C-2 .00014 Mfd Midget Variable.
C-3 .00035 Variable Condenser.
C-4 .0001 Mfd Mica Fixed Cond.
C-5 .00025 " " "
C-6 .001 " " "
C-7 .002 " " "
C-8 .01 Mfd. by 600 v. Bypass.
C-9 .1 do
C-10 .25 do
R-1 2000 ohm Resistor ½ watt.
R-2 20,000 do
R-3 250,000 do
R-4 2 meg. Resistor ¼ watt.
R-5 5 meg. do
R-6 50,000 ohm Vol. Control & Switch
R-7 100,000 do
R-8 500,000 do
R-9 2 meg. do
CH-1 2½ mhy R.F.Choke
IP MRL Fixed Iron Pyrites Xtal
S-1 S.P.S.T. Switch on Vol. Control.
S-2 S.P.S.T. Switch, on panel.
T-1 Audio Transformer, Any Ratio.

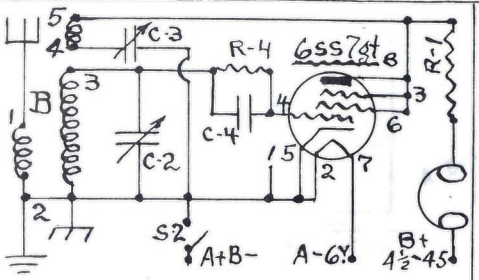
A (C-1) may be used across (C-2) for bandspreading.

See Catalog for prices.

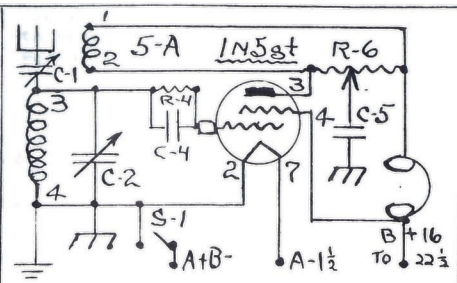
See DP-28 for explanation of Radio Symbols.

Other tubes and combinations may be substituted.

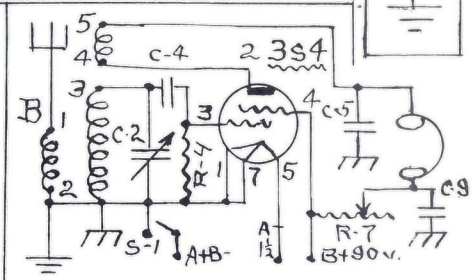
Modern Radio Labs.



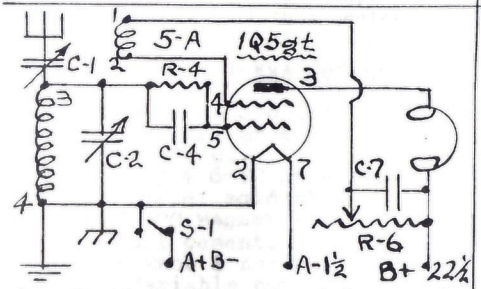
4-A. Lo-B. B coils; 6ss7gt octal.



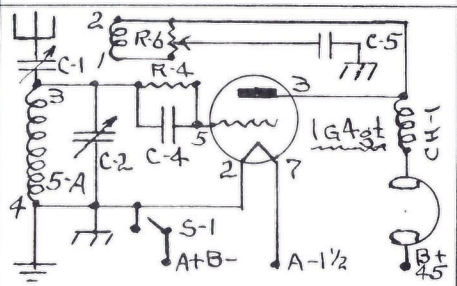
4-B. Tickler. 5-A coils; 1N5gt octal



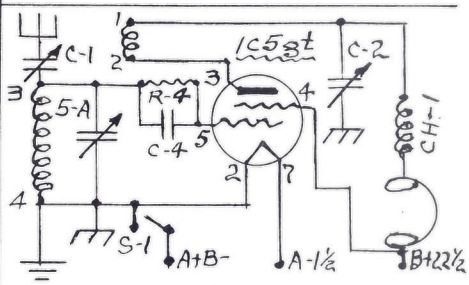
4-C. Var.plate. B coils; 3S4 min.



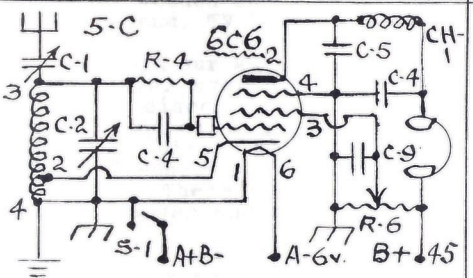
4-D. Var.S.G. 5-A coils; 1Q5gt octal



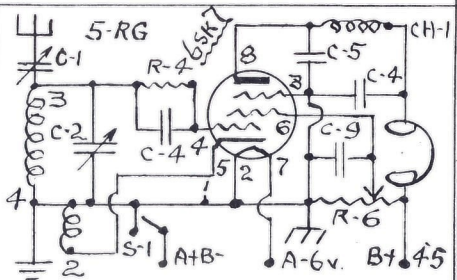
4-E. Triode. 5-A coils; 1G4gt octal



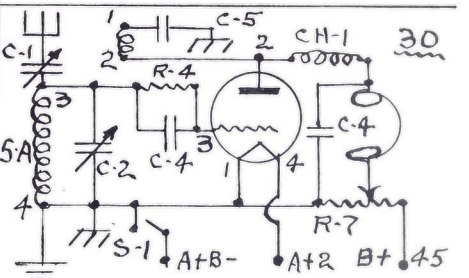
4-F. Capacity. 5-A coils; 1c5gt octal



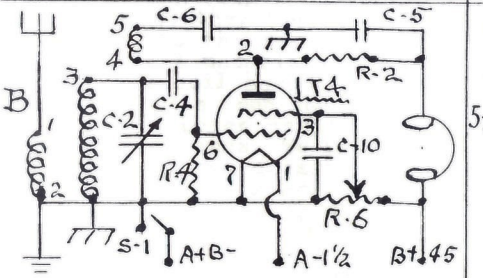
4-G. E.C. 5-C coils; 6c6 6 prongs.



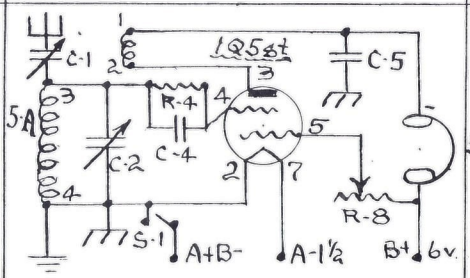
4-H. Rev.E.C. 5-RG coils; 6sk7 octal



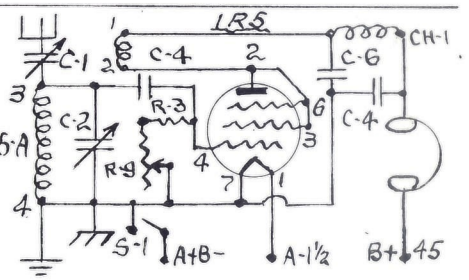
4-I. P control. 5-A coils; 30 UX



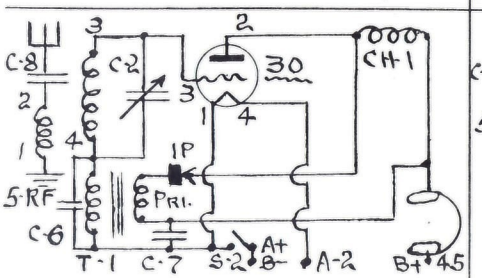
4-J. Fixed P. B coils; 1T4 miniature



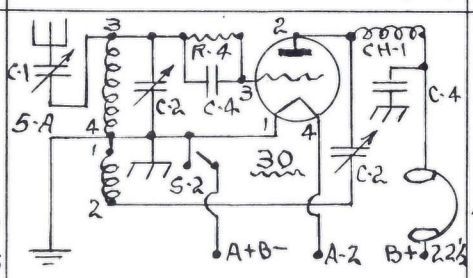
4-K. Space chg. 5-A coils; 1Q5gt octal



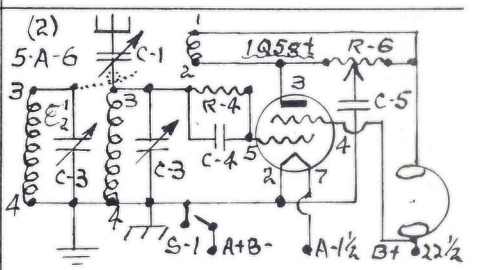
4-L. Super-reg. 5-A coils; 1R5 min.



4-M. Reflex. 5-RF coils; 30 UX base



4-N. Armstrong. 5-A coils; 30 UX



4-O. Long Wave. (2) 5-A-6; 1Q5gt oct.

MRL TYPE D·ALL-WAVE ANTENNA COUPLER

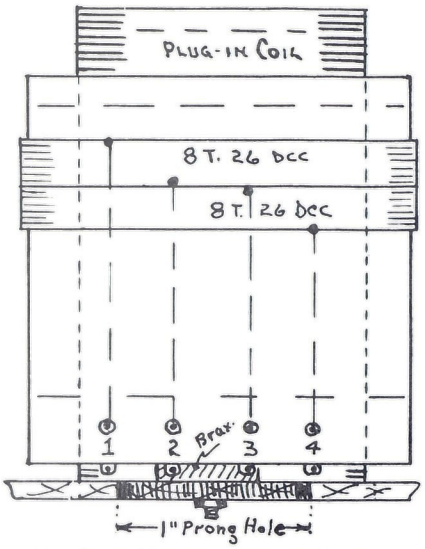


Fig.1. Full size detailed layout showing plug-in coil thru center.

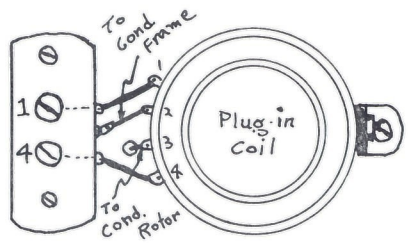


Fig.2. Top view with connections to screw Terminal strip and to variable condenser. Scale ½" – 1".

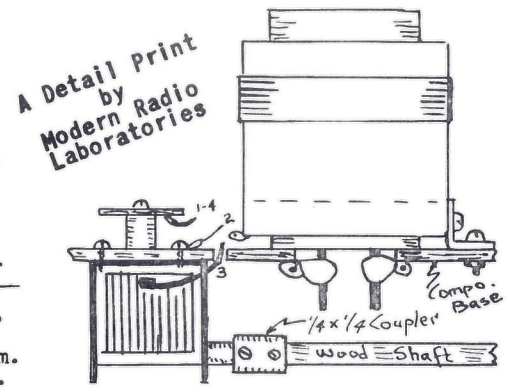


Fig.3. Side view showing condenser mounting beneath compo. insulated base. Scale ½" – 1".

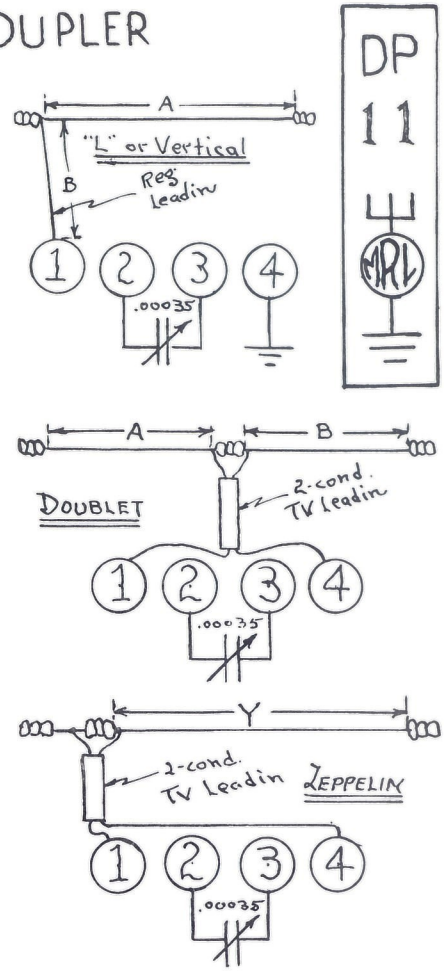


Fig.4. Coupler connected to various types of Aerials.

PARTS LIST FOR ANTENNA COUPLER.

1 MRL P2XM Celluloid Coil form.
(or) Bak. form 2" x 2" long.
1 ½" x ½" bracket.
1 ¼" bushing & 6-32 screw/nut.
4 Type C Eyelet soldering lugs.
10 Ft. #26 DCC Magnet wire.
Light coil cement.
1 1¾" Bar knob & scale.
1 .00035 Variable condenser.
1 ¼" x ¼" Shaft coupling.
1 ¼" dia. wooden shaft to suit.
1 Lgth 2-cond. TV Leadin wire.

We have had our MRL Type D Antenna Coupler ever since 1934, in San Francisco. Hundreds have been made and sold. It tunes the Antenna circuit to the same, or harmonic frequency of the incoming signal. Therefore, signals become stronger and much easier to handle.

While a Bakelite form 2" dia. x 2" long may be used, we have always preferred a Celluloid low loss form (MRL P2XM). One wants all the energy they can get from the Aerial to the set, so the most efficient materials should be used. The coil has even been lowered a little from the original to give closer coupling on the 20-40 m. bands. We now use #26 Double Cotton covered wire as it is better for Short wave work. Due to operating on harmonics, the Coupler is efficient on Long or Short waves.

Using the full-sized drawings, with the large ring at the bottom, punch the holes for the wire as shown. Drill the small holes for the Eyelet lugs and mount them inside, with the lugs extending below the edge. For a Bakelite form, drill as shown.

Simply wind 8 turns on each side, and bring out to lugs. Run wires thru Eyelet holes and wrap a couple of times around lugs and solder.

When mounting the Coupler, around the coil socket, raise it just enough to clear lugs. If a metal base is used, be sure to insulate lugs and condenser. Fig. 3 shows how the .00035 may be mounted beneath the base. Be sure to use wooden, or other insulated shaft to the panel. Use dial scale and knob so you can log.

Any type of Plug-in coil will work with the Coupler. The distance between the coil and the coupler adds selectivity. The unit may be mounted at one end of the set, or in a separate box. When using it on a 1-tuber, with series Ant. cond. eliminate the latter and connect Aerial-ground to Coupler.

Fig. 4 shows 3 types of Antennae, with their connections to Coupler. With the "L" or vertical we use ordinary Leadin wire. For the Doublet or Zep. the 2-conductor parallel TV leadin wire is fine. For highest frequencies one may use an open-line type of leadin, with 2 lengths of regular stranded wire separated by feeder insulators, or spacers.

The first type Aerials tune leadin as well as flat-top. The Doublet or Zep. tunes just the flat-top. Lengths do not have to be accurate, but it helps. One may build an Aerial for his favorite band. Like octaves, on a Piano, a 40 m. Aerial also works good on 20, etc.

The natural period of an "L" or vertical Aerial is about 10% more than the sum of the leadin and flat-top. For instance, a flat-top of 60 ft. and leadin of 40 ft. averages about 113 meters of natural wavelength. If you add the coupler the wavelength goes up. Size of wire, insulation, nearness to objects, etc. all may influence the natural oscillating period. (1) and (4) on the Coupler may often be reversed to get better results.

To measure a Doublet:

$\frac{2 \times (A \text{ plus } B)}{3\text{-}1/3}$ = **meters** natural period. A or B are each ¼ wave.

To design a Doublet:

$\frac{\text{Meters} \times 3\text{-}1/3}{4}$ = **Feet** on a side.

Best all-around is 58 feet.

To measure a Zeppelin:

$\frac{2Y}{3\text{-}1/3}$ = **Meters** to work on.

A Zep. is a half-wave. Y is as long as A plus B of Doublet.

To design a Zeppelin:

$\frac{\text{Meters} \times 3\text{-}1/3}{2}$ = **Feet** Flat top.

A Zep. is used mostly for 160 m. and lower frequencies. The biggest objection is that they occupy so much space.

A Radio wave, oscillating from ground to far end and back to ground makes a complete cycle or wave. This is the reason an "L" Antenna is called a half-wave. A big variation in current occurs along an "L" Aerial. However, on the Doublet, or Zep. the current is even over most of its length, so makes a better Aerial.

Always use as large wire as possible. A stranded wire will give more surface than a single wire and is more flexible and is less liable to break. You can make a good experiment by substituting your regular Aerial wire with magnet wire and you'll readily see difference in DX.

MRL 2-STAGE TRANSISTOR AMPLIFIER

A Detail Print
by
Modern Radio Laboratories.

DP 12

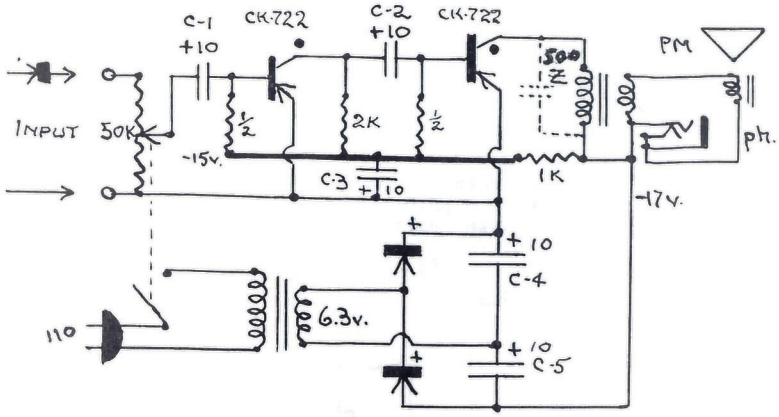


Fig. 1. Schematic Diagram.

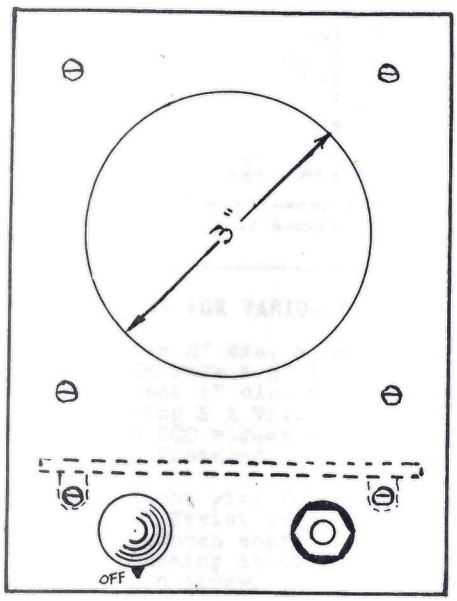


Fig. 2. Panel ½" - 1".

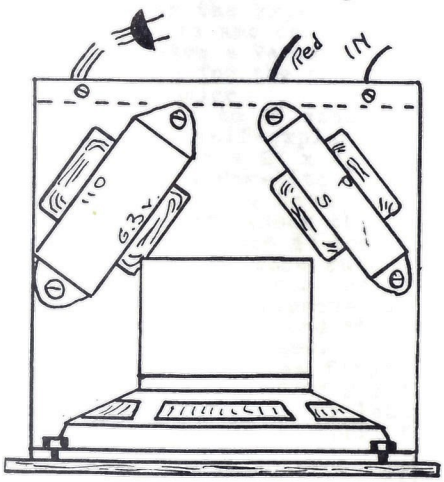


Fig. 3. Top Base. Scale ½" - 1".

This amplifier will give good volume on weak stations. The output phone connections of a Crystal or tube set may be hooked to the input of the amplifier. In most circuits it works best as shown in Fig. 1.

Construction is fairly well shown - using scale ½" to 1" - which seems to be the best layout. If you can spare the room it is best to make panel 6" x 6" to give better tone. Tone will also be improved if the amplifier is placed in a cabinet.

The base is screwed onto the back plywood strip with 2 wood screws. Wood, instead of metal, eliminates grommets, etc.

Any PM speaker is OK if you can get it in the space. It is better to cut a 3" hole for the speaker - with a coping saw, instead of drilling holes. A soft baffle (or insulating board) is good between speaker and panel. Cut a 3" hole in it, too. Cement grille cloth on with Heavy Coil cement for a neat job.

The transformers are placed at an angle to each other and the speaker to lessen hum. The filament transformer steps the voltage down to 6.3 and the Diodes & condensers, acting as a doubler, brings it up to 17 v. DC. The power supply may be used for any other circuit, if desired.

An Universal output transformer may work better but 2000 ohms impedance seems to be OK. If you can get a 50 ohm impedance primary output for Transistor use, it may further improve. But, be sure the output matches the PM speaker. You will note the shorting jack lets you use phones or speaker. When phones are plugged in the amperage is cut so much that the speaker doesn't operate at all. A .002 mica, or other bypass may be hooked across pri. for lower tone.

By the use of 10 mfd. bypass condensers, instead of .1 as used in RF circuits, we get a lower tone. Be sure polarities are Ok. In Fig. 4 you will see a neat arrangement of all 5 condensers, held together with Cello. tape.

Wire the rig up, except the Diodes & Transistors, which are put in last. Be sure they are poled right. Before adding the Transistors test the power supply for polarity with an Ohmmeter or you may ruin Transistors. Hold leads of Diodes & Transistors with pliers when soldering. The "dot" on Transistors is carried thru all drawings for your protection in hooking them up.

You will note the tie point at the rear. Solder a piece of busbar onto it and use for a negative lead - which helps to keep wiring rigid.

Without the 1000 ohm filter resistor the unit will hum. Adding resistance cuts volume. It drops voltage from 17 to 15 with 20 being allowed.

As to bias, we tried inserting a resistor and condenser between Emitters and B-plus. Instead of helping, it cut volume.

We hope this amplifier unit will add to your pleasure.

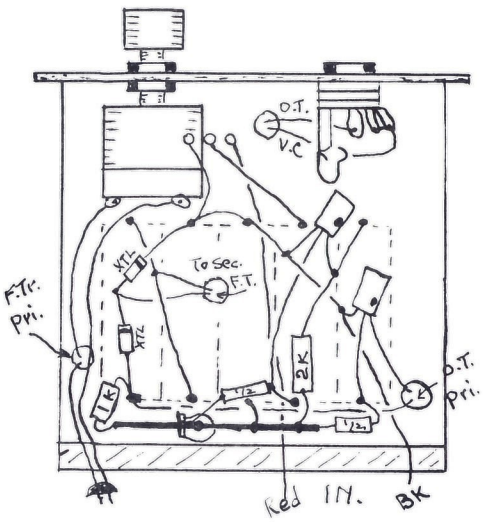


Fig. 5. Under Base Wiring.

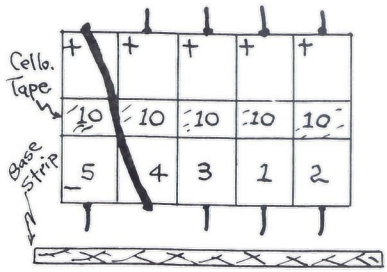


Fig. 4. Fixed Condenser Assembly.

PARTS LIST.

1 Compo. Panel 4½ x 6 or 6 x 6.
1 " Base 4 x 4.
1 Ply base strip 1¼ x 4.
1 4" PM speaker.
1 Speaker grille cloth
1 6.3 v. filament transformer.
1 500 imped. output "
1 50M volume control & switch.
1 Small pointer knob.
1 Double phone jack.
5 10 mfd. x 50 v. condensers.
2 CK-722 (or other PNP) Trans.
1 1000 ohm ½ watt resistor.
1 2000 do.
2 500,000 do.
2 1N34 (or other) diodes.
5 ft. Rip cord & attach. plug.
3 ft. #22 stranded hookup wire.
6 6-32 x 3/8" BH mach. screws.
6 6-32 x 3/8" RH do.
12 6-32 x ¼ hex. nuts.
2 ½ x ½ angle brackets.
1 1-lug tie point.

MRL ALL-WAVE VARIO-COUPLER

DP 13

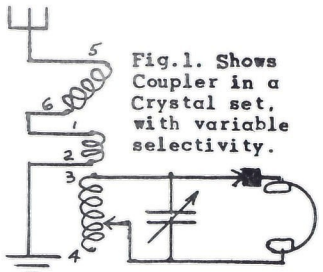


Fig.1. Shows Coupler in a Crystal set, with variable selectivity.

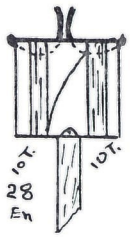
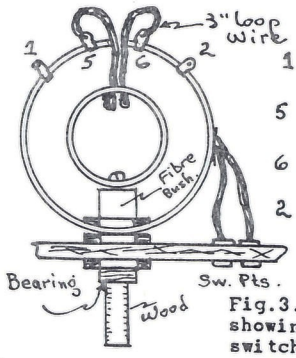


Fig.2. Rotor building & mounting details. ½" – 1"



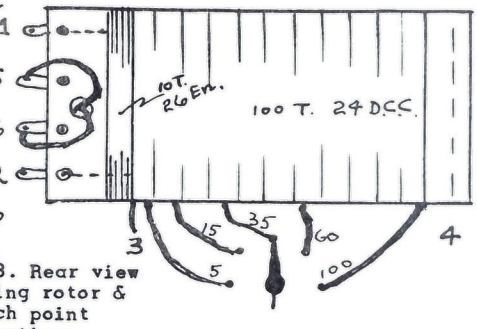


Fig.3. Rear view showing rotor & switch point connections. Scale ½" – 1".

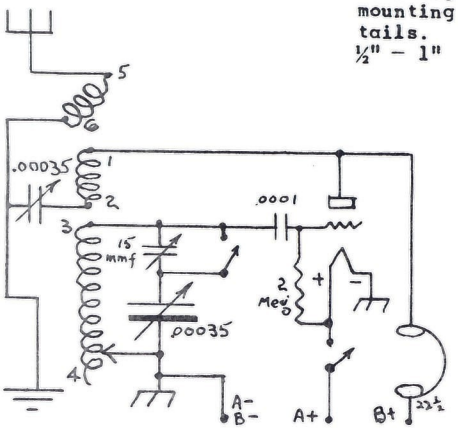


Fig.4. Australian All-wave with variable selectivity of secondary.

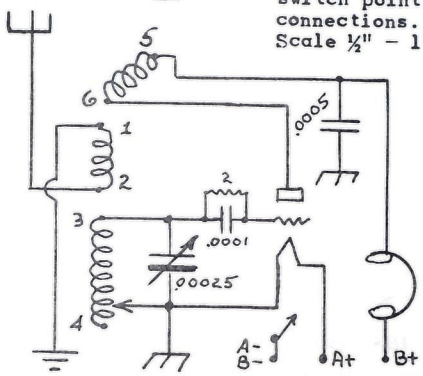


Fig.5. Broadcast band with the rotor controlling degree of regeneration.

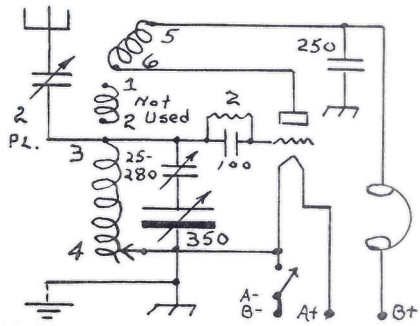


Fig.6. Direct-coupled Short wave band with rotor regeneration control.

PARTS LIST FOR VARIO-COUPLER.

1 Bak. form 2" dia. x 4½" long.
(or) 2XM Form & ¾" long ring.
1 Bak. rotor 1" dia. x 1" long.
1 ¼" Bearing & 1 Vol. con. nut.
65 Ft. #24 DCC magnet wire.
6 " #26 Enameled " .
5 " #28 " " .
6 Inches Loop wire for rotor.
6 Type "C" Eyelet lugs.
3 Inches Wooden shaft.
1 Fibre bushing about ¼" long.
1 Tiny wood screw.

A Vario-coupler is a handy instrument for the Experimenter. When all coils are connected in series it makes a Variometer. If rotor is used for the primary it becomes a Coupler.

Using the ½" to 1" scale, the drawings are self-explanatory. While we prefer a 2" x 4½" celluloid form, a Bakelite form is OK. Our 2XM forms have a 3/8" ring in one end. Knock this out and replace with one ¾" long, in order to make it more substantial for mounting, etc. Be sure to use the same measurements as given, as we have found them to work best in most cases.

Drill all the holes first in the large form. Use 3/8" for the bearing; 3/16" for rotor leads. Make (4) 1/8" holes ½" apart for the eyelet lugs.

Wind 10 turns #26 Enam. wire for the primary and bring leads to outside lugs. Wind 100 turns #24 DCC close to this. Tap it at 5-15-35-60-100 by running a ½" strip of heavy paper under the raised tap wires when winding. Cover edges of windings with MRL Light Coil Cement.

For the rotor 1" dia.x 1" long center a 1/16" hole for the wood screw. Then a 3/16" hole opposite for the leads to run thru. Wind 10 turns #28 Enam. on each side and bring to inside lugs. Cement overall with Coil cement. When mounting the rotor, drill a tiny hole in the shaft to start the screw. Push shaft thru hole and fit bushing over shaft. Then slip shaft into a vise and screw in with small screwdriver. Cut 2 pcs. 3" loop wire and wrap ends with tiny binding wires. Solder to rotor and thru holes into the inside lugs. and she's ready.

When hooking up a tickler to the rotor it may not oscillate. If not, reverse connections. The flexibility of the instrument is shown by some of the circuits.

Fig. 1. Crystal circuit. You may eliminate (1-2) if you wish. Or, it may be connected in series with the secondary to add 10 more turns to the latter. You'll find a favorite setting of the rotor so you can cut out your stations. You will also notice that varying the rotor will also change dial readings. Therefore, I'd use a Bar knob and scale for the rotor so it may be logged.

Fig. 4. Australian circuit. It uses condenser feed-back; a popular type of regeneration down there. We have found it usually very broad, but most effective for DX. You can bring the regeneration cond. right up to the correct point. Cutting the 15 mmfd. trimmer in and out will give flexibility of tuning. The 2 meg. grid leak connection is very important. Likewise, it is a good idea to find the best position for the rotor.

Fig. 5. Broadcast band. The old reliable circuit. Instead of an expensive cond. for regeneration – the rotor is used. This circuit is selective enough for most conditions and locations.

Fig. 6. Short wave band. A good all-wave rig, still using rotor for regeneration. A most efficient circuit. Coil (1-2) is not used.

Various types of tubes may be used. Also, you may find certain feed-back condensers, from rotor to ground, may work better. A 140 mmfd. may be used instead of the .00035 and trimmer.

Mount the coupler upright on the panel, preferably on the left side. Place switch lever and points to the right. Place tuning cond. on right of panel.

Couplers, using one stationary coil and a rotor were made by the thousands in the 1920's. Today, due to hi-amplification obtainable, a fixed primary is used. Even so, many microamps of energy are lost by not tuning the primary. Adjusting the rotor tends to balance up the primary with the secondary, and aid in its tuning.

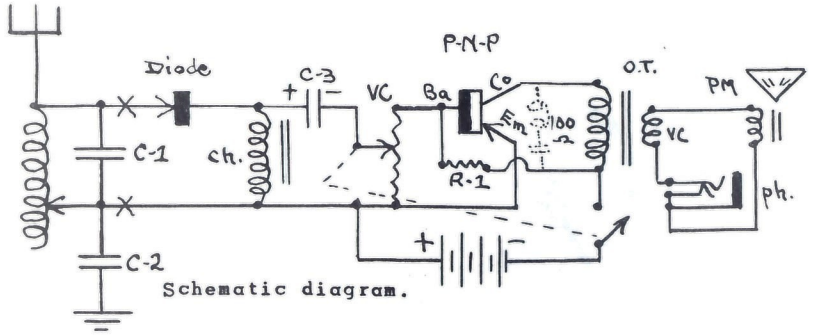
You may be interested in the approx. wavelengths covered by the taps, and say cir. Fig. 6. 5 18-75 m.; 15 50-170 m.; 35 67-275 m; 60 130-500 m.; 100 175-700 meters. This will vary with condensers and Aerials.

Your ingenuity will find a lot more uses for this Coupler.

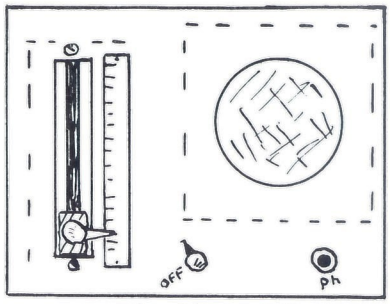
A Detail Print
by
Modern Radio Laboratories.

MRL TRANSISTOR SMALL SET AMPLIFIER

DP 14



Schematic diagram.



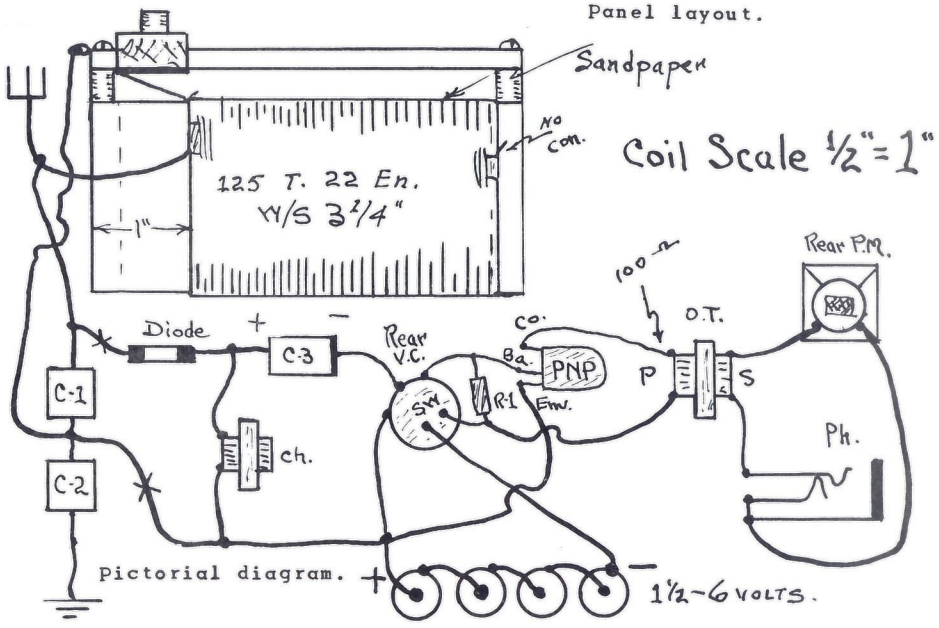
Scale 1/4" = 1"

Panel layout.

PARTS LIST.

C-1,2	.0001 mica condensers.
C-3	.25 x 600 v. bypass cond.
R-1	500M ohm ½ watt resistor.
VC	50,000 ohm VC & Switch.
1	Audio, filter choke.
1	PNP Transistor.
1	Xtal diode, any type.
1	2-5000 Imp. Output Trans.
1	PM speaker, any size to 4"
1	Double phone jack.
1	Compo. panel 6" x 8".
1	2XM 2" x 4½" Coil form.
35'	#22 Enam. Magnet wire.
1	4½" slider rod.
1	Slider.
2	Fibre bushings ¼" high.
2	4-40 x ¾" B.H. screws.
2	4-40 nuts.
1	Small pointer knob.

1 or more Flashlight cells.
Hookup wire, solder, etc.



Pictorial diagram.

Now that the Transistor is an established part of the Experimenter's Paradise, here is one that will give good returns for your money. It will give more than comfortable volume on the phones - and will operate a PM speaker - on 1½ volts, or 1 dry-cell. Add 3 more - to make 6 v. and she will blast a speaker on loud locals. It will also bring in those elusive weak ones you could barely hear before. One of the best advantages in the use of a Transistor, is that values of parts are not critical.

However, there are 4 don'ts to the use of Transistors. (1) Hook them up right as to leads and to battery polarity; (2) check the maximum batt. voltage allowed & do not exceed this; (3) cut off the battery each time you change the circuit, or not in use and (4) do not solder up close on leads - nor bend them too much.

Note the position of the leads and you can't go wrong, if you follow the drawing. Never reverse voltage on the Collector or you will get a rushing sound - which is your pocket book going out the window!

Do not use over .25 volt on the bias to Base. You will see we used 500M ohm resistor here to cut it down. It works better than a 250M. Most Transistors will draw about ¼ to 1 m.a. of current from a 9 v. battery - so it makes the batteries last. If you break a connection, with the battery hooked to another part of the Transistor, you may damage it. This is why you cut off the battery to make a change.

Any type Transistor is OK for this low-frequency work.

Drawing gives fairly good layout on the panel. Any other Xtal set may be used if desired. One may place a pointer on the slider and calibrate it for your stations. You will find the slider to work very well, and fairly selective. We picked up Airports, Hams, Police and almost all BC stations near us, - with a poor Aerial and no ground, as it was tested from the second floor.

When winding the coil, start 1" over from one end. As we got Airport stations on the 3-4th turns, it may be more effective to build one slider set with a 1" form - of say 50 turns, in order to tune these stations in better. Sandpaper the enamel off - don't file it. Bring slider contact to a point, so it will touch but one wire at a time, to get all the stations. Use Light Coil Cement on the edges and up close to the slider path. Very peculiarly, we placed a hot soldering iron onto the negative post of our battery - and got our loudest station "busting" in above everything else.

Any type of Audio choke seems to be OK. We tried both high and low impedance. It seems to work a lot better for us than an Audio transformer. However, special audios are called for, but at present are very high priced. We prefer the Audio choke instead of a resistor, as it gives a low resistance path from the crystal Diode back to ground. Any kind of Diode is OK, but we used a 1N34. The correct polarity may be checked ona weak station.

As for bypass condenser (3) the specs. call for a 10 mfd. We tried this - and down to a .25 by 600 v. bypass, and found very little difference. Be sure to get the polarity right. When the .25 was placed in circuit, we shunted the 10 mfd. across it. You could hear the 10 mfd. short the circuit, and then build up in volume.

If you would like more volume on phones - replace the output transformer with phones. Or, if you want output trans. hooked up all the time, just put phones in series with a .1 x 600 v. bypass condenser, as shown by the dotted lines. Whatever you do - don't make this change unless you disconnect battery first.

This Transistor circuit was taken from a basic circuit used in Australia. However, we have changed it around so it only slightly resembles the original one. Anyway, this works good - and is well worth your time to build it up.

A Detail Print
by
Modern Radio Laboratories

MRL Nº 2 LONG DISTANCE CRYSTAL SET.

DP 22

A Detail Print by Modern Radio Laboratories.

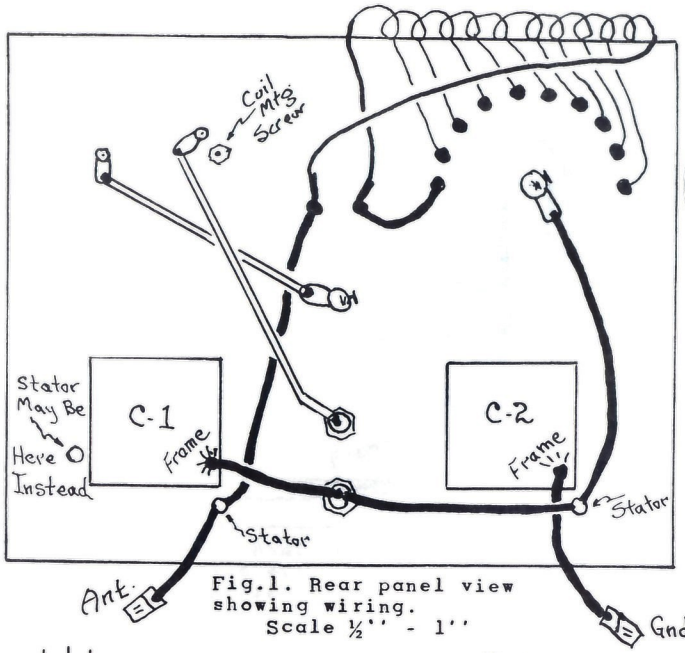


Fig.1. Rear panel view showing wiring. Scale ½'' - 1''

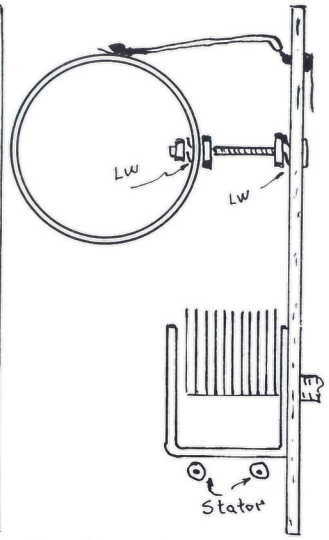


Fig.2. Side view showing coil mounting.

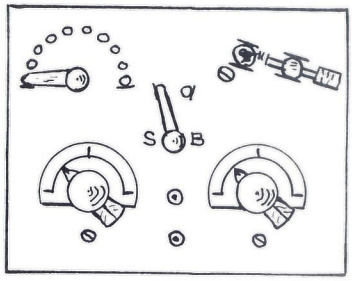


Fig.3. Panel layout. Scale ¼'' - 1''

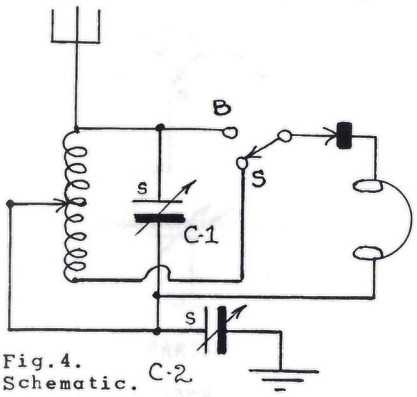


Fig.4. Schematic.

PARTS LIST.

2 .00035 Variable condensers.
2 1¼" Bar knobs & scales.
1 5½ x 7 Compo. panel.
2 1" switch levers.
12 Switch points & 4 stops.
2 Phone tip jacks.
1 k/d Crystal stand and c/w.
1 Steel galena crystal or Diode
2 Fahnstock clips for Ant-Gnd.
2' #18 Stranded hookup wire.
3' #22 " " " .
8" Rosin solder.
1 MRL #2 Coil, or following:

1 Celluloid or Bak. form 2" by 4½" long.
50 ft. #22 DCC magnet wire.
1 6-32 Binding head machine sc. by 1¼" long.
2 6-32 x 5/16" hex. nuts.
1 6-32 x ¼" " " .
2 #6 lockwashers.

This set is undoubtedly one of the best Crystal sets made. We have about 12" of unsolicited testimonials on its performance. MRL has been building it since about 1933, being one of our first sets on entering the Small Set field. Many changes have been made from the original - some on purpose; others accidental. In the Miss. valley, where it is flat, most Fans get 1000 miles the first night. Continual reports come in about European reception night after night on the Short waves. Why some companies continue building an inferior Xtal set year after year is beyond common sense.

LAYOUT. Fig. 3 shows layout ¼" - 1" scale. This is the best plan we've found for short connections, which improves reception of DX. Mount variable condensers and cement on the dial scales & let dry. Mount SEL-BRD scale by center-punching first and cement on. Switch points are 5/16" on center. One for SEL-BRD switch may be 3/8" to keep the opposite ends of coil separated. When you mount switch levers, bend them down good to make a solid connection. A touch of Vaseline, if wiped off, gives smooth running.

WIRING. For solid, heavy leads on Fig. 1. use the largest Hookup wire. Busbar may also be used if desired. RF travels better on large wire, and it helps a lot in DX reception of Short waves. Use smaller wire for the unshaded leads and coil leads. On the latter the large wire would be harder to handle. Wire up all of the set except the coil, which is mounted later. After making A soldered joint, yank the connection to see if OK. Also, tighten all nuts after soldering. Most trouble is had by loose joints.

COIL. While Bakelite form may be OK, we prefer Celluloid as it is lower loss on DX. At one end of the coil start winding 90 Ts. #22 DCC wire. #24 will make it even sharper, due to capacity between turns. Fasten first down with a loop of tape run under 2nd turn. Cut pc. of light cardboard ½" wide for taps. Wind 5 turns and slip it under the tap. Raise it up and continue to #10 turn and make another tap. Continue tapping at 16-23-31-40-50-61-73 and put another loop of tape under the last #90 turn, to make 10 taps in all. Paint the edges with Light Coil cement.

Tin the switch points before mounting coil. Also scrape the taps with sandpaper and tin the wires. Place a 1¼" screw thru panel as shown in Fig. 2, keeping coil away from the panel for lower loss. Take up nuts good to keep coil rigid. Tin each wire & hold it on switch pt. with screw driver until cold. Yank it. You may curve leads to top of coil so there will be no strain.

CRYSTAL. Steel galena works best on DX. It is also more selective than a Diode, but latter may be used if not too near a strong station. Mount 2 Fahnstock clips back of the Xtal stand to hold Diode leads. Polarity may be checked on a DX station. Solder heavy Catwhisker on arm and wrap fine c/w loosely around it.

PHONES. The higher resistance the better, as it makes set more sensitive and selective at the same time.

AERIAL. We always prefer a long Ant. altho 50' is OK. Large in the Country. Best method is to have several Ant., each hooked to a SPST knife sw: so you may use none, one or several. On camping trips throw 100 ft. of leadin over a limb and a pipe into ground.

OPERATION. Selling sets all over the World calls for different requirements. It must be selective in the City and broad in the Country for DX. DX may be possible in the City depending on conditions. Broad tuning gives the original circuit with closer coupling to Ant. SELective gives 200% more selectivity than BRD.

Re-adjust c/w on DX stations & log them down. On the left-hand you'll find Short Waves. Tune in slowly so you won't pass over any of them.

MRL HB-2 gives 24 pages of details on this and #2-A Set.

MRL Nº 2-A LONG DISTANCE CRYSTAL SET.

DP 22-A

A Detail Print by Modern Radio Laboratories.

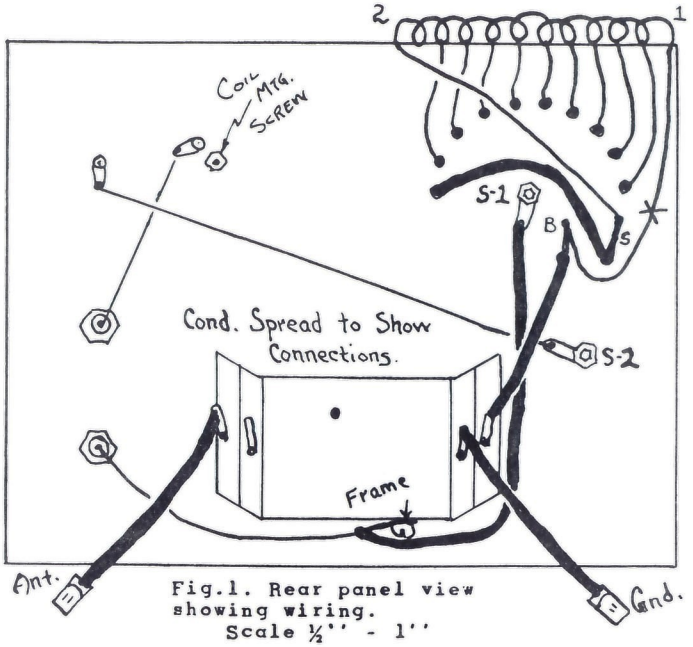


Fig.1. Rear panel view showing wiring. Scale ½'' - 1''

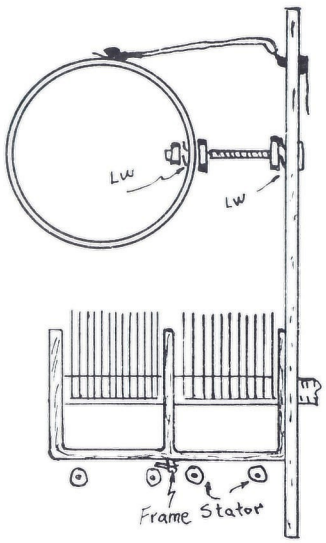


Fig.2. Side view showing coil mounting.

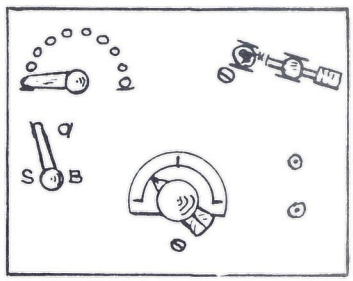


Fig.3. Panel layout. Scale ¼'' - 1''

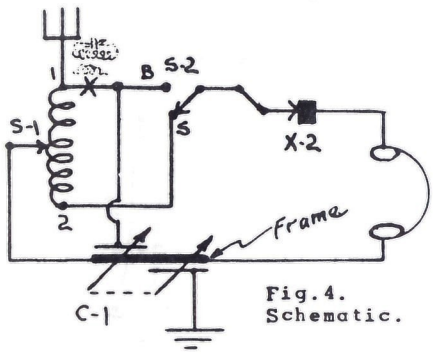


Fig.4. Schematic.

PARTS LIST.

1 .00035 2-gang Var. Condenser.
1 Compo. panel 1/8" x 5½" x 7".
12 Switch points & nuts.
4 " stops.
2 1" Switch levers.
1 Knocked/down Crystal Stand.
1 1¼" Bar knob & scale.
2 Phone tip jacks.
2 Fahnstock clips for A-G.
1 Steel galena Xtal & fine c/w.
2' #18 Stranded hookup wire.
3' #22 " for coil leads.
8" Rosin core solder. lugs, etc.
1 #2 Celluloid coil, or

Coil parts:

1 Cell. or Bak. form 2" x 4½".
50 ft. #22 DCC Magnet Wire.
1 6-32 x 1¼" RH or BH Mach. Sc.
2 6-32 x 5/16" nuts.
1 6-32 x ¼" " .
2 6-32 lockwashers.

Optional parts. (not in kit):

1 SPDT switch for S-B lever.
1 Xtal Diode for Steel galena.
1 .001 cond. across phones.
1 MRL QRM Coil. (x)
1 Trimmer cond. or .00035 Var. Cond. for QRM Coil.

This is the same circuit as #2 but use of the 2-gang tuning condenser changes the layout a lot. It was developed during the War when single cond. were not obtainable. If trimmers R on the 2-gang it will be OK as condensers are self-balancing. DX records about equal the #2 set.

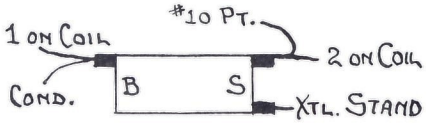


Fig. 5. Connections when substituting SPDT Toggle Switch for S-B switch lever.

LAYOUT. Fig. 3 shows layout ¼" - 1" scale. This is the best plan we've found for short connections, which improves reception of DX. Mount variable condensers and cement on the dial scales & let dry. Mount SEL-BRD scale by center-punching first and cement on. Switch points are 5/16" on center. One for SEL-BRD switch may be 3/8" to keep the opposite ends of coil separated. When you mount switch levers, bend them down good to make a solid connection. A touch of Vaseline, if wiped off, gives smooth running.

WIRING. For solid, heavy leads on Fig. 1. use the largest Hookup wire. Busbar may also be used if desired. RF travels better on large wire, and it helps a lot in DX reception of Short waves. Use smaller wire for the unshaded leads and coil leads. On the latter the large wire would be harder to handle. Wire up all of the set except the coil, which is mounted later. After making A soldered joint, yank the connection to see if OK. Also, tighten all nuts after soldering. Most trouble is had by loose joints.

COIL. While Bakelite form may be OK, we prefer Celluloid as it is lower loss on DX. At one end of the coil start winding 90 Ts. #22 DCC wire. #24 will make it even sharper, due to capacity between turns. Fasten first down with a loop of tape run under 2nd turn. Cut pc. of light cardboard ⅜" wide for taps. Wind 5 turns and slip it under the tap. Raise it up and continue to #10 turn and make another tap. Continue tapping at 16-23-31-40-50-61-73 and put another loop of tape under the last #90 turn, to make 10 taps in all. Paint the edges with Light Coil cement.

Tin the switch points before mounting coil. Also scrape the taps with sandpaper and tin the wires. Place a 1¼" screw thru panel as shown in Fig. 2, keeping coil away from the panel for lower loss. Take up nuts good to keep coil rigid. Tin each wire & hold it on switch pt. with screw driver until cold. Yank it. You may curve leads to top of coil so there will be no strain.

SELECTIVITY is the desire of most Crystal set users. The S-B switch gives sharper tuning on the SELective side. You may substitute a SPDT toggle switch for the 2-point lever as shown Fig. 5. For very troublesome stations with strong ground waves cut the coil lead (X) Fig. 1 & 4 and insert a MRL QRM Coil primary. Set a trimmer, or .00035 var. cond. on bothersome station and leave it. Tune balance of set as usual and it will cut it out, as well as sharpen the set.

CRYSTAL. Steel galena works best on DX. It is also more selective than a Diode, but latter may be used if not too near a strong station. Mount 2 Fahnstock clips back of the Xtal stand to hold Diode leads. Polarity may be checked on a DX station. Solder heavy Catwhisker on arm and wrap fine c/w loosely around it.

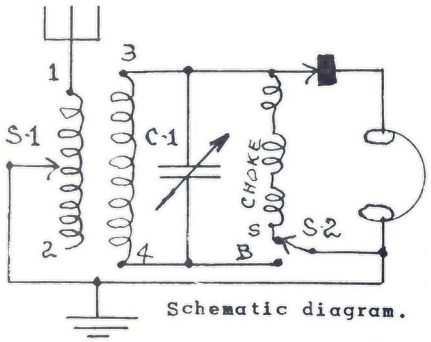
Some Operators use a .001 across the phones for lower tone.

A 3/8" Plywood base may be put on to hold it upright.

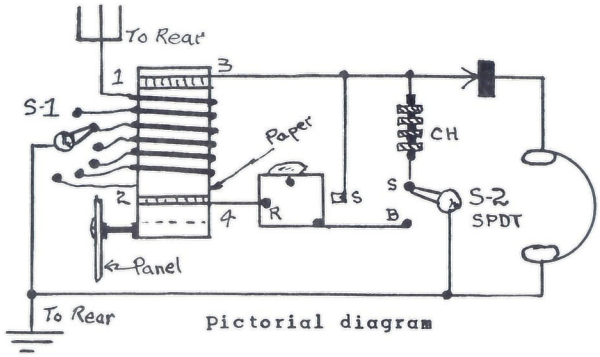
AERIAL. We always prefer a long Ant. altho 50' is OK. Large in the Country. Best method is to have several Ant., each hooked to a SPST knife sw. so you may use none, one or several. On camping trips throw 100 ft. of leadin over a limb and a pipe into ground.

MRL Nº 8 CRYSTAL SET.

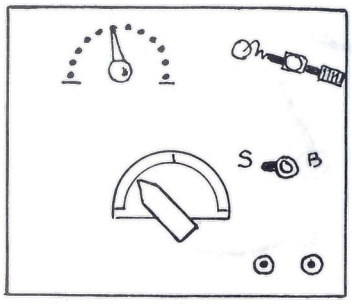
DP 23



Schematic diagram.

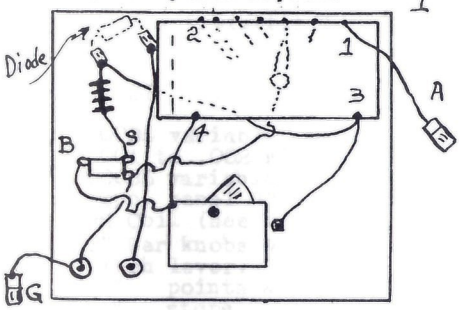


Pictorial diagram



Front panel layout.

Scale 1/4" To 1"



Rear panel wiring.

PARTS LIST.

1 .00035 variable condenser.
1 R.F. Choke, see text.
1 Switch lever.
12 " points & 2 stops.
1 SPDT Toggle switch.
1 Knocked/down Crystal stand.
1 Steel galena Xtal, or Diode.
1 Compo. panel 1/8 x 6 x 7.
1 1¼" Bar knob and scale.
2 Phone tip jacks.
2 Fahnstock clips for A & G.
1 2XM Cell. form 2" x 4½".
40 ft. #22 DCC magnet wire.
12 ft. #20 DCC " " .
5 ft. #18 Stranded hookup wire.
3 ft. #22 " for coil leads.
1 6-32 x 1¼" BH Machine screw.
3 6-32 x 5/16" hexagon nuts.

This set was originally designed by MRL for use by a Mining Engineer at Baker,Oregon. He had tried several other ones in his location- but this one seemed to "hit the spot." Stations were received 1800 miles away which he considered good for his location and conditions.

Like the #2 - it has a switch (S-2) that gives a choice of broad or sharp tuning. In other words - sharp for the City and broad for the Country. A very simple set to build and a most efficient one to operate. However,the circuits are different.

When switch is on (B) it will tune broadly - which may be called the stand-by circuit. It is used mostly in the Country with a good Aerial for DX work. Or, it is OK in the City - if the locals aren't too strong or too near to you. During broad tuning the Xtal and phones are right across the coil - allowing leakage across the latter, which results in broader tuning. However the set is most sensitive on the (B) side of the switch.

If switch is on (S) it throws in the RF choke and makes it a very selective set. This is due to the "floating coil effect" - obtained by "raising" the coil above ground potential. Also, there is only one lead from (3) being fed into the crystal circuit. This principle may also be used in tube circuits for increasing selectivity. A similar condition happens with the #2 set but it has 17 turns in use, while the #8 has none.

The RF Choke principle was adopted to build up an amount of inductance to run in series with the crystal and phones. A Shortwave choke is OK, but the higher inductance of a BC choke is much better. A BC choke usually has about 50 ohms DC test. Also the 4-sectioned choke seems to work very well. The Xtal-choke-phone circuit seems to pick up some of the energy from the ground return. The RF choke seems to work better than anything we've tried so far. An Audio choke doesn't seem to work with us, possibly because a HF inductance is required. The RF choke was also replaced with a #2 coil of 90 T. 22 DCC on 2" form, but it, too, failed to work as well. Several RF chokes may be tried in series to build a higher inductance. Check them on weak stations for the best volume.

Our best distances have been reported on Celluloid forms- altho other forms may be used.

On our original DP-23 the coil was placed at right angles to the panel. However, we now prefer it placed parallel - being held out from panel by the 1¼" screw and nuts. It is easier to wire and makes a neater job. Be sure to mount coil last, after the rest is all wired up.

COIL. On 2XM Celluloid form 2" in dia. x 4½" long, wind 75 Ts. #22 DCC, with no taps. Leave 6" leads. Over this winding, lay a pc. of heavy wrapping paper 2½" x 9" long, held down by Cellophane tape. Then wind 20 turns #20 DCC loosely across it. Fasten ends down with tape. Spread turns out evenly. Cement them down with Light Coil Cement. You sandpaper turns for taps - to be soldered on after coil is mounted. Tap this primary coil at 4-6-7-8-9-10-11-12-14-16-18-20 - making 12 in all. This gives you more efficient tuning for the Aerial-ground circuit, so it may be used on any type Aerial.

Wire up the body of the set with the heavy #18 stranded hook up wire, as HF signals travel better over a larger surface. Busbar is OK if the joints are solid. The smaller wire is used for wiring to switch points. Be sure to mount coil so taps come on top for easier soldering.

Use Steel galena, or any good Xtal. A Diode, of any type, may be used. Because it is unwise to solder a Diode, we prefer placing 2 small Fahnstock clips on the back, as shown by the dotted lines. Diode may then be slipped in. Carborundum, with 1½-3 volts in series may also be used OK.

Length of Aerial is not critical with this set. If one wishes more selectivity, they may hook an MRL QRM Coil and trimmer in series between (1) on coil and Aerial. Tune trimmer to bothersome station, and leave it on. Tune balance of set as usual.

Baker, Ore. Engineer reports: "Cincinnati (1800); XERA (1500); Los Angeles (800); Denver (750); S.F. (600); Calgary(500) are the best ones. KSL (450) like local. 155' Ant. 50' high #12 wire.Your choke is a novel idea." He won first prize in an early MRL Xtal DX contest.

Brighton, Colo., R.C.:"21 Sta. on my #8, including WLW (1100); XEAW (1050); XEPN,Chicago (900); KFI, KNX, XERA, WOAI (800); WFAA WBAP (650); WHO (600), etc. Use 125' Ant. with Wave trap (QRM) in Antenna circuit."

Ingleside, Ill., R.B.:"Built #8. Altho hi-tension lines on 3 sides - I get lots of DX as WBT (600); Rochester (500);Nashville (400). For volume taps 10-11-12 are best; selectivity 1-2-3."

Walsenburg, Colo. "675 miles."

Lithia, Fla. "1000 miles."

Los Angeles & Tulsa report excellent selectivity amid strong locals. Best set yet, etc.

A Detail Print
by
Modern Radio Laboratories

MRL Nº1 – DX CRYSTAL SET

A Detail Print
by
Modern Radio Laboratories.

DP
26
MRL

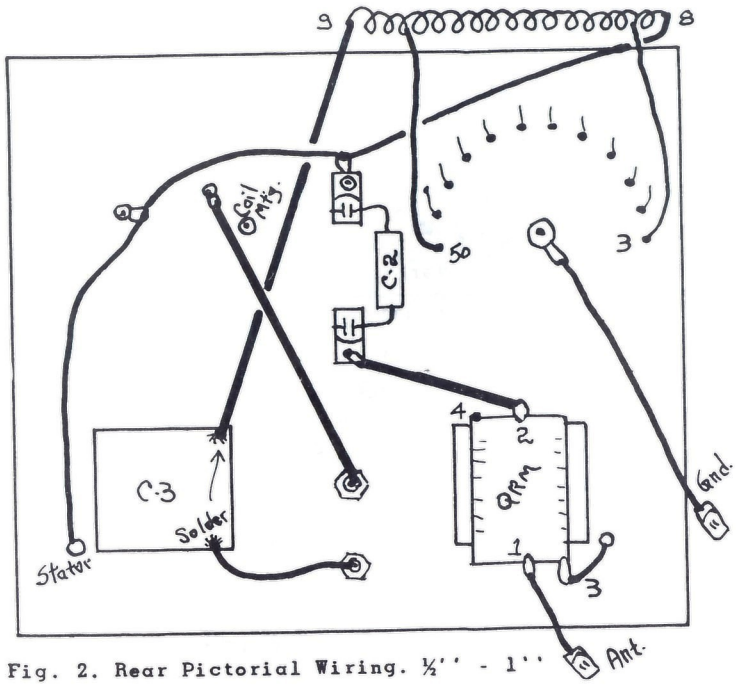


Fig. 2. Rear Pictorial Wiring. ½'' - 1''

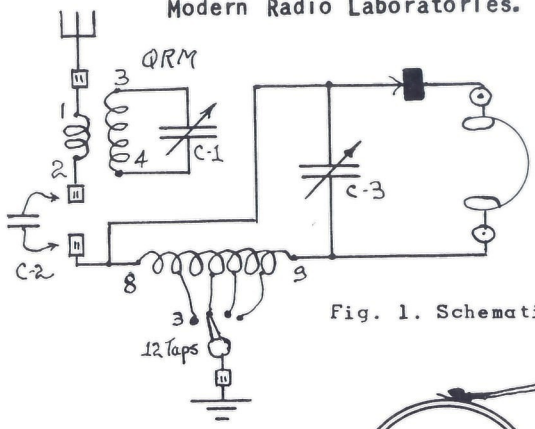


Fig. 1. Schematic

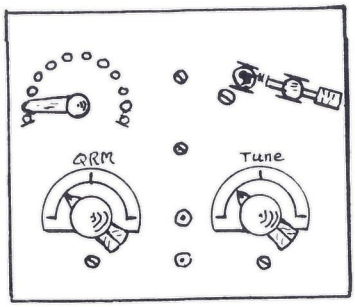


Fig. 3. Panel Layout ¼'' - 1''

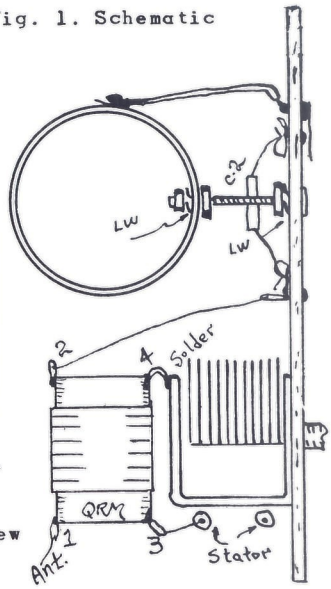


Fig. 4. Side View Showing Coils.

PARTS LIST:

C-1 .00035 variable condenser.
C-2 .0001 to .002 mica condenser
C-3 .00035 variable condenser.
1 Compo. panel 6" x 7".
1 QRM Coil (see text).
2 1¾" Bar knobs & dial scales.
1 Switch lever.
12 " points & nuts.
2 " stops.
2 Phone tip jacks.
1 Crystal stand.
4 Fahnstock clips.
1 Steel galena or Diode Xtal.
1 6-32 x 1¼" mach. screw/nuts.
1 MRL #1 Crystal set coil, or
50' #22 DCC wire.
Cel. or Bak. form 2" x 4½".
Hookup wire, hardware, etc.

Many good DX records have been piled up with this set due to the close coupling to the Aerial and its efficient construction. Good volume is also had on local stations that emit good.

Selectivity is regulated by adjustment of C-2 condenser as to size. The smaller capacity of condenser the more selective the set becomes. The switch lever is also helpful in getting the best operating condition. The condenser size is regulated by nearness to loud stations and the length of your Aerial-ground circuit. Once you get the correct capacity you leave it in circuit.

ASSEMBLY. We have found the layouts shown to be the best but not critical. Drawings are to scale so not difficult. Be sure all joints are tight. After you solder up – yank each wire to be sure it is soldered well. Mount and wire all parts but the coil which is done last.

COIL. Our original plan called for mounting the tuning coil at right angles to the panel. We have since found that if one mounts it parallel and held away from the panel by the 1¼" mach. screw and nuts that you get a much easier job of wiring to the switch points.

Most of our sets are built around Celluloid coil forms. We have found these best for long distance reception. Thick celluloid forms are taboo – but when used .015" thick, as we use, we find them most efficient. Other forms may be used if desired.

Starting at the end of the form with the small ring – wind 75 turns of #22 DCC as follows. Hold first turn down with a pc. of friction tape around the turn and held down by the second. Tap it by running a piece of light cardboard under each turn to be tapped. Tap coil at 3-6-9-12-15-20-25-30-35-40-45-50 in 12 taps. Keep winding to 75 turns and secure last turn with tape around it – held down by next to last turn made tight. Paint a light coil cement along the edges of the winding and alongside paper tapping strip to make it rigid. Before mounting the coil sandpaper the taps and tin them with the iron for easier soldering. Use #22 flexible hookup wire for leads to points. Do not use any soldering paste on the coil. The winding space of wire is about 2-3/4" long. Be sure coil clears condenser plates. Further data on winding forms see HB-17.

QRM COIL. On a 1" fibre form 1-5/8" long – wind 110 turns #32 enameled wire and bring leads to eyelet lugs. Paint with a light coil cement. Over this space-wind 20 turns #24-28 DCC and to lugs. When mounting this coil one lug (4) may be soldered right to the frame of C-1. This saves a mounting screw and connection. Run (3) to the stator, as shown, but use busbar to make it rigid. We used to mount the QRM coil inside the tuning coil but believe this method is better.

Bothersome stations may be partly or entirely eliminated by adjustment of C-1. While you may use a trimmer – we prefer a variable as the set is so much more flexible, especially on DX. Take the loudest station and tune it in good. Gradually run C-1 until it is trapped out. Leave it on this setting. If a powerful station – it will still be of sufficient volume.

The Series trap (QRM) has some deadening effect on the circuit, but this is offset by the many advantages of QRM elimination.

CRYSTAL. Crystal Diodes may be used if desired to amplify loud stations with no adjustment. But we prefer a Galena or Steel galena with fine catwhisker for DX stations. The selectivity is also improved with the Galenas, Iron pyrites, Silicon or Carborundum (with 1½ v. batt.). Compare!

AERIAL. For the city we recommend a 50' Ant. and ground. In some congested areas you may cut out the ground but the QRM coil doesn't work right. Country reception may use 100-150' Aerial, high as possible, and ground. DX is always better in far country.

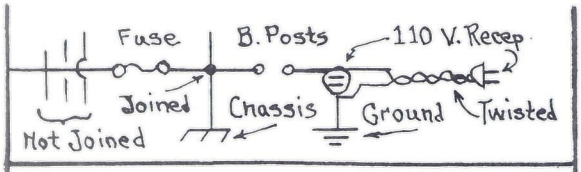
TRANSISTOR amplifier may be added to this set at phone con. Use hi-impedance phones.

NEW & OLD RADIO & ELECTRICAL SYMBOLS

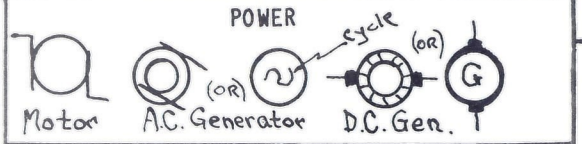
DP 28

MRL

WIRING

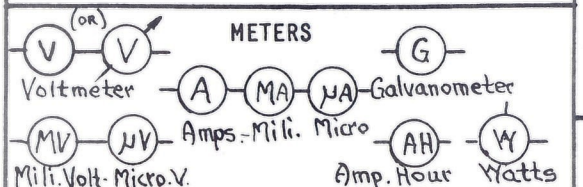


POWER

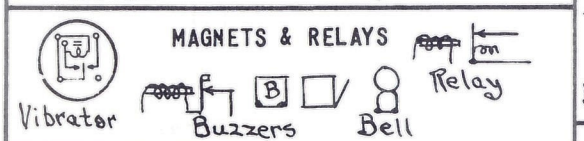


OBSOLETE TRANSMITTERS

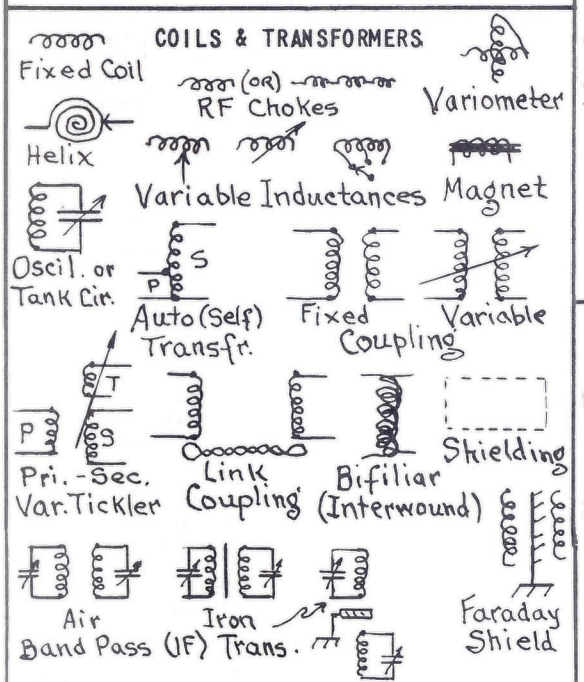
METERS



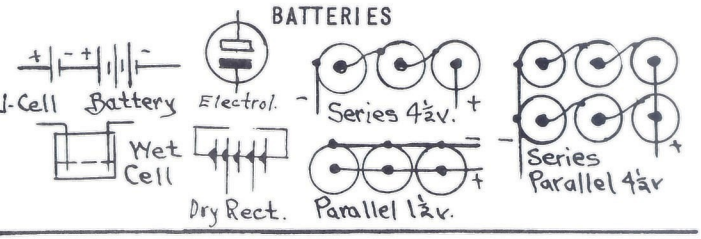
MAGNETS & RELAYS



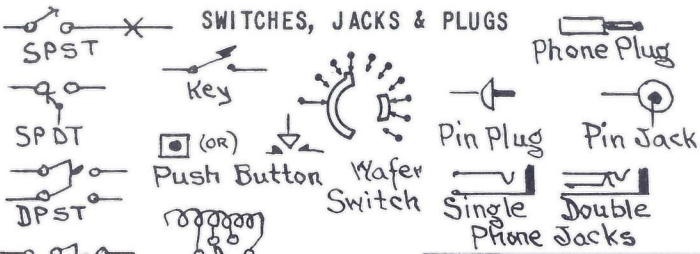
COILS & TRANSFORMERS



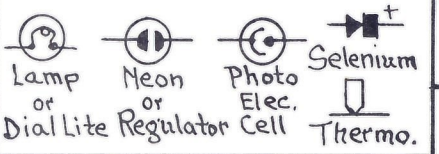
BATTERIES



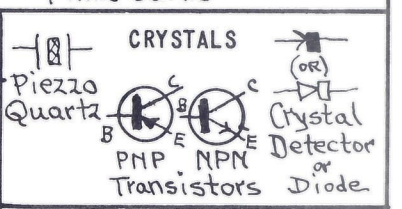
SWITCHES, JACKS & PLUGS



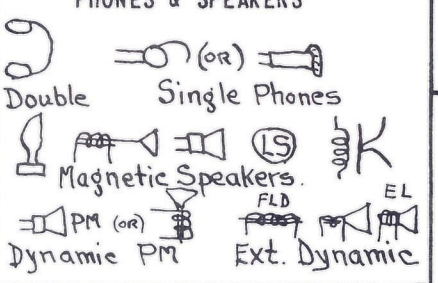
LAMPS, TUBES & INDICATORS



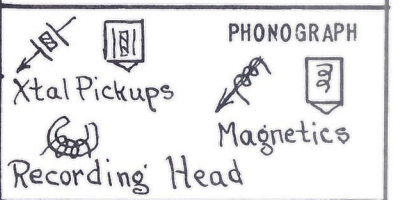
CRYSTALS



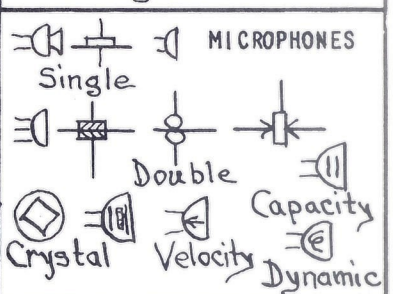
PHONES & SPEAKERS



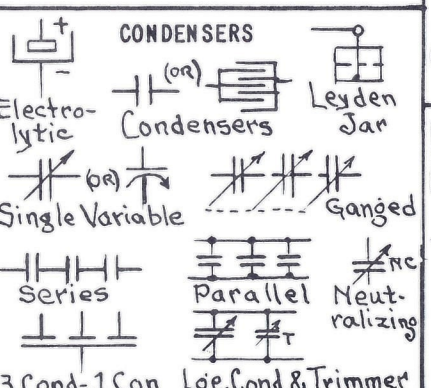
PHONOGRAPH



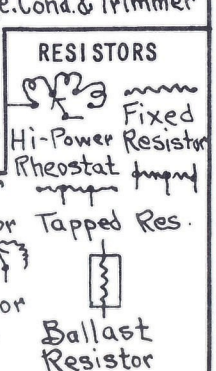
MICROPHONES



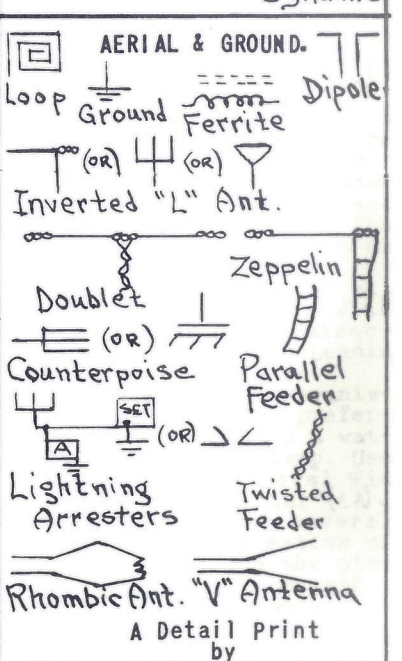
CONDENSERS



RESISTORS



AERIAL & GROUND



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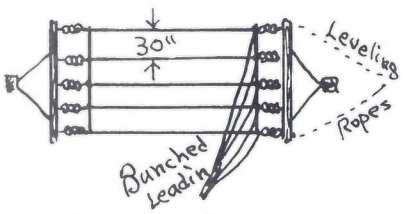
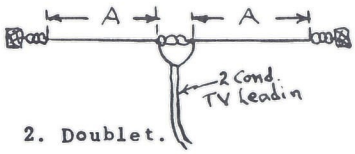
PROPER AERIAL & GROUND CONSTRUCTION

DP 30

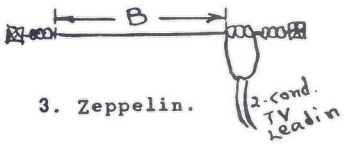
A Detail Print by Modern Radio Labs.



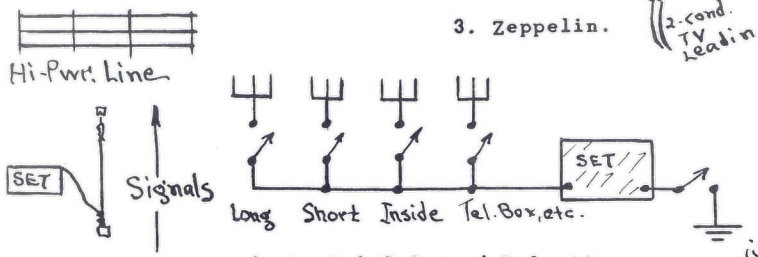
1. Multi-wire Flat-top Aerial.



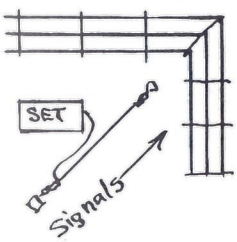
2. Doublet.



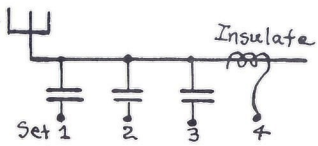
3. Zeppelin.



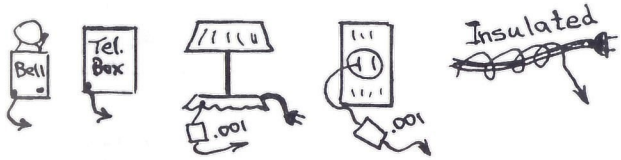
4. Aerial & Ground Selection.



5. Hi-line Interference.



6. Using several sets from the same Antenna.



7. Various Substitutes for Aerials.

8. A Modern Installation.

There is always a change in Radio- even to Aerial and Ground installations. While the latter change but very little - there are many in the Aerial. Looking back at our DP-30, which this replaces, we can see how the Fan is getting to tune his A-G circuit more every day.

Most Aerials are called Dipole Hertz, half-wave, etc. Length from far end to ground is a half wavelength, as the oscillation must complete itself by going back to the original end.

Fig. 5 shows the best way to place an Ant. if bothered with powerlines. Most utility lines run about 660 on top and usually noisy at times. Incoming signals are shown by arrows.

Fig. 7 shows several ways to get energy if you haven't space for an Aerial. Be sure to place a paper or mica cond. in series as shown, to avoid fireworks!

Fig. 6 shows how several sets may be worked from one Ant. At the right is from a lamp cord.

Fig. 1. If located on a short lot - use a light wooden spreader as shown. Be sure to get wires 30" apart to be effective, and solder well. Signals will be much stronger than a single wire. The wavelength will be increased a little but not proportionately.

For small sets in the City we usually specify a flat top of 50 ft. The Country takes 100 ft. or more. A good City Ant. in a limited space, is a "T" Ant. with a leadin from center. This also gives more volume than a single.

To easily find the natural period of an "L" Ant. add horizontal and vertical lengths and multiply by 1.37 to get meters.

Directional effects of an "L" not noticeable under 100 feet.

Get Ant. high as possible and at least 10 ft. above the house. Up there the sigs. are stronger, less noise and absorption.

Fig. 2. For a Doublet, which is also a half-wave Ant., the best lengths for A for 20 m. is 16'; 40 m. 33'; 80 m. 66'; 160 m. and BC 132'. Use 2-conductor TV leadin to come to the set.

Fig. 3. The Zeppelin is also a half-wave and may be used when leadin problems arise. For 20 m. B is 32'; 40 m. 66'; 80 m. 132'; for 160 and BC use the 40 m. 66'.

For Doublet, Zepp. & "L" Ant. use Type D Coupler (DP-11).

Fig. 8. Now for a modern installation. As most have TV Ant. Why not use the mast? Mount TV mast on wooden block. The installation will be neat and won't worry TV set too much.

A 2x4 - 20 ft. pole may be used instead of TV mast. Holes may be drilled for guys, etc.

For most receiving Ant. you may use tinned stranded, or #12 or #14 Enameled wire. While #12-14 may be better for SW, the tinned stranded has more surface, is lighter and less apt to part.

Use #14-16 galv. iron wire for guys. Aeroplane strain insulators in the guys, down near the bottom in this case.

Up as high as possible wire a glass insulator and pull wire thru. Rig up pole in back to get length. Run same Ant. wire down thru the 7" and 3" screwins and take a turn thru the latter. You solder end to Fahnstock clip on the Window Leadin strip.

Now go back up and connect all guys together at bottom. With the mast it makes a non-directional Ant. Run to Window Leadin the same way as other wire.

Drive a 3' length of galvanized pipe into the ground- preferably a flower bed. Hook to a water faucet with ground clamp. Use separate ground of several #14 twisted wires for Arrester (LA).

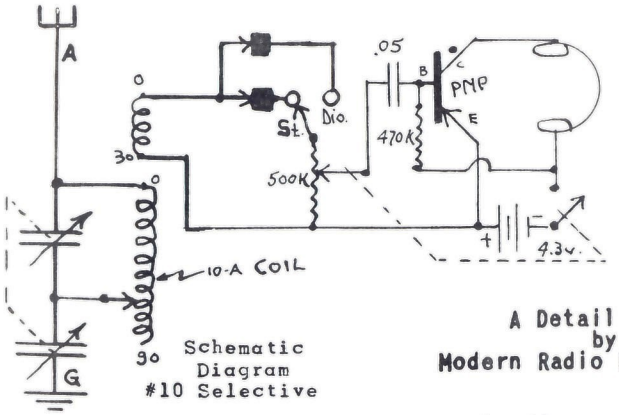
Fig. 4. Inside mount several knife switches for selection of Aerials. A wire around the picture moulding may also be used.

Solder & tape joints well.

When sigs. jump in and out you have a loose joint or wire is touching something. Solder up!

MRL Nº 10 - ALL WAVE CRYSTAL SET.

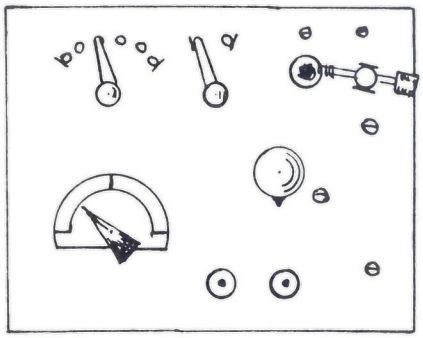
DP 34



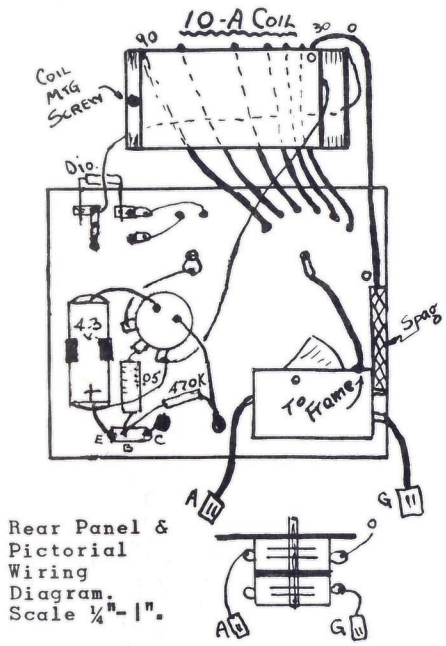
Schematic Diagram #10 Selective

REVISED with TRANSISTOR AMPLIFIER.

A Detail Print by Modern Radio Laboratories.



Front panel. Scale 3/8" - 1"



Rear Panel & Pictorial Wiring Diagram. Scale ¼" - 1".

MRL No. 10. City Operation.

PARTS LIST.

1 Compo. panel 1/8 x 5½ x 7.
1 2-gang .00035 variable cond.
1 1¾ bar knob and scale.
1 Knocked/down Xtal stand.
2 Switch levers.
8 " points. 2 stops.
2 Phone tip jacks.
1 500K vol. control and switch.
1 Small pointer knobs.
1 Steel galena. 1 Xtal diode.
1 PNP Transistor.
1 Battery holder.
1 4.3 v. Mercury battery.
1 .05 x 600 bypass condenser.
1 470K resistor.
2 ½" Fahnstocks. 2 3/4" Fahn.
1 MRL 10-A City Coil, or make:
50 ft. #22 DCC wire.
20 ft. #26 enameled wire.
MRL 2XM 2x4½" Cello. form.
1 6-32 x 1¾" BH mounting screw.
Hardware, wire, solder, lugs.

This new 10 circuit is a great improvement over our original Lab. model. Many good DX reports have been received on this circuit in the past. But, now, with addition of the TRX amplifier - you can bring in those weak stations. The circuit is most selective around congested areas, near stations. This is due a lot to the concentrated secondary coil at the end of primary.

When ordering a coil for this new selective circuit, be sure to use the #10-A. There is very little different between the two circuits basically, but this one will work better in a congested Radio district. Rear view shows the coil lifted up so you can see the connections. To save time, wire up the entire set first, then the coil. Be sure to make good, solid connections.

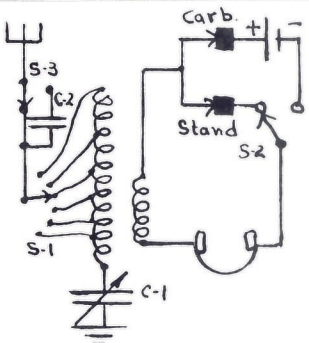
COIL: On a 2XM celluloid form 2" in diameter x 4½" long, start winding from the "hot" end with the small ring. Wind 30 turns #26 Enameled wire, winding close to the starting edge, and bring out to 8" leads. Then, next to this compact winding, wind 90 turns of #22 DCC, with 6 taps as follows: 5-10-20-40-65-90. Run a strip of light cardboard 3/4" wide under the taps. Cement ends of the coil down with Light Coil cement. When dry, sandpaper the tap wires and mount coil with the taps up, so you can solder them easily. Tin the wires a little before attempting to solder the leads to the switch points.

CONSTRUCTION. Panel is drawn to 3/8" scale; back is ¼". Arrangement is very easy to follow if you scale it up. Mount volume control in position shown. Use tiny FH screws and ½" Fahnstock clips for Diode so it can be changed at will. Be sure to get transistor in correct mounting position to keep leads right. Most of all - be sure positive (plus) of battery points downward if you want to keep your transistor. The 470K resistor may be changed to other values down to 22K, depending on TRX used.

After all parts are mounted - mount the coil. Set it away from panel on the 1¾" screw, so it clears condenser, etc. Use minimum solder on coil leads.

The switch gives choice of a stand, with Steel galena, or the Diode. You will note the Steel galena is a lot more selective than the Diode - due to difference in Impedances. When fishing for a DX station with the Steel galena, readjust it for sensitivity once the station is hooked. Note the tone compared to a tube set. If using a Carborundum (10 Country) adjust it on weak stations for best sensitivity. If using an NPN transistor - just reverse the battery polarities. Any battery from 1½ v. up may be used - the more battery, the more volume.

A 100 ft. Aerial, high as possible, and a good ground are essential. Experiment with several lengths of wire - each hooked to a SPST knife switch, as some stations may be better on a 50-footer.



MRL #10. For Country. (HB-17).

Parts same as #10 Selective, except for **C-1**, use a single-gang .00035 mfd. Variable Cond. and a .0001 mica fixed condenser for **C-2.**

The same panel layout is used, as well as most of the wiring diagram. Only difference in the latter is the coil and condenser connections.

COIL. Be sure to use the #10 coil for this set because a 10-A Selective coil won't give correct coverage of stations. However the Selective coil may be used if you only want Short wave stations. On 2XM Celluloid form, 2" dia. x 4½" long, wind a layer of 40 turns #20 DCC. Cover this with a piece of heavy wrapping paper 2" x 10" long and cement end down. Then, slit ends of the unused paper, to make a smooth winding to follow. Over this you wind 160 turns #28 DCC with taps at 5-10-20-60-100-160.

We recommend this set in locations where powerful stations do not interfere with the average set. A law of Radio is when you increase selectivity, you reduce volume. You can't have both. This #10 Country set is strong on volume, and therefore, may have greater DX properties.

As this #10 Country circuit is described fairly well in HB-17, we will omit the repetition.

CODE SHORT-CUTS.

DP 41

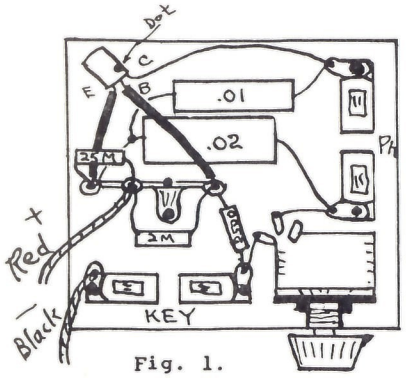


Fig. 1.

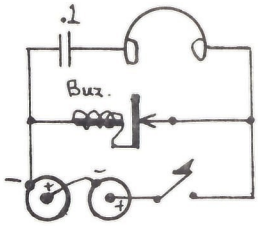


Fig. 2. Buzzer.

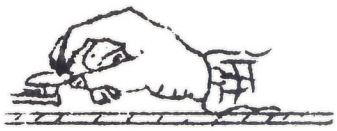


Fig. 3. Position for a straight key.

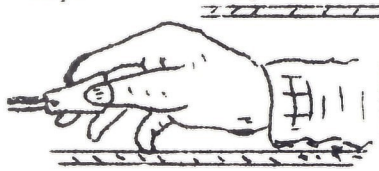


Fig. 4. Position for Bug or Cootie key.

MRL TRANSISTOR CODE OSCILLATOR.

Parts List.

1 PNP Transistor, any type.
1 50M volume control; no switch.
1 Small pointer knob.
1 1" x ½" x 1½" bracket.
1 3-lug tie point.
4 3/4" Fahnstock clips.
1 .02 x 600 bypass cond.
1 .01 do
6 6-32 x 3/8" FH Mach. Screws/nuts
4 Soldering lugs.
6 #6 lock washers.
3 ½ w. res. (2M, 2500, 25M).
1 Compo. base 3" x 3½".
2 6" flex. leads (red & black).
1 pc. 3" sleeving or spaghetti.

In learning code one must make an Oscillator as commercial stations are too fast or irregular.

This oscillator is very easy to build. Drawing gives most details of best layout. The smooth tone is variable and sounds just like a tube transmitter. The parts aren't critical in values.

Mount all parts down good and solid, using lockwashers. Enough spare wire is left over to complete the wiring. Mount the Transistor last but be sure to observe polarity connections or it may be ruined. Also hold the end of each lead with pliers when it is soldered to keep down heat. Insulate 2 leads as shown.

Use red and black wires for polarity. Just solder to the flashlite cells. It will operate on 1½ to 6 volts but good control is had on 3. As the unit draws less than 1 m.a. a battery will last a long time. When key is up no current flows.

Two of you may send to each other by hooking another phone & key across ones shown. Signals R loud enough with "cans" on the table.

In Fig. 2 you will find another rig to practice on, which uses a high Frequency Buzzer. It may work best at about 3 volts, and is easy on the batteries. The .1 mfd. bypass cond. in series with the phones, prevents shorting of the buzzer. Tone of the buzzer may be varied by bending the contacts.

KEYING. Fig. 3 shows position used on a plain key. Learn it good as that is what you'll get at the Examiners. Place tip of thumb under knob and index and 2nd finger lightly on top. Work the wrist and fingers up and down, all the time keeping the elbow on the table. Have your key placed in front of you in any desired position.

A dot is just a "tit" of the key. A dash may be 3 or more times longer than a dot, but do not make dots too long or you'll develop a "drag" that is hard to read. Give plenty separation between letters and more between words. Start by grouping several letters A, B, C, D, E into "bad, cad, bead, deed, etc." Then add F, G, H as "face, gab, had, heed etc." Keep adding 3 more letters to groups. This will help you to memorize the code by sound and not by dots and dashes. Next you may learn numerals, punctuation, etc. Make characters slowly - do not rush. Speed will come later. Have some Operator copy your sending - he'll tell you if it's good or bad!

You can learn to send by yourself - but for receiving you must copy someone else. Better, if you can get into a code class using sending tape - your speed will rapidly increase. I found that I could have gotten in one month from a tape sender what it took me years to learn myself - and by fishing code from the air at odd times. If you have access to a typewriter (mill) try to copy on it as no good Op. copies with a "stick." The Navy, etc. teach Ops. touch typing and code at the same time - a wise idea.

After you learn the straight key - you may want to dabble around with a Bug (Vibroplex) or a Cootie (sideswiper) key. Fig. 4 shows position of hand for Bug or Cootie. Because your muscles work sidewise instead of up and down - you need not fear a Glass Arm (paralysis of muscles). A Bug makes dots on one side and dashes on the other. A Cootie makes them on either side. The latter is what I always used, but my straight key sending was always under par with my Cootie.

A Tube Oscillator. Some of the Old Timers remember this type of oscillator in Fig. 5. A small B-battery may be used but we never found it necessary. Any other triode tube may be substituted 4 the 30. Note connections show the bottom view of socket.

It is advisable to use the 10 ohm wirewound resistor in series with the filament as a 30 takes 2 volts and 2 drycells in series give 3. As your batts. run down you may short out the resistor. Batts. last a long time.

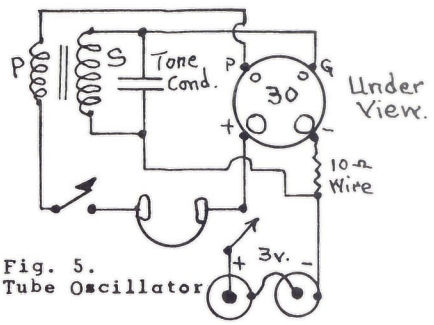


Fig. 5. Tube Oscillator

If you don't get oscillation reverse the primary or secondary or check tube connections. If U want to lower the tone, you may add the tone condenser of .00025 up to .1 mfd, as desired. If you can try different audio transformers you'll get different tones as a result.

Additional notes. Code is a sound language; not a visual one - and you learn to group sounds of letters into words.

You can't force yourself into speed; it comes slowly. Sometimes a vacation from copying will allow you to gain speed (maybe it soaks in!). When taking code for practice you always send faster than you can copy - this makes U gain speed.

Tape machines are better as Ur speed may be regulated. Phonograph records are soon memorized or cannot be regulated. Some Amateur nets have schedules for code at different speeds. In the meantime, always try to pick as much from the air as possible by a regenerative set. Altogether you will rapidly develop speed.

It isn't practical to copy over 25 wpm with a pencil - but speeds over 30 wpm may be easily taken on a mill. Good Ops copy behind a word or so. Train yourself to read it in your head and copy behind. I've seen Ops carry a whole paragraph in their head. Cypher cannot be copied behind.

Each Op has his own adjustment of key. Many Foreign Ops mount the key on front of desk & grip the knob. Some sound like they use their foot! You can soon recognize an Op's sending.

For more info. on Exams., etc. write nearest Fed. Commun. Com.

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Modern Radio Laboratories.

See DP-76 "Operator's Code Sheet" - showing Radio, Morse, Japanese, Foreign, punctuation, etc. Very complete and handy.