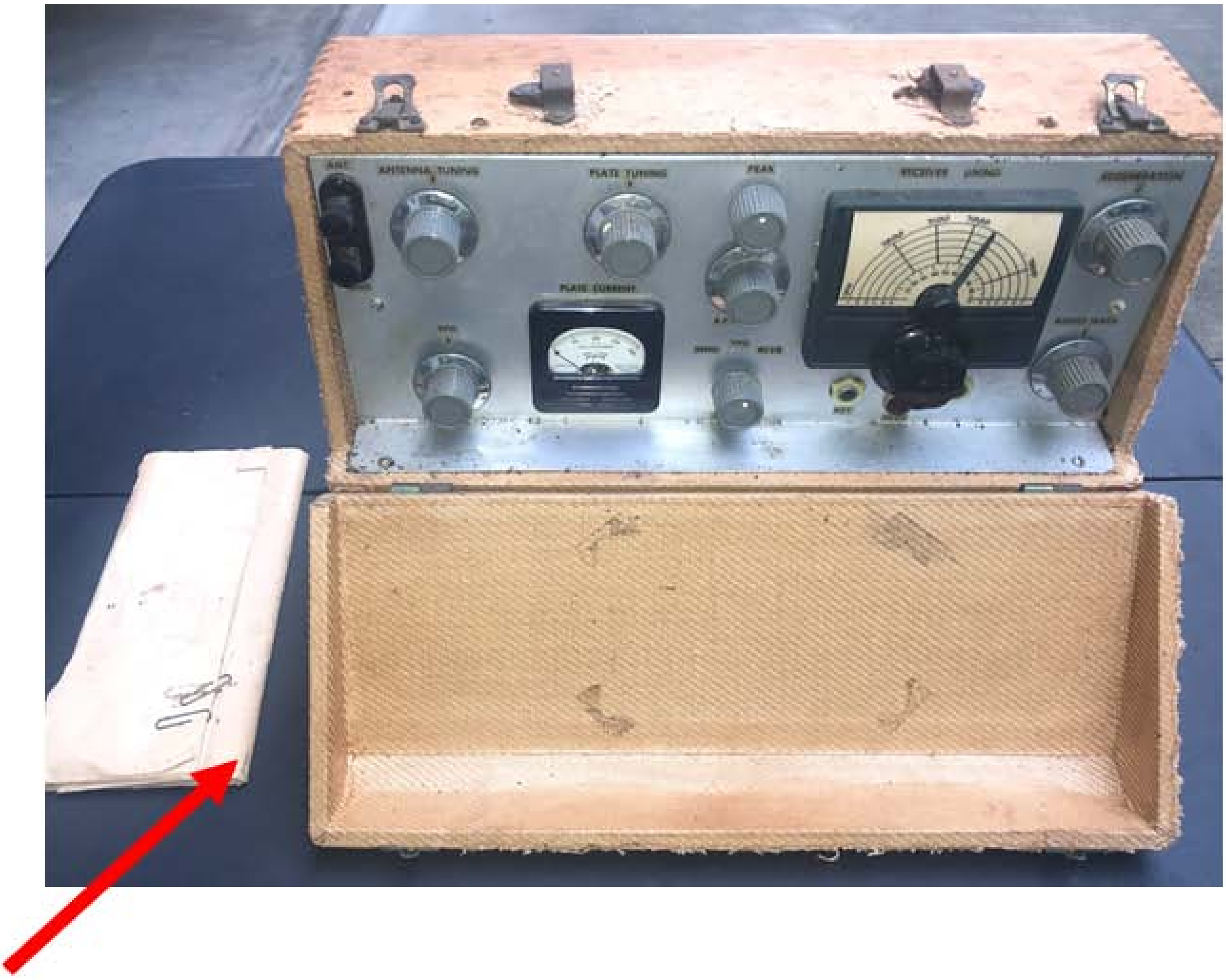
W9FCK's Paper



The Following pages accompanied a second Suitcase Portable currently in the collection of KN4R. According to this document, working with W9FKC, W9OLU constructed a nearly identical set.

THE SUITCASE PORTABLE

A complete 40 meter CW station for fixed or mobile use.

by Myron Hexter, W9FKC

During the past couple of years, various articles have appeared describing so-called portable equipment, but in most cases it was a description of either a transmitter or receiver, and not a complete station built into a single portable unit. Furthermore, such necessary details as phones, key, log book, pencil and antenna wire were either forgotten, or else were intended to be carried in a separate package.

I had long wanted a portable station, but it had to meet many requirements, and must be absolutely COMPLETE down to the last detail - and in one small easily carried case. The input to the final should be at least 25 watts; it must be VFO and stable; it should load into any kind of antenna, including a piece pf wire hung out hotel windows; it must have a very minimum of tuning controls; it would have to be sufficiently rugged to stand the abuse of being transported in an auto or on a train with no special "kid glove" handling - all this just for the transmitter section. The receiver had to be a superheterodyne; simple to operate; quiet; selective; with good sensitivity; stable; keep its calibration; have volume to spare; have few, if any, images; and in general, equal a good commercial receiver in every respect. Power for both receiver and transmitter must be in the same case, and only one switch should be moved to change from receive to transmit. Furthermore, the various units must be easy to remove from the case for any replacements or adjustments that might become necessary, and nothing about the appearance of the case should make it look like a radio transmitter, so that it would arous curiosity when carried into hotels and other public places.

With such a list of requirements, I doubted if it could all be combined into one package weighing less than 100 pounds, but it has been done - and it weighs just under 19 pounds including every detail mentioned above, as well as a copper clamp and length of wire for attaching to the nearest "ground." The actual designing and planning commenced when finally the right kind of case was discovered for $1.75. It was a new little suitcase-type box originally made to contain a G.E. AC-DC-Battery receiver, Model 254 (at least that is what the sticker on the back of the door reads.) However, this same style suitcase of approximately the same size and shape was used by many manufacturers several years ago for the earlier style AC-DC-Battery receivers, so finding a similar one should present no difficulty. Mine measures 15" long, 10" high and 6" thick - not including the handle or hardward. The front lid is hinged about 6 inches from the top, and slides out of the hinges if desired. The back door is permanently hinged on the left side (viewed from the back), and fastens shut on the right side with a couple of spring-type snaps like those used on a kitchen cupboard door. As originally purchased, there were a couple of shelves and wood separators inside, as well as a sloping cloth-covered panel inside the front lid. These were carefully removed and thrown away, leaving nothing inside except the fasteners for the rear door.

Now I had a nice little container for the rig, but still no circuits for the "insides." At this point my membership in our ham club, North Suburban Radio Club, paid generous dividends. I discussed the project with several of the members whose job is the design of electronic equipment, and W9TO and W9PSR came up with a diagram of the transmitter. They worked out the details on paper, and met all the requirements I set forth, and in addition, designed it so that a voltage multiplier type power supply could be used without danger of shock or damage if the AC power line were plugged into the outlet the "wrong" way. They had never built such a transmitter, but they "guaranteed" it would work - and it did!!

The receiver was a challenge to anyone, but it didn't scare W9DIU. He promised to work on it, and several weeks later he mailed me a diagram and stated that he had not only worked it out on paper, but had actually constructed it "bread-board" style, and had removed all the "bugs" so that it should work without further changes - and it did!! Not only did it work - it exceeded my fondest dreams. I believe it is one of the cleverest pieces of design seen in a long time, and a never ending source of amazement to me that 4 tiny tubes, and a cigarette-package-size 67½ volt B Battery can produce such volume. I was at first skeptical that a battery-powered receiver would prove satisfactory because of necessity to replace the batteries at frequent intervals, but with hard use they last 3 months, and the quiet operation of a battery-powered receiver is a revelation to anyone who has forgotten the old days , or who never used one before. The design skill of W9DIU will become more apparent as the receiver is discussed in detail.

Several types of power supplies for the transmitter were considered, but nothing seemed small enough except a voltage multiplier using selenium rectifiers and high capacity condensers. A source giving about 400 volts was desired, and on paper, a voltage tripler would suffice. It contains just 7 small functional parts - - - 3 selenium rectifiers, 3 condensers and 1 peak current limiting resistor, all weighing less than a pound and supplying 385 volts under full load with good regulation to the keyed final amplifier which draws 78 mills. The filaments to the 2 transmitting tubes are supplied from a small 6 volt transformer mounted on the power supply chasis, just in back of the batteries.

The photo of the rear of the complete unit shows the space (on the right side at the bottom) used for storing all the other necessary equipment. The "bug" is first placed in it with the bottom of the "bug" against the front panel and with the "paddle" of the "bug" to the right. Next, the phones are sprung together and pushed up against the "bug". The phone cord and plug is loosely pushed down around the paddle of the "bug" and in the bottom right hand side, a pencil and ground clamp are placed. Then the 10 foot AC cord and plug are wound into a loose coil and placed inside the head band of the phones; then on top of this is placed a 3½ inch diameter spool of 300 feet of braided copper antenna wire. This is a fibre spool with about 1 inch space between sides for winding the wire. The wire consists of about a dozen fine strands of copper wound around a center nylon thread. It is a type available as military surplus and is very strong and proves satisfactory under severe conditions including exposure to salt air, rain and wind. The log book is squeezed in any convenient place, or can be carried behind the door on the front. It's a tight fit, but EVERYTHING is there, and after a little practice all the accessories can be put in place in about 30 seconds.

When setting up to operate away from home, the accessory equipment is removed from the storage place and likely spots for the antenna are observed. Of course the best location would be between a couple of trees, and if suitable trees are available it is easy enough to tie a string to a rock and throw it over a branch and use it to pull the antenna wire to within a couple of feet of the branch. No insulator will be necessary if the installation is to be for only a day or two, as the string will provide sufficient insulation. In hotels, the antenna wire can be fed out the window to within a story or two of the ground, and used as a top fed vertical. Or, the wire can be strung around the room in the shape of an L or U, just so as much wire as possible is trung out without having parallel sections of it. Any length over 25 or 30 feet will do - more if possible. If you are travelling by car and stop at a motel, don't be afraid that an antenna strung around the room won't be high enough. I have tried it many times and it always works, even though you are only 7 or 8 feet above ground level. It is not necessary to cut the wire off the spool to connect it to the antenna post. Just bend it back on itself, and stick the end through the antenna binding post, and let the spool with the balance of the wire lay on top the suitcase without touching the metal fasteners that hold the lid in place.

This kind of antenna requires a ground to work best, so take the ground clamp and unwind the wire wrapped around it (the same kind of wire as used for the antenna), and clamp it to the nearest water pipe or radiator. If you are in a cabin in the woods near a lake, and no water pipe or other similar ground is available, attach some more wire to the ground lead, and wrap it around a large stone and toss it as far out in the lake as possible, and it will work nicely.

All of these combinations have been used with this station, and they work. It is indeed surprising how much you can hear and work with simple makeshift antenna-ground systems that ordinarily would not be attempted at home. If a permanent antenna system is wanted, the best one seems to be a folded dipole with one end of the feeder going to the ground post, and the other end to the antenna post and without any actual ground being used. With this type antenna, it is not unusual to work foreign DX.

Because the power supply for the transmitter is a voltage multiplier device, there is a "right" and "wrong" way to plug into the AC wall outlet. Although the transmitter will work with the plug in either way, a loud 120 cycle ripple will come through the receiver when the plug is in wrong. Simply reverse the plug, and the noise stops. Either way, there is no high voltage on the chasis to be dangerous.

So far, nothing has been mentioned about using this station for mobile operation. When it was first built there was no thought about using it thusly, but about a month before last Field Day I began to wonder how it could be made to operate from the car using the dynamotor that is installed in the car to supply my 10 meter mobile phone. The diagrams were studied, and it was discovered that not a single change need be made to the rig to properly connect it to the dynamotor and car battery. All that need to be done was to pull out the 6 connector Jones socket from the power supply chassis, and get another "male" Jones plug to which the connections could be made from a 4 wire cable leading to the PE-103 dynamotor in the car trunk. To this same "male" plug were fastened 2 short leads with small alligator-type clips, one to clip on the positive "A" battery lead to the receiver, and the other to any part of the chassis to complete the common ground connection between the dynamotor and the receiver and transmitter and car battery.

For an antenna, a Master Mobile whip was installed using a 40 meter center-loaded coil. The antenna lead is a piece of RG-59U coax with the shield connected to the car body at the bast of the whip, and the center of the coax connected to the whip. This lead and the power cable run through the body of the car and come out on the right side of the back seat cushion. Both are long enough to reach up to the dash-board in the front so that they can be properly connected when the suitcase is on the little table that fits into the front seat alongside the driver. The shield of the coax, is connected to the ground post, and the center goes to the antenna. When first installed in the car, you will probably not be able to get the transmitter to load into the antenna. Remove the metal shield can and plastic ring from the loading coil and take off one turn only from the loading coil without replacing the shield, and try again. Repeat this operation of removing one turn at a time until you are able to load 100 mills with the transmitter resonated at the low frequency end of the band - 7000 kc. CAUTION - Do not replace the shield at any time during this operation. Now, take off one more turn from the loading coil and see how far up the band you can still load the final to full input. When you can load to 100 mills up to about 7150 kc. you can stop. Now you have a choice. If you want to workthe lower half of the band (7000 to 7150 kc.) don't remove any more turns. If you want to work the upper half (7150 to 7300kc.) you will need to take off one or two more turns. There isn't sufficient capacity in the transmitter tank and antenna condensers to cover the entire band with full input using this type antenna. Mine covers the lower half, but I can work the upper half with reduced input quite satisfactorily. About that metal shield can. If you want to use it, more turns will need to come off the loading coil because of the capacity the shield adds to the coil. I preferred to leave it off and gain the added efficiency which a larger coil permits. To protect the coil, I gave it 2 coats of heavy lacquer, and then wound on a layer of Scbtch insulating tape, and it is unaffected by rain or weather. Leaving off the shield also reduces the wind resistance when in motion. Using a short, loaded antenna like this makes the transmitter tuning quite critical. Moving the frequency with the VFO more than a few kilocycles requires retuning the final amplifier and re-setting the antenna loading condenser if the input is to remain constant. However, it is all quite simple, and requires only a few seconds to make these two adjustments. The dynamotor delivers 500 volts (as compared to 385 from the voltage tripler), so you can load the final to about 100 mills when the car is stationary, and about 90 mills if you are in motion. This lower input for "in motion" operation is necessary because the whip will sway and the mills will vary up and down, and any load over 100 mills is just too much.

With the station set up in this fashion, the car battery continuously supplies 6 volts to the transmitter tube filaments through the dyna-motor plug. Moving the control switch on the front of the station panel from "receive" to "transmit" starts the dynamotor, and the transmitter is then ready to operate. Although a small speaker is often used on the receiver when operating at home, headphones must be worn while operating in motion in the car to exclude the noise of the car and wind. Using the "bug" while driving is not difficult, and complete concentration on operating the car while listening or transmitting is not too difficult.

A week before Field Day, I drove home from a city 300 miles south in Illinois, and during the 300 mile journey I operated about 6 hours and had 10 QSO's which lasted almost the entire trip. Stations all around the middle west were worked, and as far west as Kansas and east to the coast. Six hours were operated from the car on Field Day, and 43 stations contacted.

Now you have the story of THE SUITCASE PORTABLE. It is over a 40 meter CW station that works literally anywhere, and after 14 months of hard use it has never had a breakdown, and has travelled about 10,000 miles according to my best estimate. For those who would like to construct a similar unit, constructional details and essential data follows.

POWER SUPPLY SECTION.

This is a separate chassis, 5½" x 5½", made of 18 gauge aluminum sheet, The two edges on the sides are 3/4" high as shown in photo #7. The 3 selenium rectifiers are mounted on small bahana plugs which are just the correct size to firmly fit through the holes in the center of the rectifiers, making for easy replacement in case of a rectifier failure. The banana plugs are supported by a piece of bakelite strip which in turn is fastened to the chassis with a 5/8" angle at each end of the bakelite.

In the middle of the edge of the chassis that is to be nearest the back of the case, a section is cut out to fit a 6 connector Jones "male" plug. With the exception of the two snap-on connectors to the "B" battery, this plug provides an outlet for all the power supply connections to the receiver and transmitter on the main chassis above.

The two "A" batteries for the receiver (No. 2 size D flashlight cells) are held in place with a small metal holder that is available in any hobby shop handling model airplane parts. They come in two sizes, so be sure to get the size that holds two No. 2 size D cells. A small spiral spring presses the ends of the battery holder firmly against the batteries to make good contact. On top of this, place the "B" battery, and then shape around the whole thing a 1¼" wide piece of brass strip - the kind used for weather-stripping a door.

The brass piece is bolted together at the top to make a firm fit, thus holding the "B" battery in place. A hole is then drilled in the center of the brass strip on the bottom to correspond to the hole in the center of the "A" battery holder, and the entire assembly is bolted to the chassis so that the end of the "B" battery just touches the frame of the filament transformer which is to the rear of the battery assembly. When the batteries need changing, just loosen the nut and bolt at the top of the brass strip, slide out the "B" battery, unhook the spring on the "A" battery holder and remove the "A" batteries.

The 3 voltage-tripler condensers are fastened to the fibre forms that come with them. These fibre holders are bolted to the chassis between the battery assembly and the bakelite strip that supports the selenium rectifiers.

The entire chassis is held in place by bolts extending up through the bottom of the suitcase through two 5/8" angles mounted on the right side of the chassis (one in the front, and the other in the back), and by two self-tapping metal screws that go through the left side of the suitcase and chassis at the bottom. One of these screws can be seen in photo #3. The 5 ohm peak-current limiting resistor is mounted underneath the chassis. Photo #7 of the power supply chassis shows a wire extending upwards with a lug on the end. This wire goes between the main chassis and power supply. The other end of it goes to the brass screws which press against the "negative" ends of the "A" batteries in the metal battery holder. It is shown fastened to the main chassis on the left side in photo # 3. Another such connecting wire is also shown going from the main chassis to the power supply chassis on the bottom right screw that holds the power chassis in place. These two wires form the common ground between the two chassis and MUST ALWAYS BE CONNECTED BETWEEN THE 2 UNITS. If these wires are not connected, a "sneak" circuit develops when the AC plug is plugged into the wall socket, and all the filaments in the 4 receiving tubes will be burned out. *So, never fail to securely connect the power supply chassis with the main chassis before plugging in the AC lead to the wall outlet.*

The chassis for this, and all other sections of the entire unit are made of 18 gauge aluminum. The bends in them were made by first deeply scribing along the line to be bent, and then bending AWAY from the lines thus scribed. Before bending, a piece of wood was layed along the line, and another piece of wood was placed even with the line on the opposite side of the metal, and the whole thing then clamped in a wood vise. Then, a third piece of wood was pressed against the metal extending over the other pieces, and pressed until the metal was bent to a right-angle.

MAIN CHASSIS AND PARTS LAYOUT.

Three separate piefes are required for the chassis. Two of these are Z shaped and are joined together to form the front panel and base, as shown in photos #4 and #5. All of the parts are mounted on this assemply which is removable as a complete unit through the front of the suitcase. They are fastened to the case by two self-tapping metal screws that go through the top of the case and the chassis, and

3 more screws that go through the horizontal section of metal at the bottom of the front panel and case. These last 3 screws can be seen in photo #2, under the VFO dial, send-receive switch, and audio-gain control.

The third chassis piece can be seen in its permanent place in photo #9. It acts as the bottom plate to cover all the wiring and parts underneath the parts chassis. It is held in place with scre going through the small metal tabs to the case. The tabs are on either side, and part of this third chassis piece, and are bent in place when this piece is made. They can be seen in photo #3 - one just in back of the door snap on the right bottom, and the other just to the left and above the selenium rectifier on the left bottom. A hole is cut in this bottom plate through which passes the Jones socket and control-power cable from the main chassis to the power supply.

The r4ar edge of the main chassis fits against the rear edge of the bottom plate, and the two are held together with 4 self-tapping metal screws as shown in photo #3. The 2 screws on the left are used to fasten the ground wires between the main chassis and power supply.

After the chassis are formed and made to properly fit together in the case, the parts layout is made. Cardboard duplicates of the parts-chassis can be used on which the parts can be experimentally mounted and moved around until they all fit in properly. Then, measurements are made so that duplicate placement on the metal chassis is correct and holes are drilled, etc. and all the parts fastened.

Photos #4 and #5 show the parts on the back as follows: left to right - On the panel is the regeneration control, and back of it the audio transformer, and 2nd audio 3S4 amplifier tube. Next is th IF transformer, and back of it the 1S5 first audio amplified. The main tuning condenser for the receiver is next, and back of it is the 1T4 detector-IF tube. To the right of the base near the panel is the coil form holding the receiver input inductance and link, and back of it the oscillator-mixer 1R5 tube, and the crystal which controls the oscillator portion of this tube. Next on the panel is the receiver input peaking condenser, and below it is the receiver RF gain control and behind both of these is the 2E26 final amplifier for the transmitter. Next, is the plate tank tuning variable condenser for the transmitter final, and between it and the 2E26 is the RF choke. On the base just under the left edge of the RF choke can be seen the adjusting screw for the slug tuned coil in the plate circuit of the oscillator. The other variable condenser on the right is the antenna loading control. Between it and the plate tank condenser is mounted the final tank coil, around which can be seen the 3 turn link for the receiver pick up. In front of this coil and near the panel is the shield covering the 6AH6 VFO tube. Underneath the coil, a spare crystal for the receiver is held in place with a Fahnstock clip. The tube on the right is the OA2 voltage regulator. The antenna-ground terminal strip can be seen on the panel at the extreme upper right, just below and back of it is the screw for adjusting the slug tuned coil in the VFO oscillator grid circuit.

Photo #6 is the bottom of the chassis. The parts on the front panel appear nearest to you. Left to right they are as follows:

On the panel is the audio gain control on the back of which is mounted the off and on switch for contolling the receiver filiaments and "B" supply. To the right is the receiver phone jack, and next the insulated key jack for the traasmitter. Between the two jacks is the RF choke in the receiver circuit. In the exact center is the SEND-RECEIVE control switch, and to the right of it is the millimeter which protrudes through a hole cut into the chassis, base. Directly back of the left edge of the meter at the back of the chassis you can see the end of the slug tuned coil in the plate circuit of the VFO oscillator. And also at the extreme near on the right can be seen the RF choke in the cathode circuit of the VFO. At the right front is the small 7 plate variable used to control the VFO. Part of the chassis base is cut out to clear the plates. To the right of the VFO condenser is the slug tuned coil in the grid circuit of the VFO. The two zero-coefficient mica condensers are just in back and slightly to the right of the VFO control condenser.

Photos #1 and #2 show the front panel, with controls and parts as follows - left to right -

At the top left are the antenna - ground connectors. At the bottom left is the VFO control, and over it the antenna coupling condenser. Above the milliameter is the final amplifier tank condenser. The SEND-RECEIVE switch is in the exact center near the bottom. Above it is the receiver RF gain control, and at the top is the peaking condenser for the receiver input. Just to the left below the large receiver tuning dial is the insulated jack for the key, and on the right is the jack for the receiver phones. The top right control is for receive regeneration, and the bottom right is the audio-gain-off-on switch for the receiver.

Making the three chassis pieces and properly mounting the parts so that everything fits is the most difficult part ofd the entire construction. After all parts are in place, wiring of the transmitter section should be the next procedure, and once it is working properly, the receiver portion is wired.

THE TRANSMITTER

The oscillator is a VFO, using a 6AH6 with a high capacity grid circuit, and a broad-band fixed-tuned plate inductance. The grid coil is wound on a slug tuned form, and the slug is adjusted so that the frequency of the grid input circuit is 3500 kc. with the VFO condenser fully meshed at full capacity. This will then double into the place circuit from 7000 kc. to 7300 kc. using about 80 degrees on the VFO dial.

The plate circuit of the oscillator uses another slug tuned coil which is tuned to 7100 kc. Both slug tuned coils are adjusted for frequency arter the entire transmitter has been completely wired and assembled. A grid-dip meter will be of great assistance for these adjustments. Because no condenser is used with the plate coil, it will have a very broad response, and offers sufficient reactance across the entire 40 meter band to have little if any loss in efficiency regardless of the VFO setting.

The final amplifier is a 2E26 with a pi-network plate tank using an inductance and 2 variable condensers. The condenser nearest the 2E26 tunes the circuit to resonance, and the other condenser adjusts the antenna coupling. This arrangement is not only easy to adjust, but also helps to eliminate harmonica that might otherwise cause TVI. Incidentally, this transmitter has often been used in the same room with a TV receiver with no interference to either picture or audio.

An OA2 regulator tube is used to keep the voltage stable on the oscillator when the final amplifier is keyed.

A link of 3 turns of plastic covered #20 wire is wound around the final amplifier plate tank coil about 1/3 the way from the plate end of the coil, and the two ends of this link are connected to the CONTROL SWITCH as shown in the diagram. This link acts as the antenna pick-up coil for the receiver. It is held in place on the tank coil with a generous coating of polystyrene cement. When the transmitter is operated, the ends of this link remain open, and when the control switch is in the receiving position, they are connected to the input of the receiver. This arrangement provides the means for antenna change-over from tansmit to receive, and automatically adds a tuned antenna-input circuit to the receiver making for better receiver selectivity and gain. During periods of transmission the input of the receiver is short-circuited by the arrangement on the control switch.

To adjust the transmitter, the control switch is moved to "SEND" and the VFO condenser turned to the desired frequency. Then the key is pressed and the FINAL AMPLIFIER condenser tuned to the "dip" on the milliameter. If the milliameter shows less than 78 mills, decrease the capacity on the ANTENNA coupling condenser and readjust the FINAL to the dip again. If the meter reads more than 78 mills, increase the capacity on the ANTENNA condenser and again readjust the FINAL for the dip. Continue these two adjustments until the final resonates at 78 mills. This loading seems to give the most output when using the voltage tripler power supply. With the PE-103 dynamotor whose output is 500 volts, the final can be loaded to 100 mills with good output efficiency. The battery operated receiver has

RECEIVER.

The battery operated receiver has 4 tubes which function as follows: a 1R5 crystal controlled oscillator and mixer using a 6800 to 6815 kc. crystal to beat with the incoming signal to form the IF frequency; next, a 1T4 tunable IF amplifier and regeneratige detector then a 1S5 first audio, and finally a 3S4 second audio amplifier.

The input to the 1R5 converter is tuned with the coil and variable condenser in the grid circuit of that tube. In actual operation, the condenser acts simply as a "peaking" control, and is seldom moved once it has been peaked on an incoming signal. It need only be reset when moving from one end of the band to the other. The coil, and link that feeds it, are wound on the coil form specified in the diagram, both windings running in the same direction, and separated about 1/4 inch. The link is connected to the CONTROL SWITCH on the front panel which connects the link to the other link wound around the transmitter final tank when the switch is in the RECEIVE position. When the switch is in the SEND position, the receiver input link is short-circuited.

Assuming that the incoming signal is on 7000 kc., and that a 6815 kc. crystal is used, then the resultant IF frequency of 185 kc. formed in the 1R5 converter is tuned-in with the variable condenser and coil "L" in the grid circuit of the 1T4. To cover the 300 kc. of the 40 meter babd, then, the IF tuning condenser and coil must cover from 185 kc. to 485 kc. Detection, IF amplification and regeneration are all accomplished in this same 1T4 tube.

Because the high frequency oscillator is crystal controlled, and because the IF frequency is a comparatively low one, the stability of the entire RF section is not only as good as any commercial receiver, but is actually better than almost any on the market. Vibration and changes in humidity and ambient temperature have no noticeable affect on either the calibration of the main tuning dial or incoming signa. Further, the usual objections to detection of CW signals by regeneration are absent because of the low IF frequency which is being converted. The tube goes into regeneration so smoothly that you hardly know it is there, except that CW signals become audible. There is no detuning from hand capacity, or "blocking" on strong signals. Nor is it necessary to set the regeneration control on the "edge" of oscillation to obtain maximum signal strength. It can be advanced well beyond the oscillation point with no loss of sensitivity on CW signals.

The selectivity seems to be just as good as any <u>high grade</u> commercial receiver (not using the crystal filter in the commercial receiver), and it certainly is better than some receivers that <u>do</u> use a crystal filter. Its over-all performance is superb in every respect.

The two stages of audio provide more than enough volume for headphone operation. Most of the time the RF and audi gain are run about half way open. Opening them further will certainly rattle the phones, but there is no tendency for the receiver to block. A small speaker will work satisfactorily, provided a high impedance matching transformer is used on the receiver output.

Coil "L" is the main tuning inductance. The 300 mmfd. variable condenser across it is the maint tuning control, and it covers the 40 meter band nicely with about 5 degrees to spare at the low frequency end, and 10 degrees at the high end. The dial for this tuning condenser has an 8 to 1 ratio, so the bandspread is excellent. Coil "L" is made from a regular 455 kc. IF tuansformer commonly used in commercial superhets. The windings and rod on which they are mounted are carefully removed from the shield can, and the leads to the trimmer condensers are cutt off as near the trimmers as possible. The condensers are left in place or removed - and they are not used in either case. Then, inspect the bottom coil to see whether the top lead from it comes from the inside or outside of the winding. If it comes from the inside, solder it to the outside lead of the top coil, or vise versa. The bottom lead of the bottom coil should be marked in some manner to later identify it as the lead to be connected to the .003 mfd. condenser and 2000 ohm resistor at the "ground" end of the circuit. This lead and the other one from the top coil are arranged to come out the bottom of the shield can.

There will be about a 1/2 inch of supporting rod below the bottom IF winding. In this space random wind the tickler coil with some 30# or small cotton covered wire, in the same direction as the main windings, and coat it with polystyrene cement to hold it in place on the rod. Leave about 4 or 5 inches of wire for leads on the ends of the tickler coil. Now, replace the rod with its windings in the shield can, and the job is complete.

For those who have forgotten, or who never before have used a regenerative detector, please note that the receiver will not oscillate unless the tickler coil is connected in the "right" direction. If the receiver fails to oscillate when the regeneration control is advanced, reverse the tickler connections and it will then work properly. When the receiver is tuned to the low end of the eter band, it should oscillate with the regeneration control set about 70% advanced. At the high end of the band, it will oscillate at a mslightly lower setting. At no point is the adjustment critical, and it goes into oscillation with a velvet aotion that is absolutely perfect.

Wiring the receiver is simply a matter of making the proper connections with the shortest possible leads, and only one precaution need be observed. The lead from the arm of the 2 megohm audio gain control to the .002 fixed condenser, and from this condenser to the grid of the 1S5 (pin #6) must be shielded and as short as possible, and the shield grounded. The 10 megohm bias resistor and 50 mmfd. by-pass condenser that also go to the grid of the 1S5 should be soldered right to the tube socket pin and grounded with the shortest possible leads. It may even be necessary to wrap a layer of scotch insulating tape around the 10 megohm resistor and 50 mmfd. by-pass, and over this wrap a layer of aluminum foil which is grounded without touching the leads of the resistor or condenser. The .002 condenser is also shielded in the same manner. The foil and scotch tape wrappings can be seen in photo #6 on the far left just in back of the audio gain control on the front panel. These precautions are necessary because of the very high amplification of the 1S5 first audio tube. Unless the grid lead to this tube is well shielded, it will pick up hum from the AC leads to the transmitter filaments, and a lund induction hum may result. Carefully following the foregoing instructions will prevent this trouble.

After wiring the receiver and getting it to work propery, the 8 wires that form the POWER & CONTROL cable are bunched together and covered with a layer of scotch insulating tape to make a single large cable that passes through the hole in the bottom-plate chassis which is permanently fastened to the inside of the suitcase. The two "B" battery leads come out the side of the cable to the "B" battery, and the other 6 wirew are soldered to the "female" Jones socket #S-306-CCT. This plugs into the "mâle" Jones plug #P-306-AB on the power supply chassis, or when working mobile it connects to the "male" Jones plug #P-306-CCT on the adapter cable that runs to the PE-103 dynamotor.

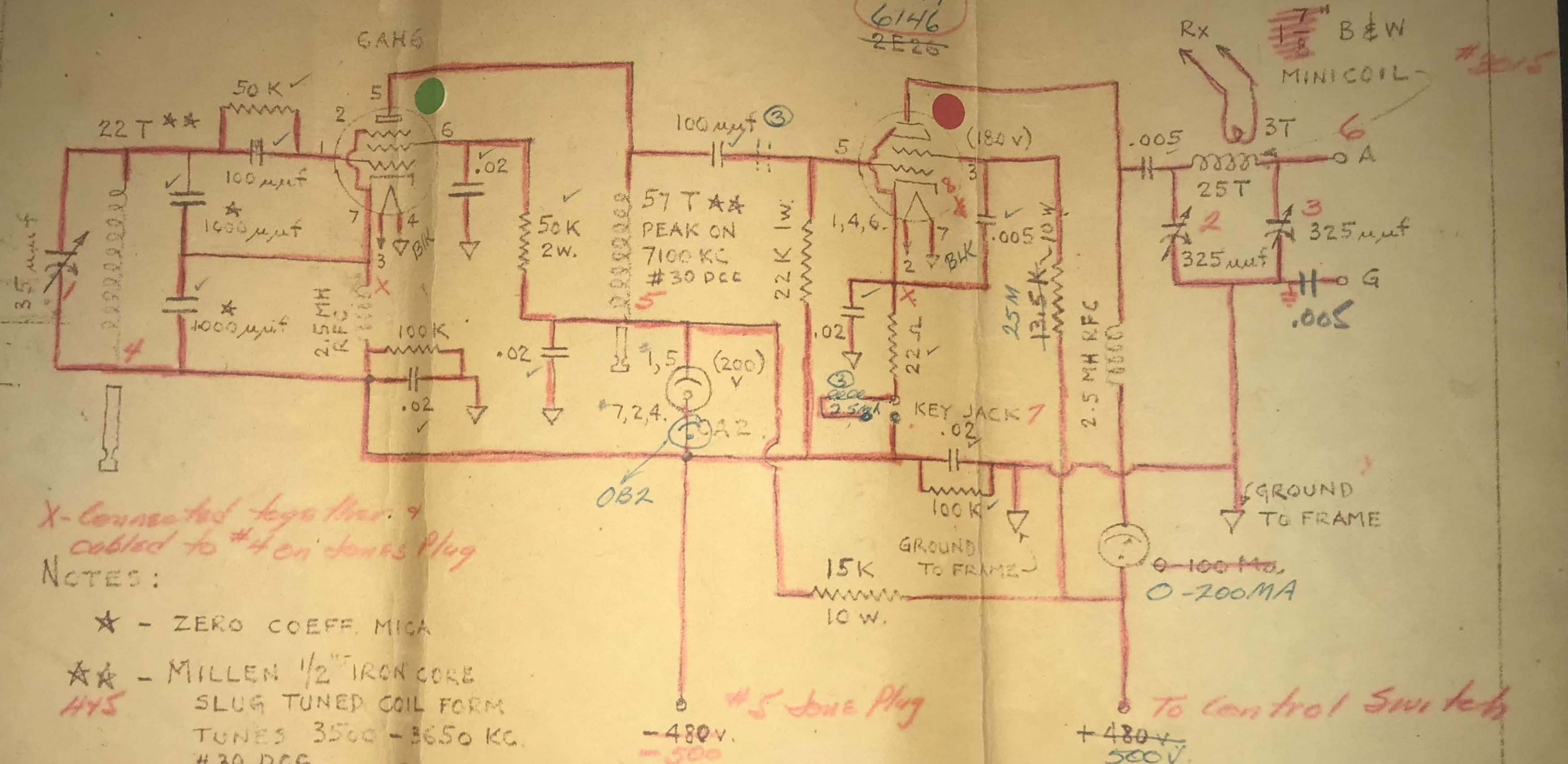
This completes the job, and the main chassis can now be fastened in the case. The receiver dial can be calibrated by marking the dial at the proper points with India ink. A calibration curve of the transmitter VFO dial can be made on graph paper and pasted inside the front lid. After 14 months of steady operation and rough travel, the calibrations are still correct on the unit described. The transmitter frequency can be set to the receiver freqeuency during operations on the air by turning the RF gain control on the receiver to zero, moving the CONTROL SWITCH TO SEND, and then turning the transmitter VFO dial until the oscillator zero-beats into the receiver phones.

The total cost of the entire unit was about $75.00, which certainly seems reasonable considering that a complete station was built for that price - one that workns not only at home, but can be used portable, or mobile, or for emergency operation should the occasion arise.

In addition to giving proper credit to W9TO and W9PSR for the transmitter design and W9DIU for the receiver, any credit for originality of construction must be mutually shared with W9OLU who constructed an identical unit simultaneously with the writer.

W9FKC PORTABLE TRANSMITTER

40 METERS



X - Connected together & cabled to #4 on Jones Plug

NOTES:

★ - ZERO COEFF. MICA

★★ - MILLEN 1/2" IRON CORE SLUG TUNED COIL FORM TUNES 3500 - 3650 KC. #30 DCC (4 & 5)

1 - Hammerlund MC-50-S (Insul. from panel)
2 & 3 " MC-325M
4 & 5 Millen 69046
6 B & W Miniductor #3015 (25T)
7. Insulate from panel

DESIGNED BY W9TO AND W9PSR

DRAWN BY W9QHZ

Changes:

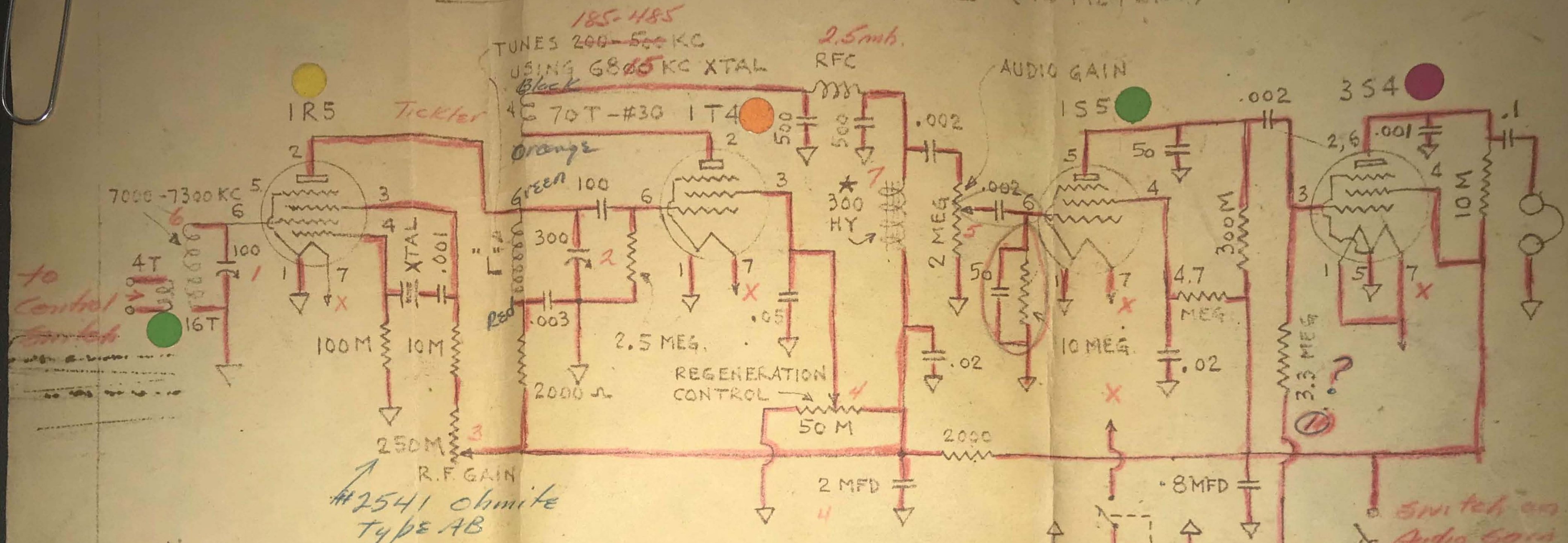
① Chg to 25000 Ω 10W.

② Shunt Meter if no 0-200MA available

③ If after #1 & 2 chgs u get chirps then add in series a 20 μμf & add RF choke 2.5mh in series with Key

④ Gnd #8 pin on #6146 RCA

W9FKC PORTABLE RECEIVER (40 METERS)



Notes:

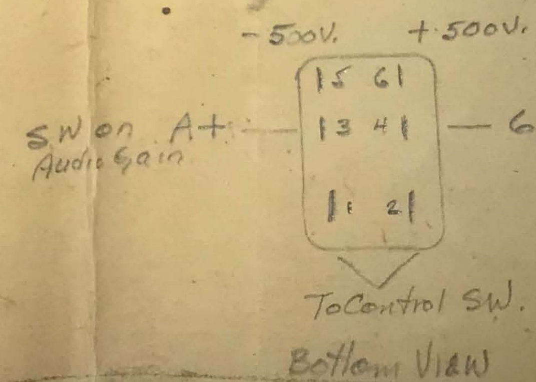
Coil "L" - 456 KC I.F. XFMR WITH PRIMARY AND SECONDARY IN SERIES. WIND TICKLER AT GND END.

Xtal - 6800 TO 6815 KC.

★ - PRIMARY ONLY OF AUDIO XFMR.

(1A). If audio howls reduce to 1/2 meg.

1. Hammarlund HF100
2. Nat'l STH300
3. #2541 ohmite Type AB
5. CRL Type A with DPST sw R-12 on back
4. CRL " A
6. Windings on 5/8" 6 pin Coil form Amp. 24-6H



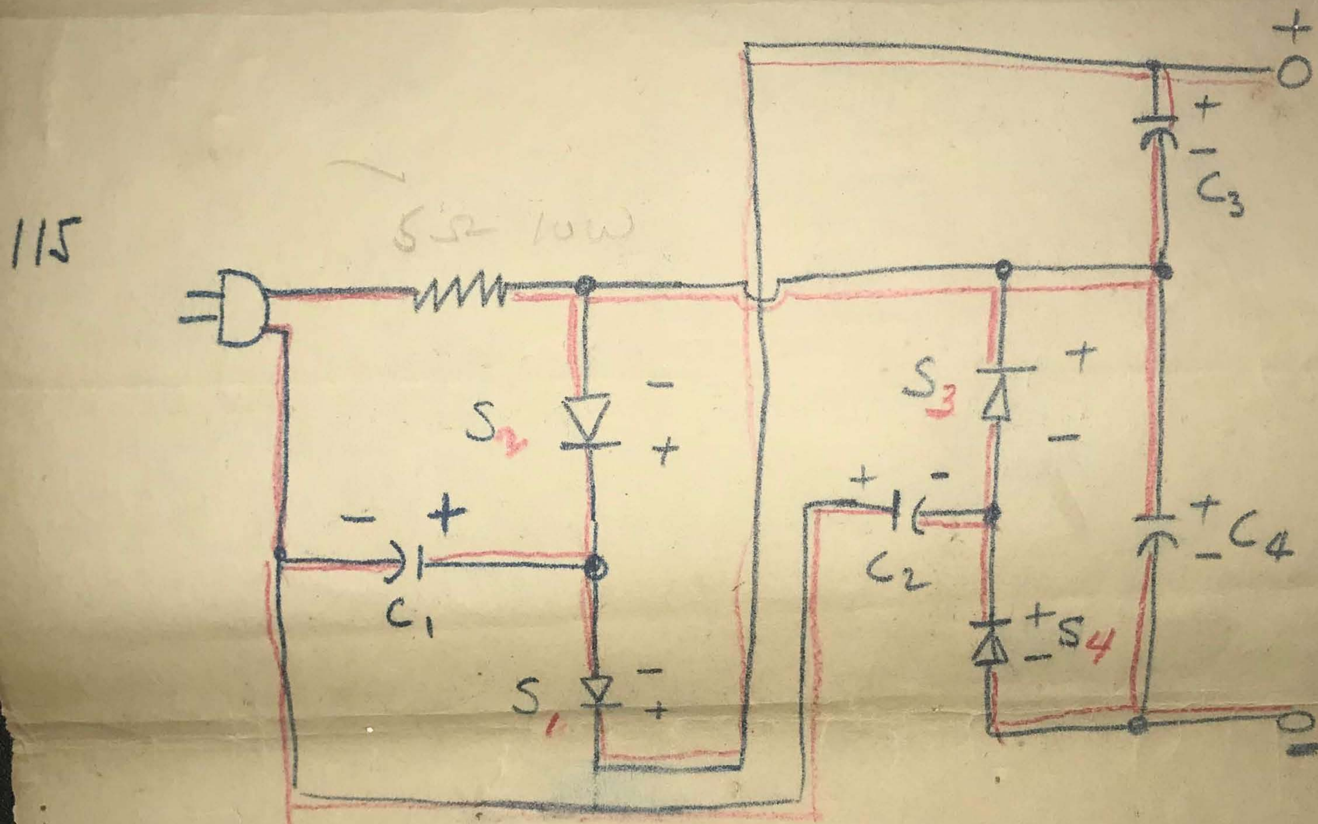
DESIGNED BY W9DIU
DRAWN BY W9QHZ

W9FKC

Valtage Quadrupler - 180 mils at 500v output 7/21/52

Caution!! Both sides of output are above ground Potential.

DO NOT CONNECT EITHER SIDE DIRECT TO CHASSIS



$C_1 + C_2$ = 100 MFD - 150v Electrolytics - Mallory #FP116

$C_3 + C_4$ = 40 MFD - 450v " " #FP146

Both of above are same size - 1" Diam - 2" Ht

S = 200 mill Selenium Rect Sarkes-Tarzian

Xmfr 6.3V. 3A. Thordarson

GEORGE H. SCHILBACH
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