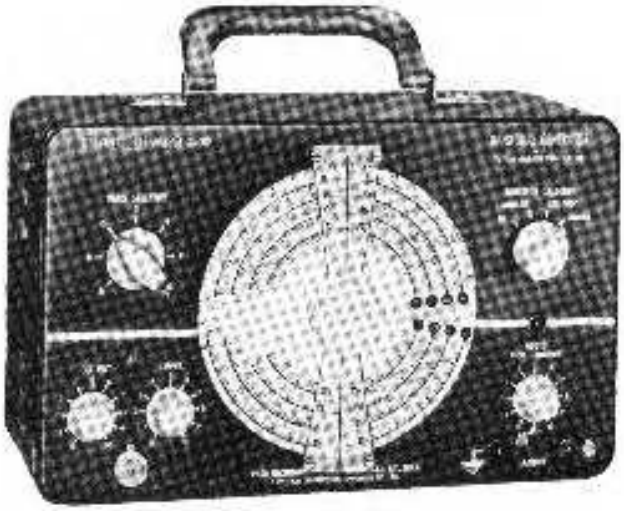
Manual . . . Net Price: $1.00

ASSEMBLY *and* OPERATING MANUAL *for*

PACO

RF SIGNAL GENERATOR KIT
Model G-30
and
Model G-30PC

PACO ELECTRONICS CO., INC.
A DIVISION OF *PRECISION* APPARATUS CO., INC. 70-31 84th STREET, GLENDALE 27, L. I., N. Y.



SPECIFICATIONS

FREQUENCY RANGE

Band A	160KC to 520KC
Band B	520 to 1700KC
Band C	1.7 to 5.5MC
Band D	5.2 to 16MC
Band E	15MC to 30.5
Band F	29 to 60MC
Band G	60MC to 120MC
Band G_2 (Calibrated Harmonics)	120MC to 240MC

TUBES:

6AU6	Electron coupled RF oscillator
6C4	Audio oscillator and audio amplifier

Power Requirements — 105-125 volts 50-60 cycle AC

Broadcast band is completely calibrated on one band:
Split sound I.F. range spread wide on Band "E" for accurate TV marking.
Latest 40Mc I.F. frequency spread out on Band "F" for accurate marking.
FM I.F. calibrated in .1Mc steps on Band "D" with specific 10.7Mc indication.
TV I.F., FM, and other often used frequency points specifically indicated on dial.
0 to 100 linear vernier calibration scale.
RF output in excess of 100,000 microvolts.
400 cycle audio output up to approximately 15 volts.
Percentage modulation continuously variable on front panel.
Two-step low impedance attenuator.
Is available in straight kit form or semi-assembled pre-calibrated model (Model G-30 PC).

GENERAL KIT CONSTRUCTION INFORMATION

INTRODUCTION

The PACO kit you have just purchased is a high quality instrument and when assembled and used in accordance with the instructions in this manual, will provide many years of trouble-free service. Therefore the first, and we feel, most valuable advice we can offer in this manual is that you work carefully and patiently By so doing, you will experience more satisfaction in your new instrument and greater confidence in your ability.

THE MANUAL

We suggest that you spend a little time NOW and read this entire manual thoroughly before starting the actual construction of the kit. This will familiarize you with the contents and the general procedure to be followed.

The step-by-step instructions will help you assemble the instrument with a minimum possibility of error. Further assistance may be gained from using the large folded-in diagrams supplied with this manual. These are enlargements of the smaller size figures referred to in the step-by-step instructions. They should be attached in some way to the wall above your work bench for greater ease in reference.

We advise you to keep this manual after the kit has been constructed, for future assistance in the use and maintenance of your PACO instrument.

UNPACKING

We cannot stress too strongly the need for exercising care throughout these instructions This is especially true now as you unpack the kit Parts may easily become damaged through carelessness here. Do not throw any packing materials away until all parts are accounted for. Each part should be checked against the parts list at the back of the manual in order to make certain all parts are present and are correct as to value and type. The color code chart at the back of this manual will assist you in identifying doubtful parts Please notify us promptly if any shortage or erroneous part is discovered. Return the inspection slip with your letter in order to expedite the handling Keep in mind however, that minor differences in some parts do not indicate an error. A .05MFD capacitor for example, may sometimes be found in the kit where a 047MFD is called for in the parts list. Such substitutions are checked carefully before they are made, and you can be assured they will work satisfactorily. The registration card which accompanies each PACO kit, MUST be filled in and returned to the company immediately after purchase Our warranty applies only to registered instruments.

TOOLS REQUIRED FOR ASSEMBLY AND WIRING OF PACO KITS.

Only standard type tools are required in the construction of PACO kits — A good quality soldering iron with a small tip (50 or 60 watts); a pair of long-nose pliers; a pair of diagonal or side-cutting pliers, a small assortment of screwdrivers, and a few small end-wrenches or a small adjustable wrench. Screwdriver handled nut-drivers may be used in place of wrenches in most cases.

ASSEMBLY AND WIRING

The position of wires and parts in this instrument is quite critical in most cases, and changes may affect the operation Follow the diagrams closely and you should encounter little, if any difficulty, for the layout has been thoroughly prechecked and tested for best results

When wiring, remove only about 1/4 inch of insulation from the ends of hook-up wire. Excessive removal of insulation may result in the exposed wire shorting to nearby terminals or wiring. If the wire has a brown, baked enamel coating (transformer leads for example) be sure to scrape the enamel off, with sandpaper or a knife, to expose the copper wire before making a terminal connection. Leads on parts (resistors, capacitors, etc.) should be trimmed to proper length before mounting. Do not cut leads too short! All parts should fit between the designated points without strain.

SOLDERING

We wish to emphasize at this point the extreme importance of proper soldering technique. Much engineering skill and effort has gone into making your PACO instrument capable of high quality performance. In order for you to fully realize these capabilities, good solder joints are essential. If you have had little or no previous experience in soldering, we suggest you spend some time practicing with an old tube socket and some scraps of wire before doing any soldering on your kit.

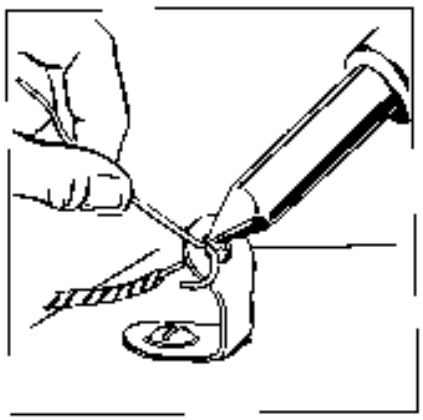
Only good quality television and radio type solder with a non-corrosive core should be used: **THIS IS IMPORTANT! ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE ANY PACO INSTRUMENT IN WHICH ACID CORE SOLDER OR PASTE FLUX HAS BEEN USED.**

To remove any doubt about your solder, we suggest you make certain the roll you buy has been clearly labeled for television and radio use.

Prior to soldering, be sure terminals and leads are clean and free of wax or corrosion. Make a good mechanical connection by crimping the leads on the terminals with your pliers. Do not rely on solder alone for mechanical strength.

Keep the tip of your iron properly tinned in accordance with the instructions of the soldering iron manufacturer. It should have a "bright" appearance and be free of excess solder. An old rag can be used to wipe the hot tip clean.

When using your iron, avoid applying excessive heat as this could cause damage to insulation or parts. It could also result in a flux flooding condition which could cause a leakage path between adjacent terminals on switches and tube sockets. **BY THE SAME TOKEN, INSUFFICIENT HEAT WILL OFTEN RESULT IN A "COLD" OR HIGH RESISTANCE SOLDER CONRECTION. THIS USUALLY HAS A DULL AND "GRAINY" APPEARANCE.** A good soldered joint will present a smooth and "shiny" appearance.



Proper technique to obtain good results involves applying the iron to the joint, holding it there momentarily until the joint heats, and then applying solder to joint and iron simultaneously. Apply the iron long enough to cause solder to <u>flow</u> smoothly into the joint. Do <u>not</u> simply melt drops of solder on to the joint . . . Solder must FLOW into the joint to be effective.

THE PACO WARRANTY

PACO Electronics Co. Inc., hereafter referred to as the company, guarantees all parts supplied with any PACO kit to be free of defects in material and workmanship under normal use and service for a period of ninety (90) days from the date of purchase. The Company's obligation under this warranty is limited to those parts which are returned transportation prepaid, with prior permission of the Company, and in the judgement of the Company are defective under the terms of this warranty. This warranty is in lieu of all other warranties, and the Company neither assumes, nor authorizes any other person to assume for them, any other liability in connection with the sale of PACO kits.

We urge the assembler to follow the instructions provided in this manual The Company assumes no responsibility for any damages or injuries sustained in the assembly or operation of PACO instruments.

All prices and specifications are subject to change without notice. The Company reserves the right to discontinue instruments and to alter specifications at any time without incurring any obligation to incorporate new features in PACO instruments previously sold.

The registration card, which accompanies each PACO kit, MUST be filled in and returned to the Company immediately after purchase This warranty applies only to registered instruments.

INFORMATION REGARDING THE PACO WARRANTY

All material and parts supplied with PACO kits have been carefully selected to meet design requirements and should perform their functions satisfactorily However, on occasion improper instrument operation may be traced to a faulty tube or component. Should replacement of a part be necessary, write directly to PACO Electronics Co Inc , and supply the following information

1 Identify the model and serial number of the kit in which the part is used

2. Identify the questionable part thoroughly Use part number and description as given in the parts list

3. Completely describe the nature of the defect, or your reason for requesting a replacement

Please do not return the part in question until you receive notice from us to do so Do not tamper with the component as this will void our warranty

When returning tubes, pack them carefully to avoid breakage in shipment Broken tubes will not be replaced in any instance. Parts that have been broken or damaged through carelessness, misuse, or improper installation on the part of the kit builder will likewise not be eligible for replacement.

SERVICE POLICY

PACO Electronics Co., Inc. offers its full cooperation and assistance to help you in obtaining the specified performance from your instrument. We maintain a complete Service Department with whom you may correspond in the event you continue to experience operational difficulties with your completed instrument. We will inspect and repair this SIGNAL GENERATOR Kit for a service charge of $4.00 plus the cost of necessary parts, provided this instrument has been constructed and completed in accordance with the instructions given in this manual This special repair service is available for a period of one year from the date of purchase. Repair service for PACO instruments that have been in use longer, will be available for PACO owners at most economical charges

Instruments not entirely completed or that have been modified in design, will not be accepted for repair Instruments which show evidence of the use of acid core solder or paste fluxes will be returned not repaired.

Instruments for repair or service MUST be returned to us transportation charges PREPAID in accordance with the shipping instructions printed below

SHIPPING INSTRUCTIONS

When returning a PACO instrument for repair or service, be sure that all parts are securely mounted. Always pack carefully in a rugged, oversized container, preferably wood, using a generous supply of padding such as excelsior, shredded paper, or crumpled newspaper. Do not ship in the original kit carton, as this carton is not considered adequate for safe shipment of the completed instrument. Attach a tag to the instrument giving your name, address, and trouble experienced Never return an instrument unless it is accompanied by a full explanation of diffi-

culties encountered. The more explicit the details, the more rapidly your instrument can be handled and processed

Please ship Via Railway Express PREPAID and address to:

PACO ELECTRONICS CO., INC
70-31 — 84th STREET,
GLENDALE 27, L. I., N. Y.
ATT: SERVICE DIVISION

A FRAGILE label should appear on at least four sides of the carton.

Return shipment will be by Railway Express COLLECT, including repair-service charges unless otherwise requested by previous correspondence.

Please take note that a carrier cannot be held liable for damage in transit if, in HIS OPINION, packing is insufficient.

STEP-BY-STEP ASSEMBLY

These instructions were prepared by skilled technicians and technical writers from experience gained through actual construction of this PACO kit. Therefore, you will find them arranged in as logical a sequence as possible, with every consideration given to the practical aspects of kit assembly. We feel they are the fastest and best method of assembling your PACO kit.

We urge you to read each step thoroughly, and understand it completely before performing it. This will help you to avoid errors. We also suggest that you use the check space, ( ), provided to indicate completion of each step. This will help you avoid omissions in the assembly. Many kit builders also follow the practice of crossing out with a colored pencil, each wire and component on the wiring diagram after installation.

The "(Solder)" and "(Don't Solder)" designations in the instructions are self-explanatory and should be complied with throughout assembly. When you see "(Don't Solder)" after a step, you should only crimp the lead to the terminal, and proceed to the next step. A later step will indicate when all leads have been connected to this terminal, and Soldering is to be done.

All parts, after being checked against the parts list, should be placed where they are readily available and will not be lost or damaged. You may find it advantageous to group parts and place them in suitable containers.

To aid you in the placement of components, a system of alphabetical and numerical coding has been set up. Certain components such as switches and controls, have been coded with letter designations relating to the function of the component. For example, the designation "C" indicates a control, and the designation "S" indicates a switch. In kits having more than one of this type of component, distinction between them is made by adding a second letter to the first in alphabetical sequence. For example, the designation "SA" indicates one switch, and the designation "SB" indicates a second switch, etc.

Other components such as tube sockets and terminal strips, have been assigned single letter designations having no particular reference to function. These designations are usually assigned in the order in which the component is installed, and will not always be the same in other kits. For example, the letter "A" may indicate a tube socket in one kit and perhaps a terminal strip or other component in another kit.

Numbers have been assigned to terminals on the various components. Thus a designation such as "SA2" indicates terminal 2 of switch "SA"; "SB3" indicates terminal 3 of switch "SB", etc.

You are now ready to proceed with the construction of your PACO SIGNAL GENERATOR

NOTICE

The PACO RF Signal Generator is supplied in either of two models

Model G-30PC: This model is partly assembled at the factory with the RF section factory wired and calibrated. If your Kit is a G-30PC you will ignore steps 1 through 39 and begin your work at step #40.

Model G-30 This model is in standard Kit form and requires the use of all steps including steps 1 through 39.

NOTE The only difference between Model G-30 and Model G-30PC, is that the Model G-30PC has been semi-assembled and calibrated at the factory.

RF ASSEMBLY

REFER TO FIGURES 1 THROUGH 9

( ) 1 Install the red pin jack at location A, using a Tinnerman fastener See Figures 1 and 3.

( ) 2 Install the black pin jack at location B, using a Tinnerman fastener. See Figures 1 and 3.

( ) 3 Install the high-frequency, low-loss 7-pin socket (light brown) at location D from the top of the chassis. Position the socket as shown in Figure 2 On the bottom of the chassis mount the lake shield ground clip. See Figure 1 Use two #4-40 x 1/4" screws, one #4 lockwasher, one #4 solder lug and two #4 nuts See Figure 5

( ) 4. Slip a 3/8 rubber grommet into the hole at location E

( ) 5 Mount the single-lug terminal strip at location F. Use a #6-32 x 3/8 " screw, #6 lockwasher and #6 nut. Position the lug as shown in Figure 2

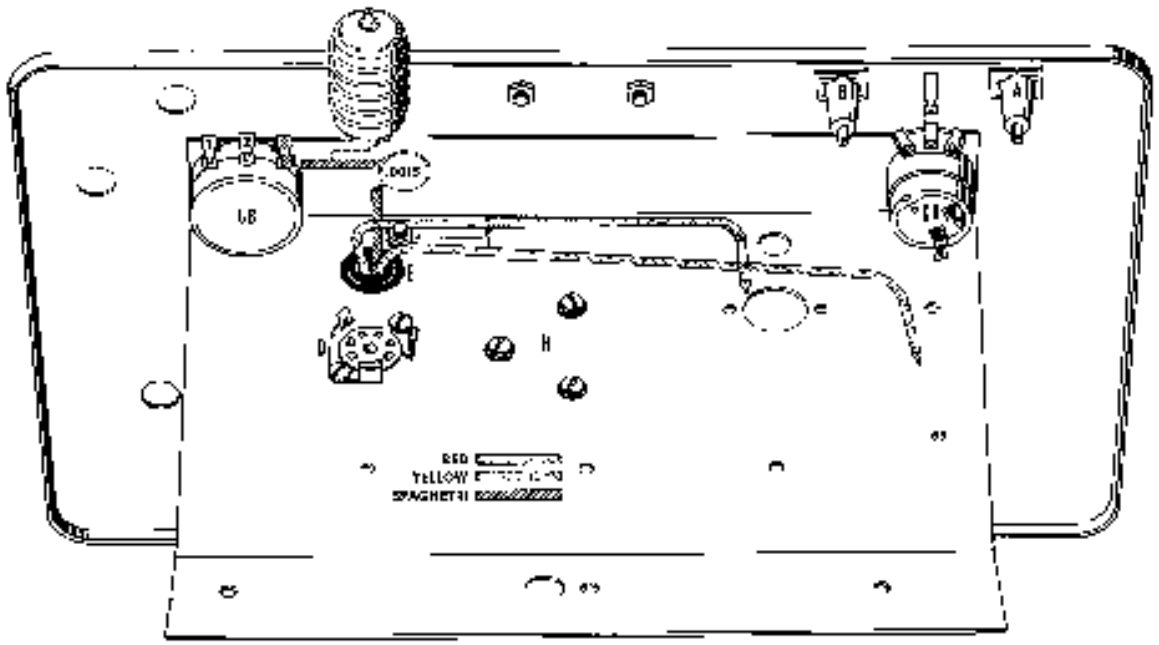


FIGURE 1

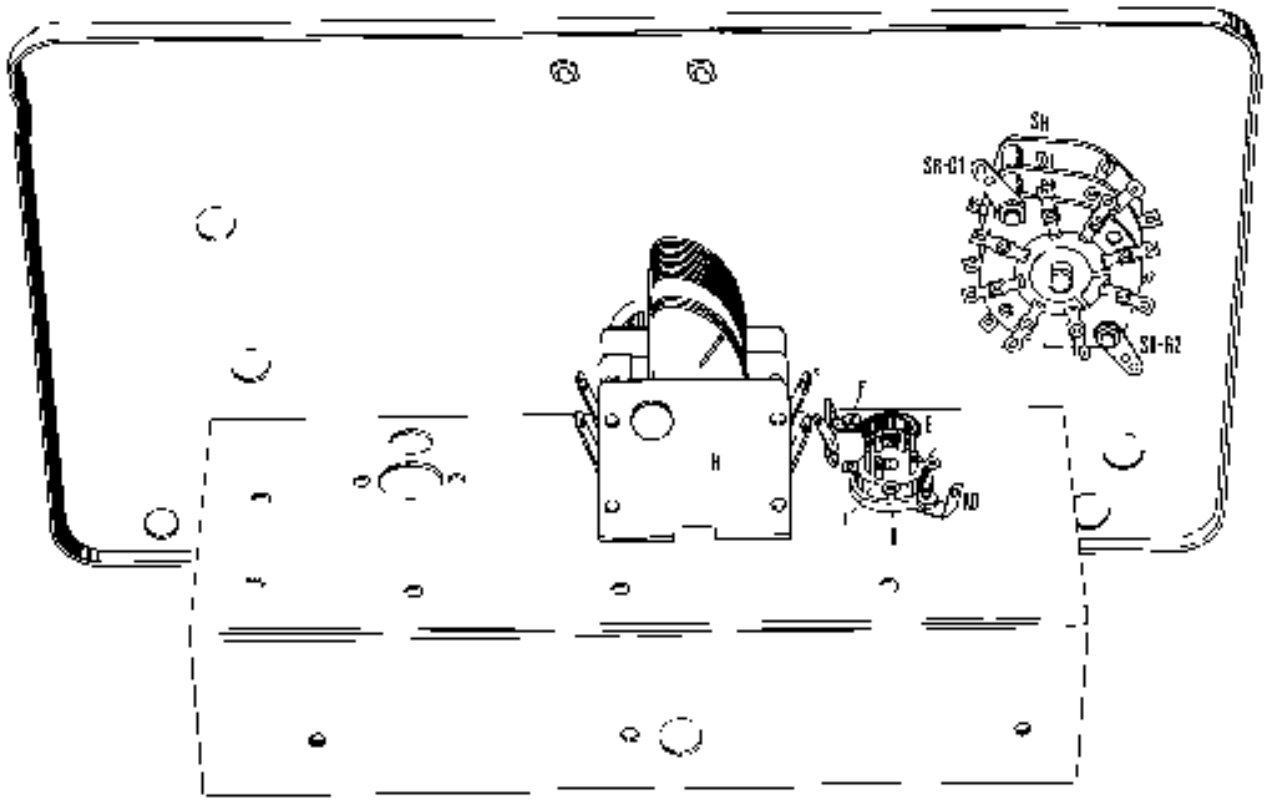


FIGURE 2

NOTE - Push Tinnerman on tightly until the jack is firmly fastened.

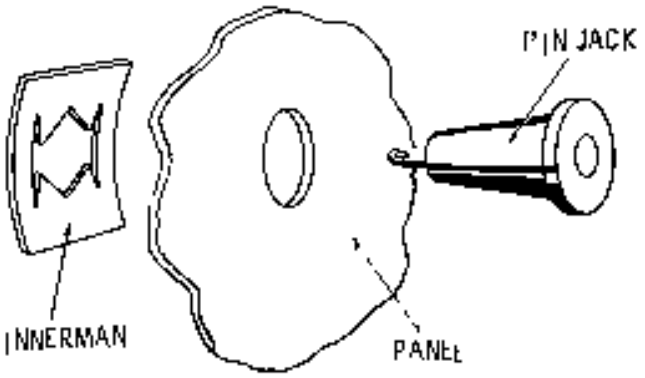


FIGURE 3

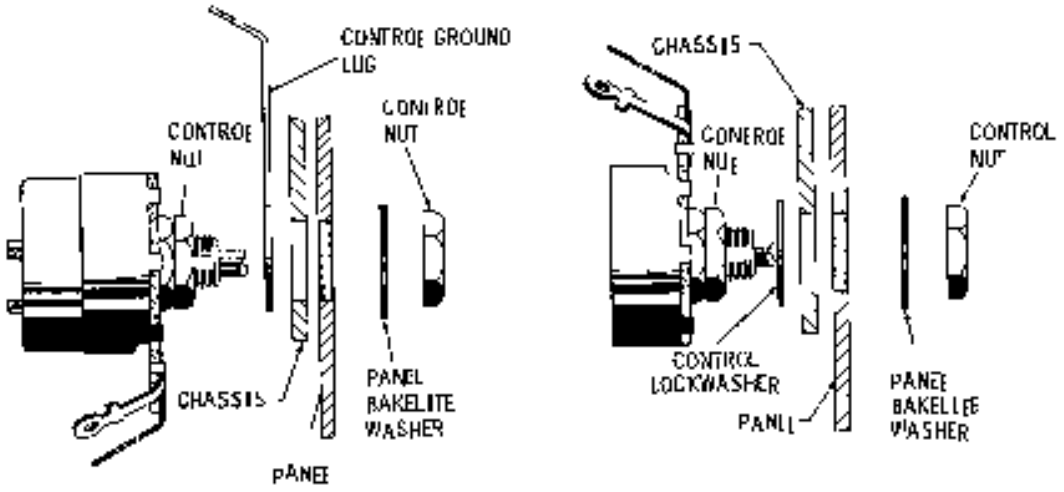


FIGURE 4

( ) 6 Place the chassis against the front panel lining up the two control holes. Install the 250KΩ Modulation Control at location CA. See Figure 1. Use a control ground lug, panel Bakelite washer and control nut. See Figure 4.

( ) 7 In the same manner install a 200Ω control (RF Level) at location CB. See Figure 1. Use a control lockwasher, panel Bakelite washer and control nut. See Figure 4.

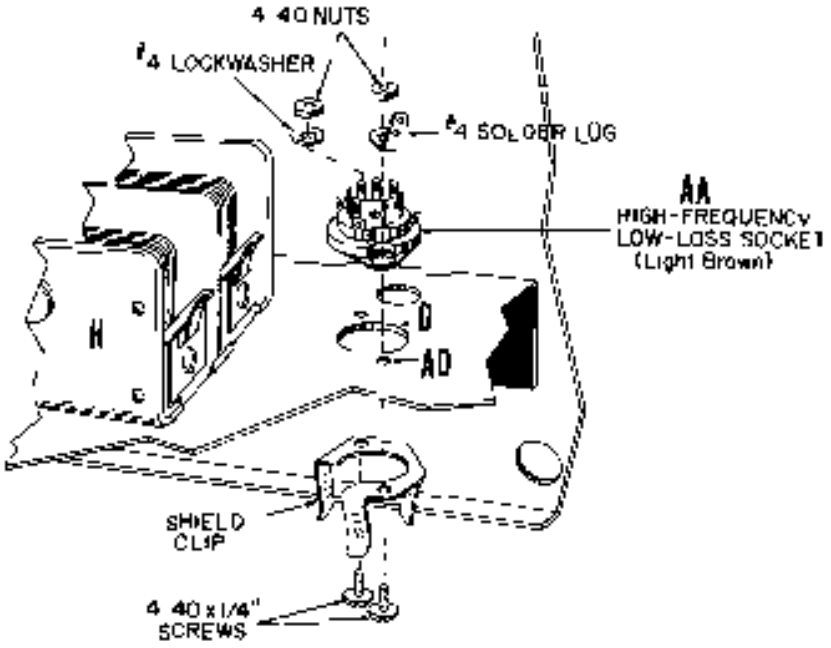


FIGURE 5

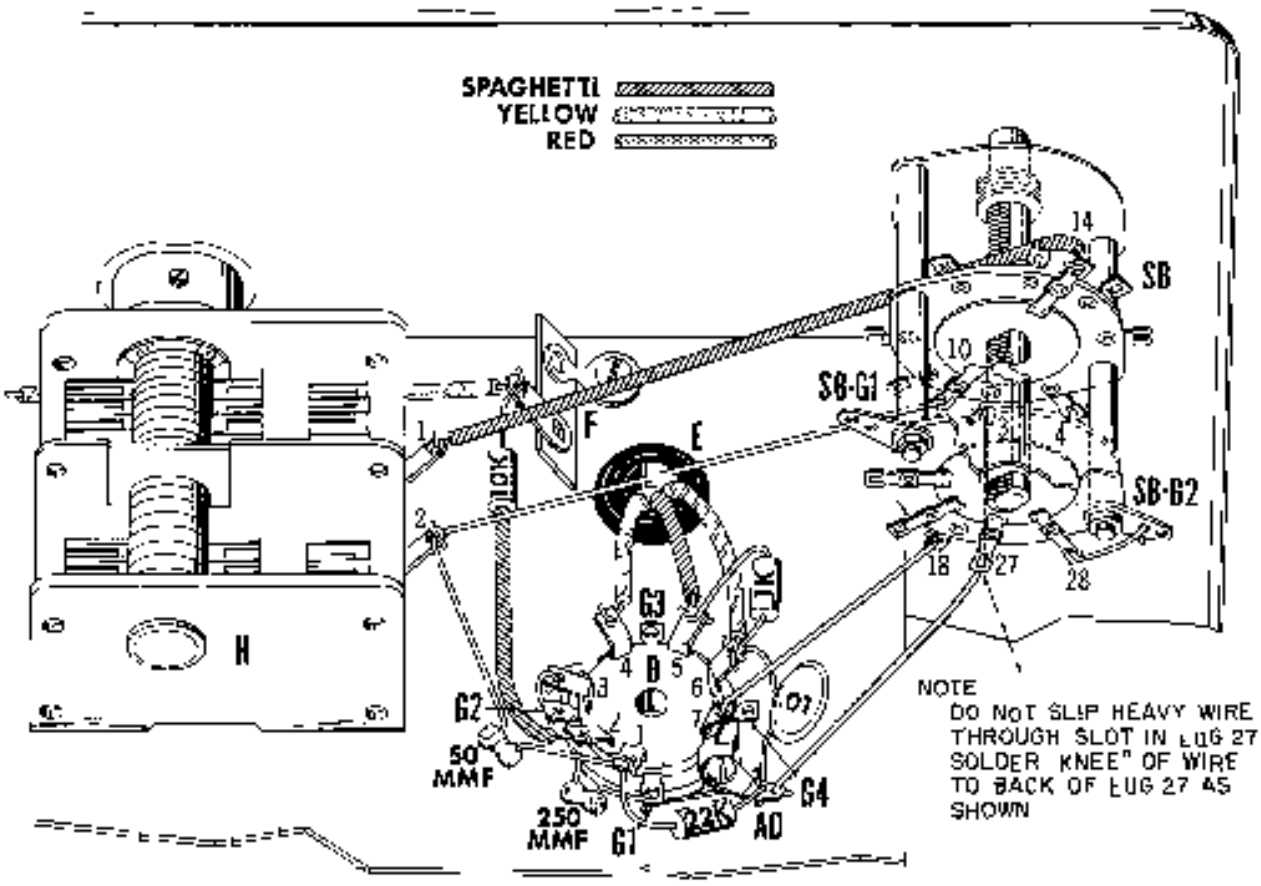


FIGURE 6

REFER TO FIGURE 6.

( ) 8 Connect one end of a 7-1/2" length of yellow wire to D4 (Solder) Pass the other end through grommet E and dress the wire along the chassis as shown in Figure 1. Leave this end free

( ) 9 Place a piece of spaghetti over one lead of a .0015 mfd (1500 mmfd) ceramic disc capacitor. Do not cut the lead. Insert it from the bottom of the chassis through grommet E and connect to D5 (Don't Solder). See Figures 1 and 6. Connect the other lead (use spaghetti) to CB3 (Solder). See Figure 1

( ) 10 Connect a 1000Ω resistor (brown-black-red) from D3 (Solder) to D6 (Don't Solder)

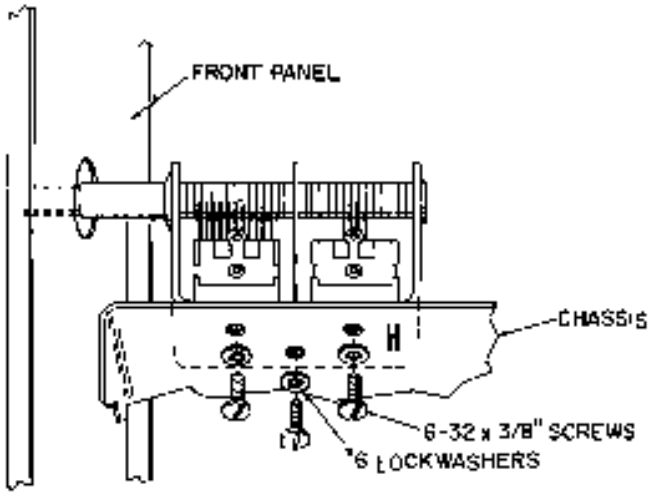


FIGURE 7

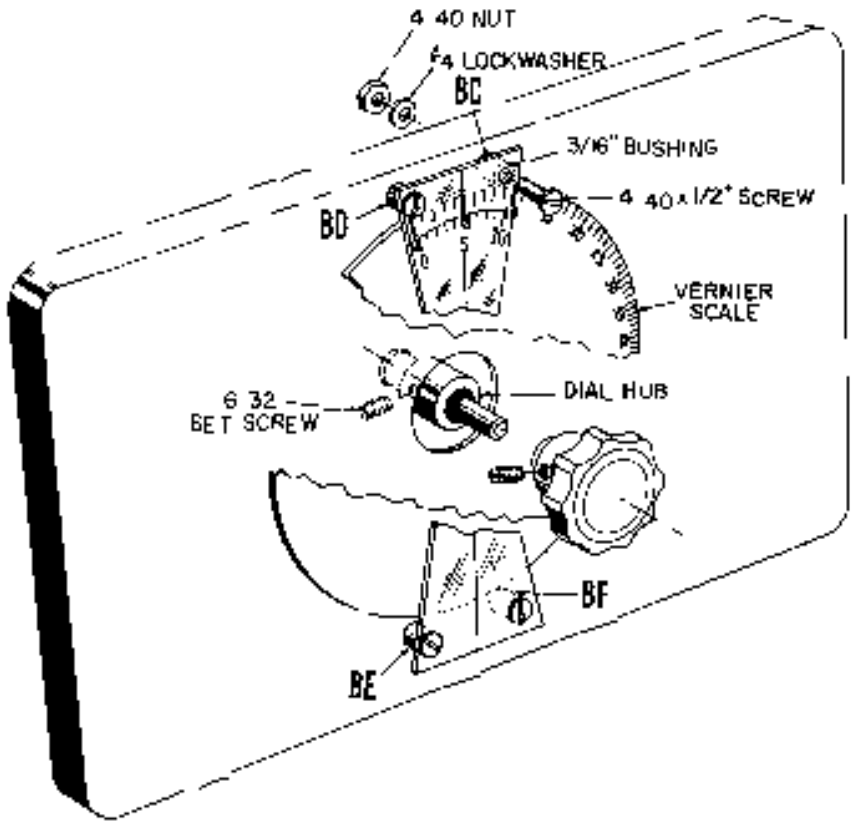


FIGURE 8

( ) 11 Connect one end of a 10" length of red wire to D6 (Don't Solder). Pass other end through grommet E and dress the wire along the chassis as shown in Figure 1. Leave this end free.

( ) 12. Connect a .01 mfd (10,000 mmfd) ceramic disc capacitor from D6 (Solder) to ground lug AD (Don't Solder). Use the lug hole closest to the mounting screw.

( ) 13. Connect a length of bare wire from D3 (solder) to ground terminal G2 of tube socket D (Solder).

( ) 14. Connect a 250 mmfd (red-green-brown) ceramic tubular capacitor from D2 (Don't Solder) to ground terminal G1 (Solder) at tube socket D.

( ) 15. Connect a 10KΩ resistor (brown-black-orange) from D2 (use spaghetti on this lead) (Solder) to F1 (Don't Solder).

( ) 16. Connect one end of a 7-1/2' length of yellow wire to F1 (Solder). Dress the wire to the left along the chassis as shown in Figure 6. Leave this end free.

( ) 17. Cut one lead of the 50 mmfd (green-black-black) ceramic tubular capacitor to a length of 1/2". Connect this end to D1 (Don't Solder). Leave other lead free.

( ) 18. Connect a 22KΩ resistor (red-red-orange) from D1 (Solder) to ground lug AD (Don't Solder). Use the lug hole closest to the mounting screw.

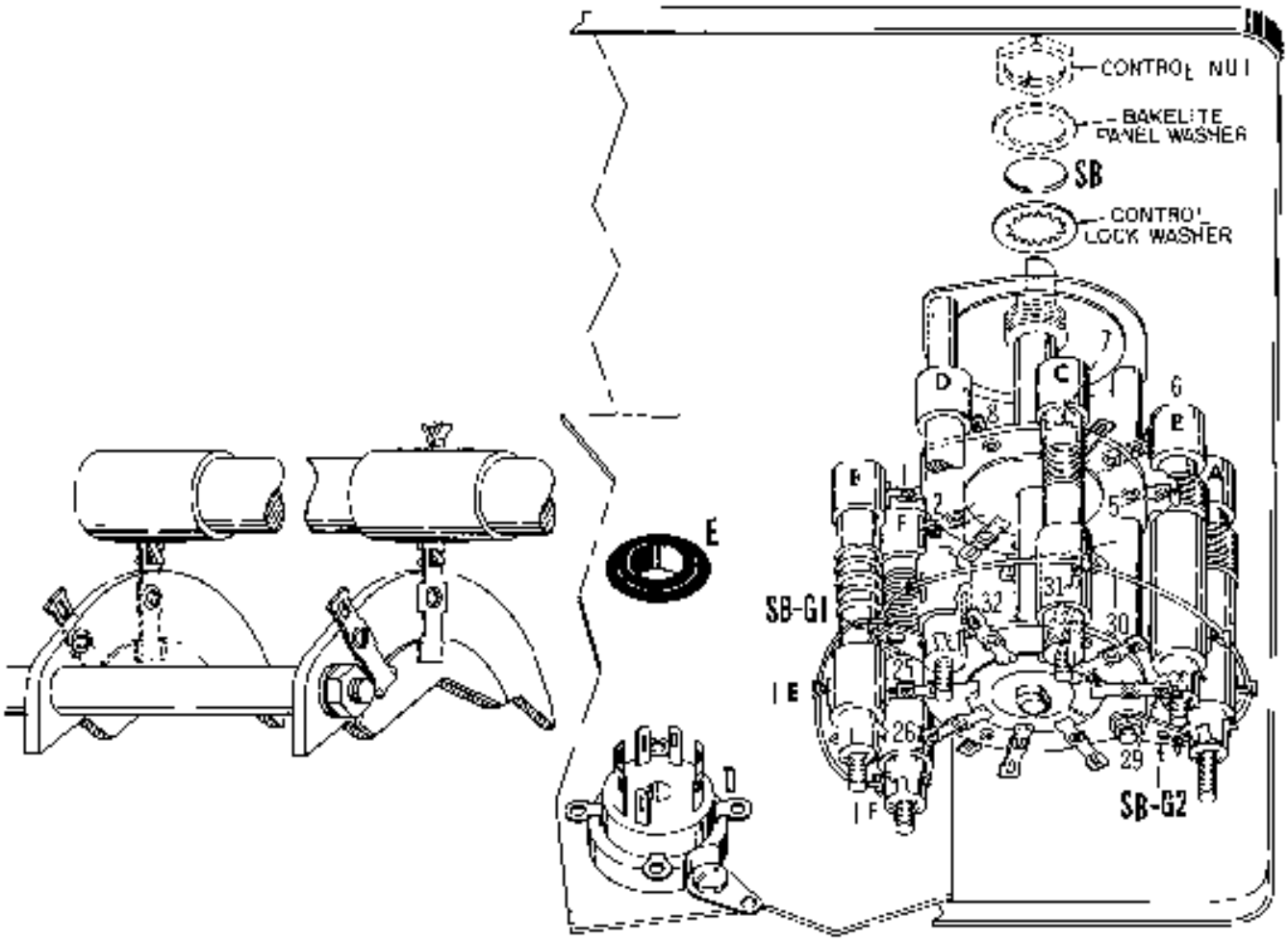


FIGURE 9

( ) 19 Mount the two-gang variable capacitor at location H See Figure 2. Keep the rotor plates fully meshed until all construction is completed to avoid damage to the plates. Use three 6-32 x 3/8" screws and #6 lockwashers See Figure 7 for mounting details Align the tuning shaft as closely as possible to the center of the hole in the front panel. Then tighten the screws

( ) 20 Insert the #6-32 x 3/16 set screw into the tapped hole in the dial hub. Mount the dial on the variable capacitor shaft. See Figure 8. Do not tighten the set screw at this time

( ) 21 Mount the plastic pointer using four #4-40 x 1/2" screws, 3/16 bushings, #4 lockwashers and #4 nuts at locations BC, BD, BE and BF, with the 0 to 10 vernier at the top of the panel See Figure 8.

( ) 22. Mount the large knob on the variable capacitor shaft and tighten the set screw Turn the knob counterclockwise until the capacitor is at maximum capacity (fully closed). Rotate the dial by hand until the 100 on the vernier dial scale is aligned with the "0" of the vernier on the plastic pointer. Hold the dial in alignment and tighten the set screw in the hub. See Figure 8 Check operation of the dial to see that it does not rub against either the panel or the plastic pointer.

( ) 23 Install the band switch at location SB Use a control lockwasher, a Bakelite panel washer and control nut. See Figure 9 With the switch turned fully counterclockwise, position the flat on the shaft so that it is opposite the Band "A" marking on the panel. Tighten the control nut.

( ) 24. Mount a large pointer knob on the switch shaft and tighten set screw against the flat on the shaft. If the pointer does not line up with the "A" mark remove the knob, loosen the control nut and reposition the switch as required

( ) 25 The band switch SB is supplied with two nuts at location SB-G1 and two nuts at location SB-G2 Remove one nut at each location Mount a #4 solder lug at each location and replace the nuts just removed to secure the ground lugs. See Figure 2. Each solder lug should be sandwiched between two nuts

( ) 26 Slip a 4 length of large-diameter spaghetti on the pre-cut 4-1/8" length of heavy wire. Connect this wire from band switch terminal SB14 (Solder) to H1 (Solder). Be sure that the wire does not touch the rotor or any other part of the band switch. See Figure 6

( ) 27. Connect the pre-cut 2-9/16 length of heavy wire from H2 (Don't Solder) to SB10 (Solder) See Figure 6

( ) 28 Connect the free end of the 90 mmfd capacitor from D1 to H2 (Solder)

( ) 29 Connect the pre-cut 1-7/8 " length of heavy wire from SB16 (Solder) to D7 (Solder) See Figure 6

( ) 30. Refer to Fig. 6 and slip the short end of the pre-cut and pre-formed L shaped heavy wire into SB-3 Slip the other end into the lug hole on AD farthest from the mounting screw Adjust the position of the wire so that the "knee" rests against back of SB-27 Now solder the three connection points — SB-3, SB-27 and AD.

( ) 31 Slip a 1-3/4 " length of thin bare wire through SB28 to SB4 (Solder). Connect the other end to ground lug SB-G2 (Don't Solder) Now solder SB28. See Figure 6.

REFER TO FIGURE 9

NOTE The six band coils have two lugs on one side. These snap into corresponding lugs on both switch decks, in accordance with the steps listed below See

Figure 9 The coils are labeled with letters which correspond to the band. The coils are adjusted at the factory for proper calibration. Do not turn the slug adjustments. See calibration procedure in this manual.

CAUTION Do not let the soldering iron come in contact with the coil windings. Do not put excessive force on switch and coil terminals before or after soldering.

( ) 32 Mount the 'F' coil between SB2 (Solder) and SB26 (Solder)

( ) 33 Mount the 'E' coil between SB1 (Solder) and SB25 (Solder)

( ) 34 Mount the 'D' coil between SB8 (Solder) and SB32 (Solder)

( ) 35. Mount the 'C' coil between SB7 (Solder) and SB31 (Solder)

( ) 36. Mount the 'B' coil between SB6 (Solder) and SB30 (Solder).

( ) 37 Mount the 'A' coil between SB5 (Solder) and SB29 (Solder)

( ) 38. Slip a 2-1/4" length of thin bare wire through terminal LE to LF (Solder). Connect the other end to ground lug SB-G1 (Don't Solder). Now solder LE. See Figure 9

( ) 39 Slip a 6" length of thin bare wire through LD, LC, LB and LA to ground lug SB-G2 (Solder). Connect the other end to ground lug SB-G1 (Solder). Now solder LD, LC LB and LA

GENERAL ASSEMBLY

REFER TO FIGURES 10 AND 12

( ) 40 Mount a 200Ω control (RF Output) at location CC. See Figure 10. Use a control lockwasher, Bakelite panel washer and two control nuts. See Figure 4. Before mounting the control, place a control nut on the mounting bushing and run it down the

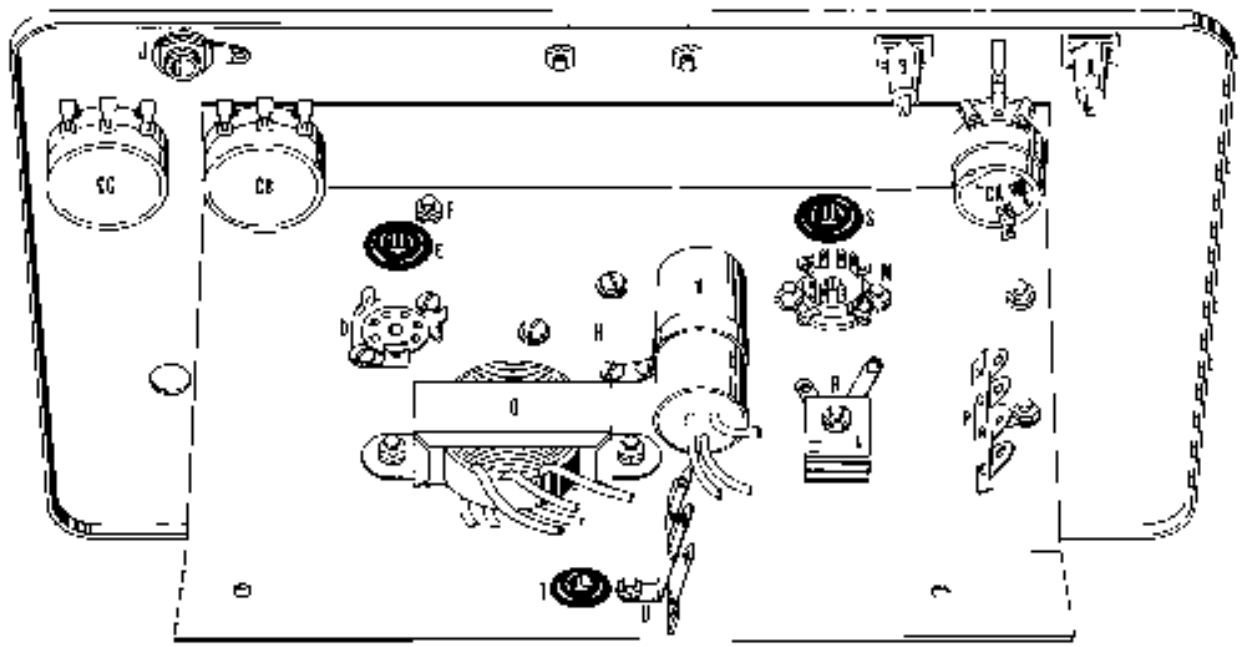


FIGURE 10

bushing to the body of the control. Place the control lockwasher on the bushing and insert the control in the panel hole. Mount the Bakelite control washer and second control nut on the bushing from the front of the panel, and tighten the nut.

( ) 41. Mount the male panel connector at location J. Use a control lockwasher, connector ground lug and connector nut. See Figure 11. Position the ground lug as shown in Figure 10.

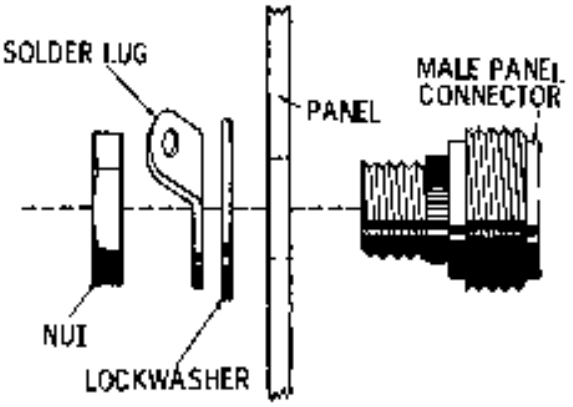


FIGURE 11

( ) 42. Mount the pilot light bracket at location K. Use the pilot light jewel and the 1/4" nut. See Figure 12.

( ) 43. Mount the function selector switch at location SA using a control ground lug, Bakelite panel washer and control nut. Position the ground lug as shown in Figure 12. With the switch turned fully counterclockwise, position the flat on the shaft opposite the "RF" marking on the panel. Tighten the control nut.

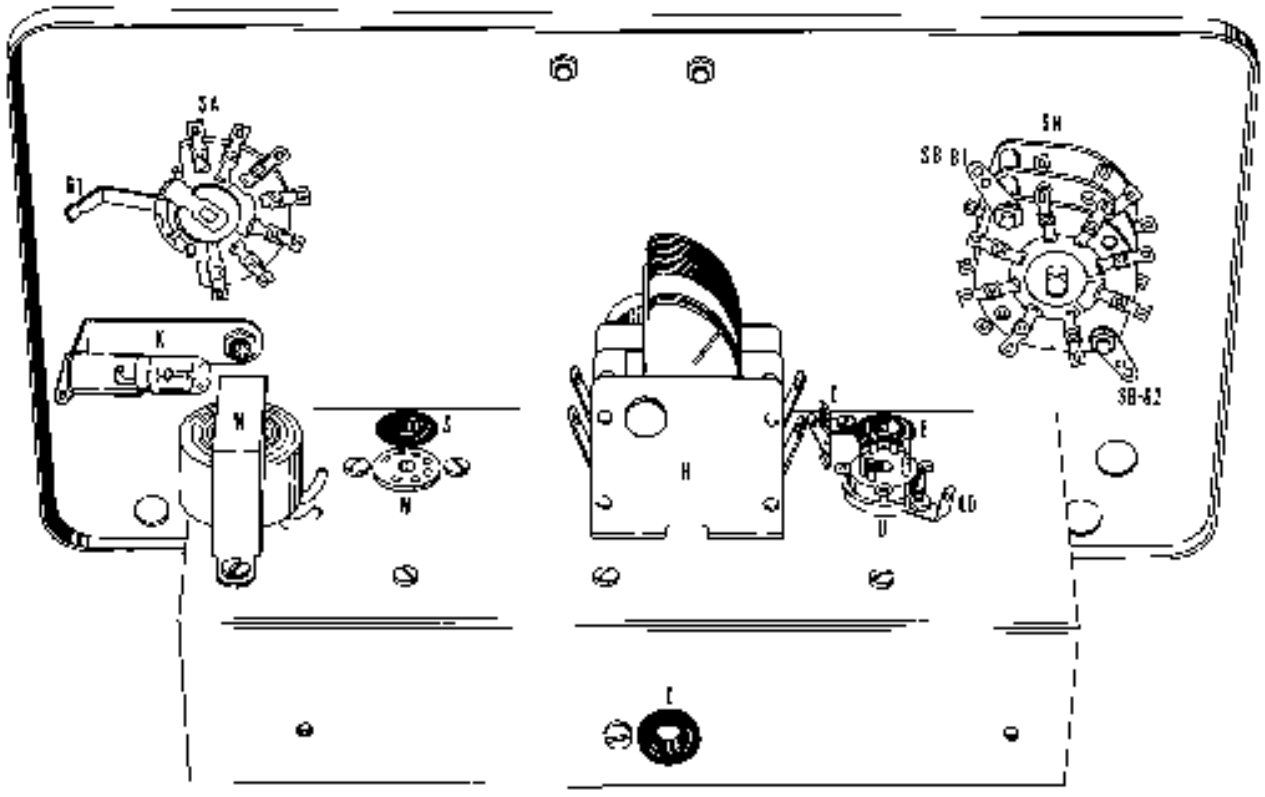


FIGURE 12

( ) 44 Mount a large pointer knob on the switch shaft and tighten set screw against flat on shaft. If the pointer does not line up with the "RF" mark, remove the knob, loosen the control nut and reposition the switch as required.

( ) 45. Mount a small skirted knob on each RF control (LEVEL and OUTPUT) shaft. With the controls turned fully counterclockwise, position the index line on each knob to indicate "0". Tighten the set screws.

( ) 46 Mount a small skirted knob on the MODULATION control shaft. With the control turned fully counterclockwise, position the index line on the knob to indicate "OFF". Tighten the set screw.

( ) 47 Mount the 7-pin socket at location M. Position the socket as shown in Figures 10 and 12. Use two #4-40 x 1/4" screws, #4 lockwashers and #4 nuts.

( ) 48 Mount the Audio Choke at location N on top of the chassis with the leads toward the center of the chassis. See Figure 12. Use two #6-32 x 3/8" screws, #6 lockwashers and #6 nuts. At location P mount the 4-lug terminal strip. See Figure 10.

( ) 49 Mount the power transformer at location Q with the leads toward the rear of the chassis. See Figure 10. Use two #6-32 x 3/8" screws, #6 lockwashers and #6 nuts.

( ) 50 Mount a #6-32 x 1" screw at location R using a #6 lockwasher and #6 nut. Then mount the Selenium Rectifier on this screw with another #6 lockwasher and #6 nut. Be sure that the "+" or "K" terminal is mounted away from the chassis. See Figures 10 and 13.

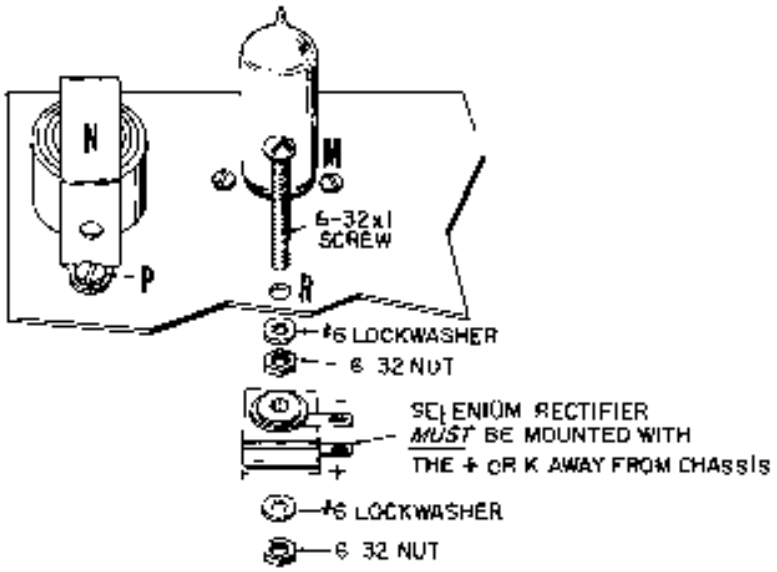


FIGURE 13

( ) 51. Slip a 3/8" rubber grommet into the hole at location S.

( ) 52 Slip a 3/8" rubber grommet into the hole at location T.

( ) 53 Mount the 3-lug terminal strip at location U on the rear apron of the chassis. Use a #6-32 x 3/8" screw, #6 lockwasher and #6 nut. See Figure 10.

( ) 54 Remove the #6-32 x 3/4" screw and #6 lockwasher at location V. See Figure 10. Mount the dual electrolytic capacitor (20-20 mfd @ 150V) with the leads toward the rear of the chassis. Use the screw and lockwasher just removed. See Figure 10.

UNDER CHASSIS WIRING

REFER TO FIGURE 14

( ) 55 Connect the long black lead from the power transformer to CA5 (Solder) See Figure 14

( ) 56 Connect the green lead from the power transformer to ground terminal G2 (Solder) of tube socket M See Figure 14

( ) 57. Connect the red lead from the power transformer to P4 (Don't Solder) See Figure 14

( ) 58 Connect the yellow lead from the power transformer to M3 (Don't Solder) See Figure 14

( ) 59 Connect the red/yellow lead from the power transformer to R1 (Solder) See Figure 14.

NOTE R1 is the negative terminal, closest to chassis.

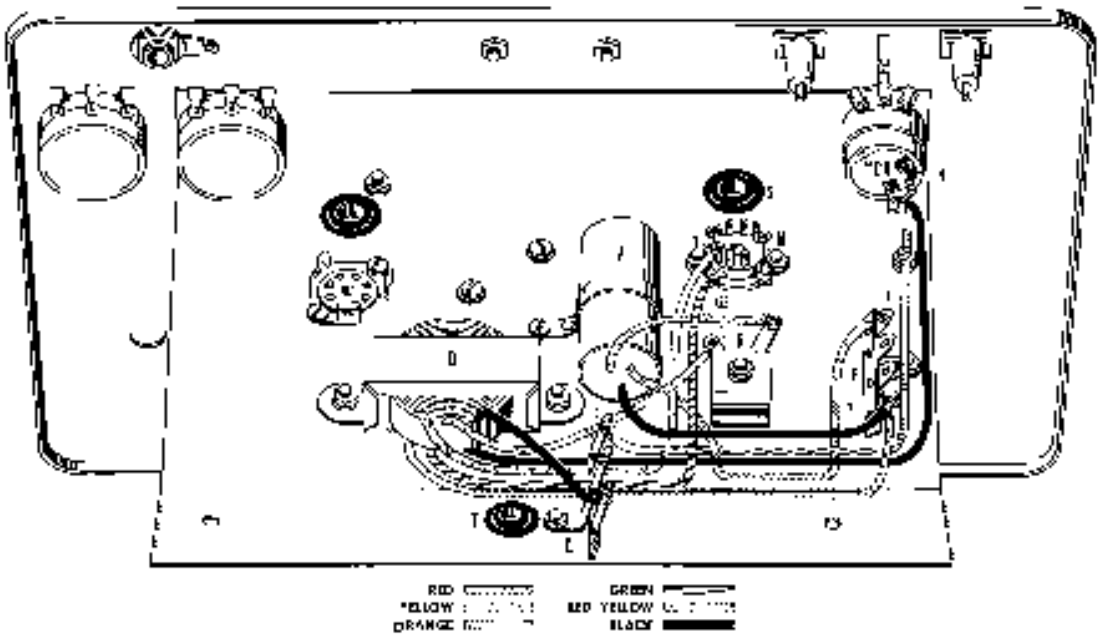


FIGURE 14

( ) 60 Connect the short black lead from the power transformer to L3 (Don't Solder) See Figure 14.

( ) 61 Connect an 8 length of orange wire from CA4 (Solder) to U1 (Don't Solder)

( ) 62 Connect the black lead from the electrolytic capacitor V to P4 (Don't Solder) See Figure 14

( ) 63 Connect either red lead from the electrolytic capacitor to R2 (Don't Solder)

( ) 64. Connect remaining red lead from electrolytic capacitor to P1 (Don't Solder) See Figure 14

UNDER CHASSIS WIRING

REFER TO FIGURE 15

( ) 65 Connect one end of a 9-1/4" length of yellow wire to P3 (Don't Solder) Pass the other end through grommet S. Leave this end free

( ) 66 Connect the red wire from D6 (See Step 11) to P1 (Don't Solder)

( ) 67. Connect a 470KΩ resistor (yellow-violet-yellow) from P3 (Solder) to P4 (Don't Solder)

( ) 68 Connect a 6800 resistor (blue-grey-brown) from P2 (Solder) to P4 (Solder).

( ) 69 Connect the free end of the yellow wire from D4 (See Step 8) to M3 (Don't Solder).

( ) 70 Connect a 6" length of yellow wire from M3 (Solder) to the terminal on pilot light K (Solder) Bend terminal in away from the panel edge.

( ) 71 Connect a length of thin bare wire from M4 (Solder) to ground terminal G3 (Don't Solder) of tube socket M (See blow-up No 1)

( ) 72 Connect a 100KΩ resistor (brown-black-yellow) from G9 of tube socket M (Solder) to M6 (Don't Solder).

( ) 73 Connect a 330Ω resistor (orange-orange-brown) from M7 (Solder) to ground terminal G1 (Solder) of tube socket M

( ) 74. Pass one lead of a .01 mfd (10,000 mmfd) ceramic disc capacitor (do not cut lead, use spaghetti) through grommet S from the top side of the chassis to M8 (Solder) Leave the other end free. See Figures 15 and 16

( ) 75. Connect one end of a 6-1/2" length of orange wire to red pin jack A (Solder) Pass the other end through grommet S to the top of the chassis. Leave this end free.

( ) 76. Connect one end of a 5-3/4" length of red wire to CA2 (Solder), pass the other end through grommet S to the top of the chassis Leave this end free.

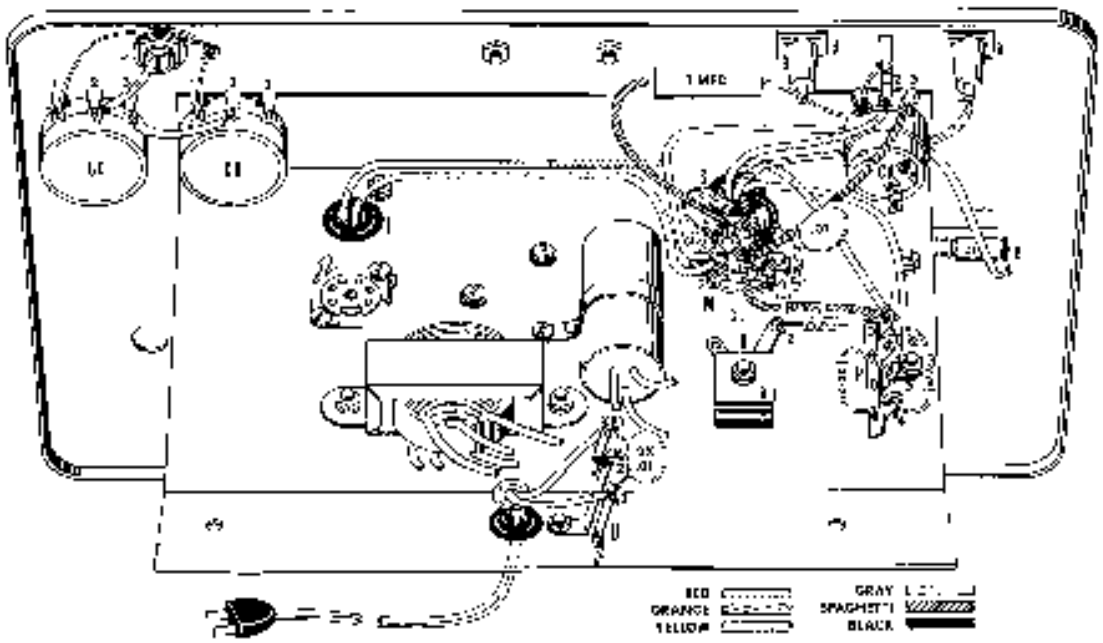


FIGURE 15

( ) 77. Pass the black lead shown in Figure 16 from the Audio Choke N down through grommet S and connect to M_1 (Don't Solder). See Figures 15 and 16

( ) 78. Connect a .01 mfd (10,000 mmfd) ceramic disc capacitor, using spaghetti on both leads, from M_1 (Solder) to CA_3 (Solder)

( ) 79 Pass one lead of a .1 mfd tubular paper capacitor through terminal of black pin jack B, through terminal CA_1 to ground lug on control CA (Solder) Now solder CA_1 and pin jack terminal B Connect the other lead of the capacitor (use spaghetti) to M5 (Don t Solder)

( ) 80 Connect a 5600Ω resistor (green-blue-red) using spaghetti on both leads from M5 (Solder) to P1 (Don't Solder)

( ) 81 Connect a 2200Ω resistor (red-red-red) from P1 (Solder) to R2 (Solder).

( ) 82 Connect a 1-3/4 length of yellow wire from CB_2 (Solder) to CC_3 (Solder)

( ) 83 Slip one end of a 3-1/4 length of thin bare wire through ground lug of connector J to CB_1 (Solder) Now solder J ground lug. Connect the other end to CC_1 (Solder).

( ) 84. Connect a 2 length of red wire from CC_2 (Solder) to the center of panel connector J (Solder).

CAUTION When soldering panel connector use only enough heat to make a good connection and to form a small ball over the eyelet Excessive heat may cause solder to flow into the body of the connector possibly resulting in a shorted condition

TOP CHASSIS WIRING

REFER TO FIGURE 16

( ) 85. Connect the remaining black lead from the Audio Choke N to SA_8 (Don t Solder).

( ) 86 Connect the free end of the .01 mfd (10,000 mmfd) ceramic disc capacitor (use spaghetti) from M6 (see Step 74) to SA_7 (Solder)

( ) 87. Connect the free end of the orange wire from pin jack A (see Step 75) to SA_5 (Don t Solder).

( ) 88 Connect a 1-3/4" length of orange wire from SA_5 (Solder) to SA_1 (Solder)

( ) 89. Connect the free end of the red wire from CA_2 (see Step 76) to SA_4 (Don't Solder)

( ) 90 Connect the free end of the yellow wire from P1 (see Step 18) to SA_3 (Don t Solder)

( ) 91 Connect the free end of the yellow wire from C3 (see Step 65) to SA_3 (Solder)

( ) 92 Connect a .01 mfd (10,000 m mfd) ceramic disc capacitor from SA_4 (Solder) to SA_2 (Solder)

( ) 93. Connect a .02 mfd tubular paper capacitor (use spaghetti) from SA_6 (Solder) to switch ground lug G1 (Solder)

( ) 94 Connect the center lead of the dual .01 mfd (10,000 mmfd) ceramic disc capacitor to the point U2 (Solder). Connect one side lead to U1 (Don't Solder) and the other side lead to U3 (Don't Solder). See Figure 15 Keep the leads as short as possible.

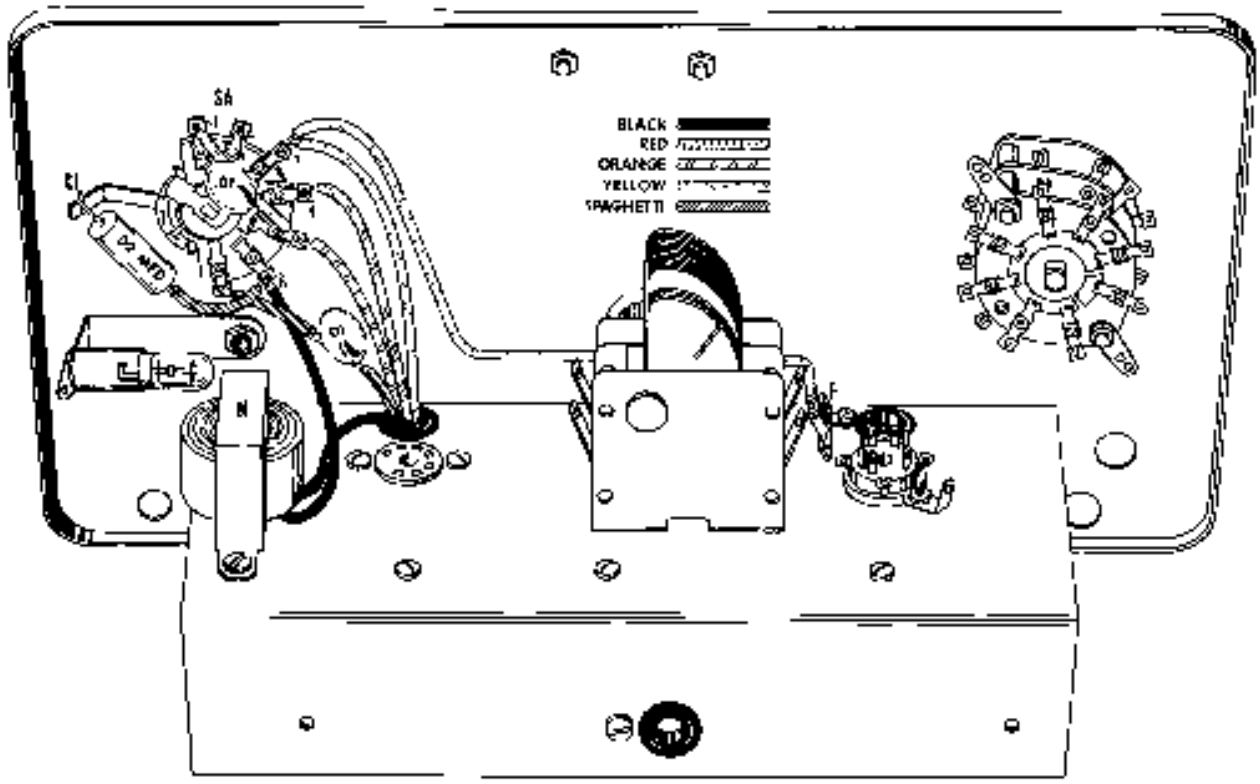


FIGURE 16

( ) 95. Insert line cord through 3/8" rubber grommet T. Tie a single overhand knot about 3" from the end of the cord for strain relief. See Figure 15

( ) 96 Connect one end of the line cord to U1 (solder). Connect the other end to U3 (solder).

This completes the wiring of your PACO SIGNAL GENERATOR.

CAUTION Miniature tubes can be easily damaged. Use caution when installing them in their sockets.

( ) 97 See Figures 10 and 12. Install 5AU5 tube in socket at location D and 5C4 in socket at location M. Place shield over 5AU5.

NOTE Pre-calibrated units (Model G-30PC) have the 6AL6 tube already installed with its shield in place.

( ) 98. Install pilot lamp in socket at location K. See Figure 12.

RF CABLE PREPARATION

REFER TO FIGURE 17, 18, AND 19

( ) 99 Remove 4" of the black outer insulation from one end of the RF cable.

( ) 100 Compress the shield until it bulges as shown in Fig. 17. With a small screwdriver work open the braid, reach into the opening with the screwdriver and pull the inner conductor up through the shield opening and out.

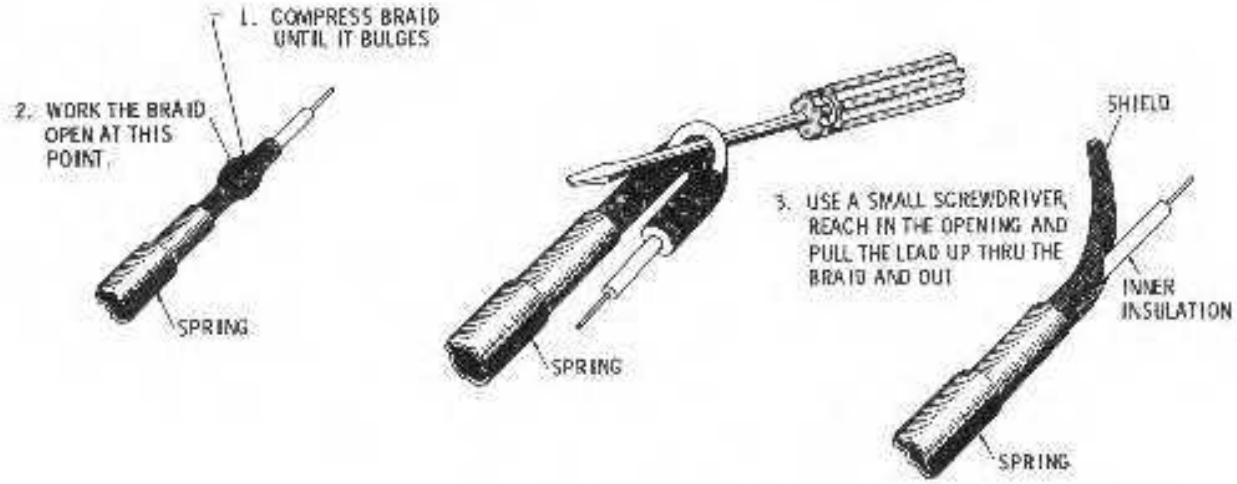


FIGURE 17

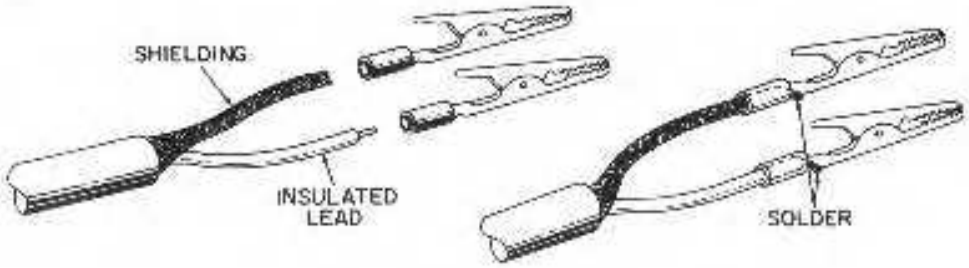


FIGURE 18

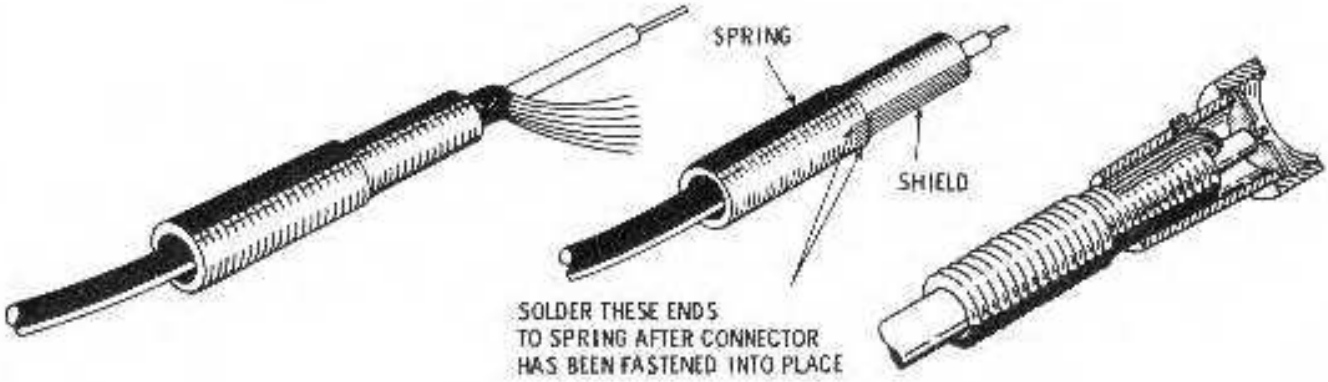


FIGURE 19

( ) 101. Pull the shield between the black insulation and the inner conductor until the shield fits snugly around the inner conductor. Strip 1/4" of the clear plastic insulation from the end of the inner conductor. Tin and insert this end into an alligator clip so that the tinned end enters the formed slot (Solder). See Figure 18.

( ) 102. Squeeze the end of the shield with a pair of long nose pliers, tin the end and insert it into the other alligator clip. Guide the tinned end through the hole above the formed slot, bend it over the metal and solder to the body of the alligator clip. See Figure 18.

( ) 103. Remove 1-7/8" of the black insulation from the other end of the RF cable.

( ) 104. Slip the female cable connector spring over this end of the cable with the smaller diameter toward the cable end. See Figure 19.

( ) 105 With the spring pushed back along the cable, unbraid the shield back for a distance of 1-1/4". Pull back the unbraided shield until the ends extend on to the large diameter section of the spring. See Figure 19

( ) 106. Remove 1" of the clear insulation from the inner conductor, and twist the stranded leads by hand.

( ) 107 Insert the prepared end of the cable into the female connector, and guide the exposed cable wire through the eyelet in the connector. Push the connector over the connector spring as far back as it will go, making sure that the set screw is directly over the unbraided shield. Tighten the set screw.

( ) 108 Cut the excessive unbraided shield 1/4" from the end of the connector and solder to the large diameter spring

( ) 109. Trim off the inner conductor flush with the eyelet in the connector and solder

CAUTION Use only enough heat to make a good connection and to form a small ball of solder over the eyelet. Excessive heat may cause solder to flow into the body of the connector, possibly resulting in a shorted condition.

CABINET PREPARATION

( ) 110. Mount handle and brackets as shown in Figure 20. Use four oval head #6-32 screws, #6 lockwashers, and #6-32 nuts.

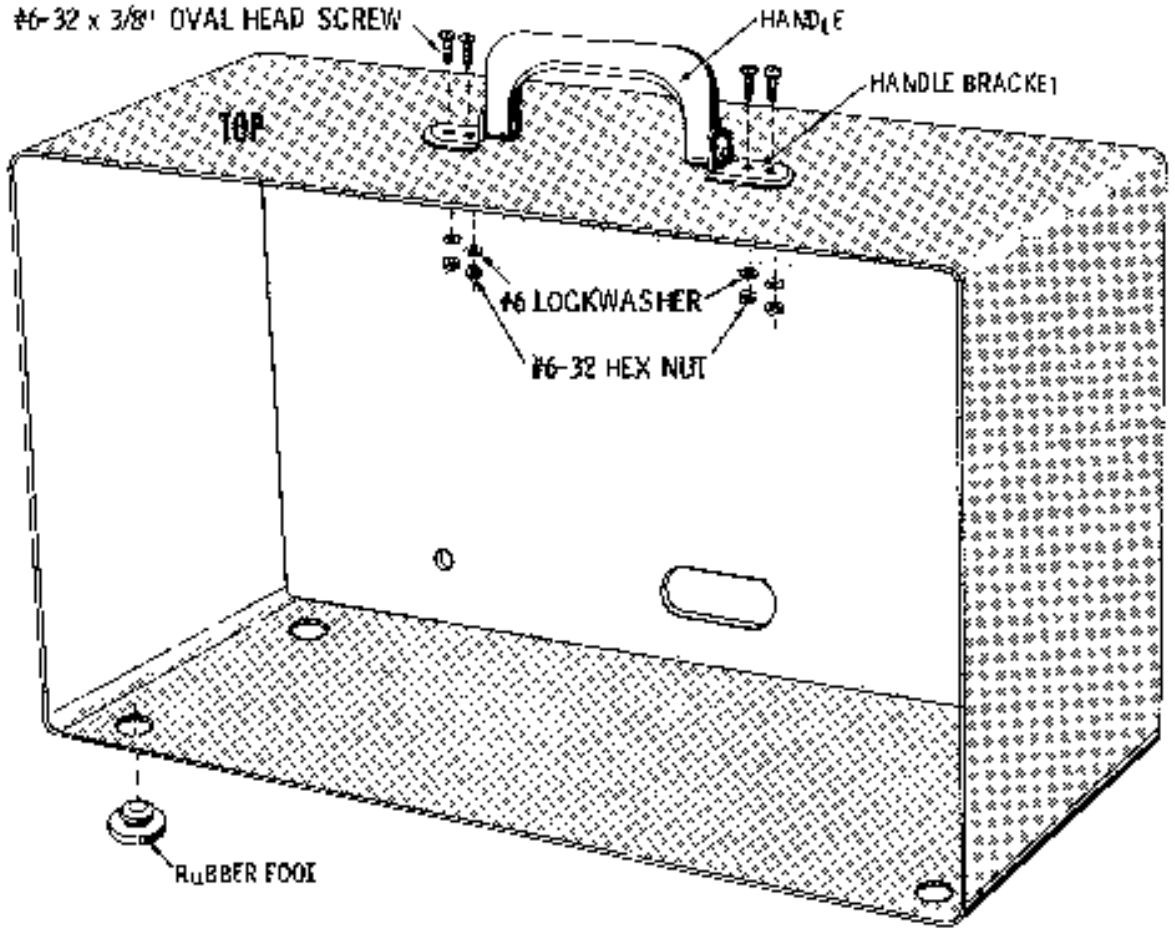
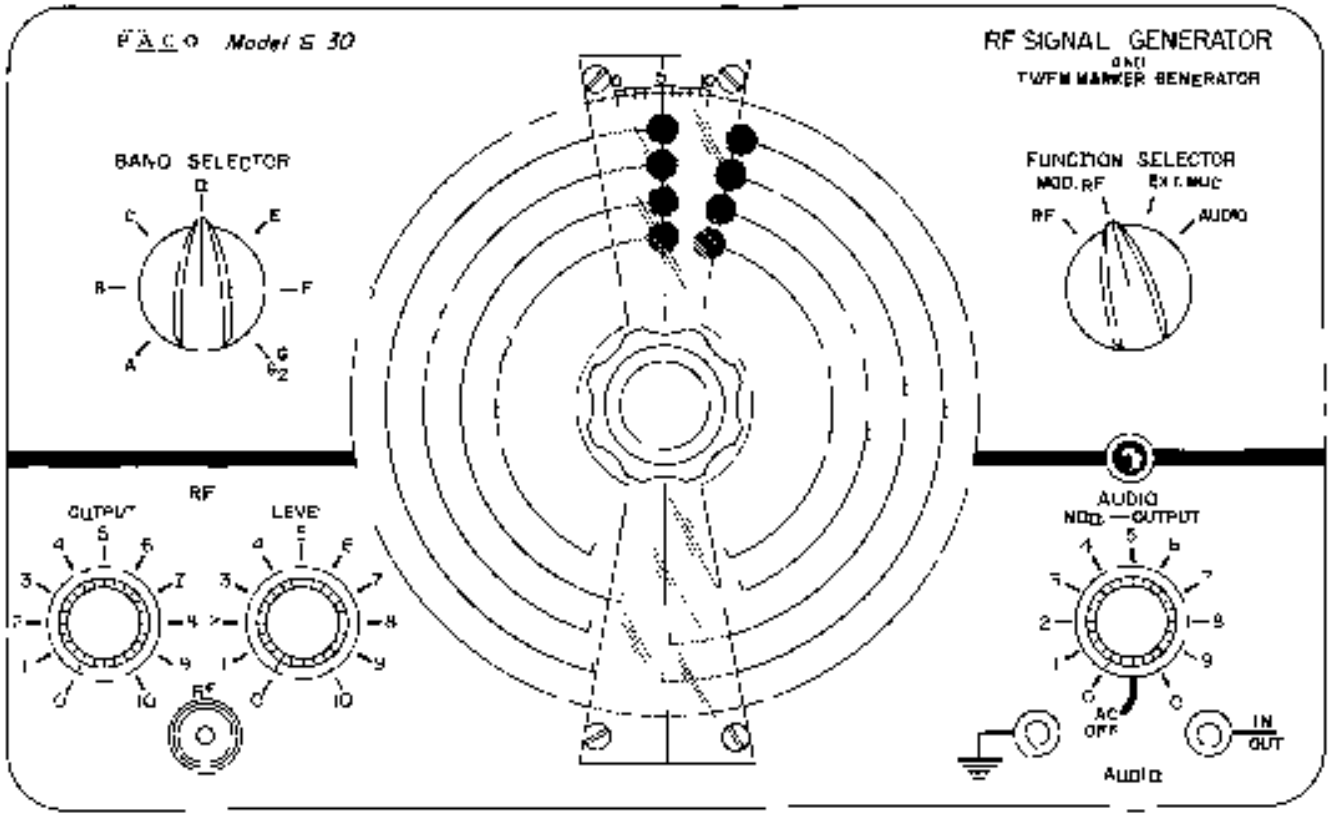


FIGURE 20

( ) 111 Mount the four rubber feet in the holes on the bottom of the case by applying pressure with thumb. See Figure 20

CABINET MOUNTING

The AC cord should be fed through the hole in the rear of the metal cabinet and the chassis inserted into the cabinet. The front panel will fit snugly around the outside of the cabinet and the entire unit held in place by two sheet metal screws mounted in the holes at the rear of the cabinet



FRONT PANEL

CONTROL AND TERMINAL FUNCTIONS

AUDIO MOD. - OUTPUT - The AC "OFF-ON" switch is combined with this control. The level of the 400 CPS audio output voltage which is obtained at the audio jack is governed by this control. It also controls the amount of Internal and External Modulation which is applied to the RF section of the generator.

BAND SELECTOR - This switch is used to select the proper band of frequencies desired. Note that the bands G and G_2 are both read when the band switch is in the G - G_2 position.

TUNING DIAL - Changes in frequency within the limits of the band selected, are made by the tuning knob, and direct frequency readings can be taken from the dial. The VERNIER scale at the top of the plastic pointer should be used ONLY for reference in resetting the dial to a predetermined position. (See further notes on use of the VERNIER scale on Page 28)

RF LEVEL AND OUTPUT CONTROLS - These controls are connected in a series-parallel type circuit. The LEVEL control directly governs the amount of RF voltage which is fed to the OUTPUT control. The LEVEL control may be considered as a "coarse" adjustment and the OUTPUT control as a "fine" adjustment.

RF CONNECTOR - The output cable is connected to this terminal and the RF voltage available at this point is controlled by the LEVEL and OUTPUT controls.

AUDIO JACKS - The black terminal is the ground terminal. The red terminal serves two purposes, when the FUNCTION SELECTOR switch is in the AUDIO position, a 400 cycle audio signal is fed to this terminal. When the FUNCTION SELECTOR switch is in the EXT. MOD. position the red terminal is used as an input for externally modulating the RF oscillator.

FUNCTION SELECTOR SWITCH - In the RF position a pure or unmodulated RF signal is fed to the RF connector. In the MOD. RF position an internally modulated (400 cycle modulation) RF signal is fed to the RF connector. In the EXT. MOD. position the signal at the RF connector may be modulated by an external source being fed into the AUDIO IN jack. In the AUDIO position, a 400 cycle audio signal is fed to the AUDIO OUT jack.

CALIBRATION

The Model G-30PC (pre-calibrated, partly assembled Kit) has been pre-calibrated at the factory and no calibration will be necessary. The calibration of the Model G-30 (Standard Kit), when completely assembled should be satisfactorily accurate as the coils have been pre-adjusted at the factory. However, to obtain greatest accuracy of calibration, or to recalibrate a model G-30 generator which has been repaired, one of the following calibration methods may be used.

(A) A signal generator of known accuracy in conjunction with either a radio receiver covering the desired frequency ranges or an oscilloscope and a crystal diode, such as a 1N48, for observing zero beat. See Figure 21.

(B) If the equipment in (A) is not available, an accurate calibration job may be done using only an AM-FM receiver (or separate AM and FM receivers).

Before any calibration is attempted the equipment to be used must be allowed to warm up for 10 to 15 minutes.

1. Calibration of Band A (560KC to 520KC)

Tune an AM receiver to a broadcast station in the vicinity of 700KC. The Function Switch of the G-30 must be set to the "RF" position and the Band Switch set to Band "A". Connect the RF output cable from the G-30 to the antenna and ground terminals of the AM receiver. Tune

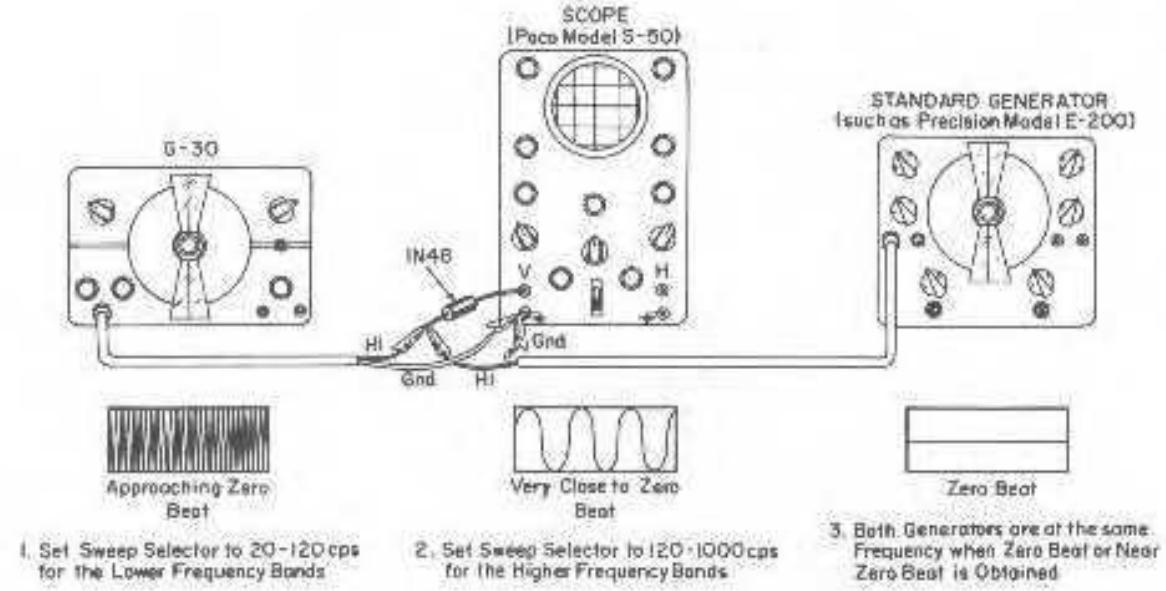


FIGURE 21

G-30 dial for zero beat in loudspeaker. Determine the exact frequency of broadcast station being received and divide frequency in half (Example: 1/2 of 710KC would equal 355KC). Zero beat should occur when the dial of the Model G-30 is set at the frequency equal to one half the frequency of the broadcast station being received. If dial reads lower in frequency, turn tuning slug on Band "A" coil out (counterclockwise) until dial reading is correct. If dial reads higher in frequency turn tuning slug in (clockwise).

2. Calibration of Band "B" (520KC to 1700KC):

Set the G-30 Band Switch to Band "B". Tune the G-30 dial to the frequency of the same broadcast station used in Step 1. Then tune the G-30 dial accurately for zero beat. If dial reads lower in frequency turn tuning slug of "B" coil out (counterclockwise) until dial reading is correct. If dial reads higher in frequency turn the tuning slug in (clockwise).

3. Calibration of Band "C" (1.7MC to 5.5MC):

Band "C" may be calibrated by use of either of two methods. The first method requires the use of a communications or short wave receiver. If this type of receiver is available, use the following procedure:

1st Method (using communications receiver): Tune in station WWV at 2.5MC on the receiver. Connect the RF output cable from the G-30 to the antenna and ground terminals of the receiver. Set the G-30 Band Switch to Band "C" and adjust the dial for zero beat in the speaker. If adjustment is required, the slug of the "C" coil may be adjusted in the same manner as in Step 1 above.

A communications receiver can be used to check the calibration of any point on the dial within the frequency range of the set by tuning in stations of known frequency and checking the G-30 dial for zero beat at those frequencies.

2nd Method: If a communications receiver is not available, a broadcast band AM receiver can be used at its high frequency end to yield a signal in the region of 2.5MC by using the IMAGE frequency of the receiver. Inasmuch as the IF frequency of the receiver is involved in this procedure, the exact frequency of the receivers IF must be determined before making the actual calibration.

The step-by-step procedure for calibrating Band "C" by this "IMAGE" method is as follows:

Set the G-30 back to Band "A". Disable the AM oscillator of the receiver, or if this is not convenient, turn the receiver dial to a quiet spot. Turn the G-30 Function Selector Switch to "RF Mod." Turn the Modulation control half-way on. Tune the G-30 dial to the IF frequency of the receiver (usually 455KC). NOTE: RF Level and Output controls will usually have to be near

maximum to get the IF signal through the antenna circuits. When the exact IF frequency is determined it should be written down.

Now set the Band Selector Switch of the G-30 to Band "C" and the function Switch to the RF position. Tune the receiver to a station between 1500 and 1600KC. Multiply the IF frequency (just recorded above) by 2 and add the station frequency. (Example. 455KC x 2 = 910KC + 1560KC = 2470KC or 2.47MC). Turn the G-30 dial carefully in the vicinity of 2.47MC for zero beat. If the dial reads lower or higher turn the tuning slug on coil "C" for the correct dial reading as in preceding steps.

4 Calibration of Band "D" (5.2MC to 16MC)

In this case, the 10.7MC. discriminator or ratio detector of the FM receiver may be used for calibration purposes; However, unless the FM receiver being used is known to be accurately aligned at 10.7MC, it might be wise to check the alignment before proceeding with the actual calibration of Band "D". The check procedure is simple and is detailed as follows:

Set the G-30 Band Switch to Band "C" and connect the RF output cable to the antenna posts of the FM receiver (or to the input of the first IF for a stronger signal), disable the FM oscillator of the receiver or tune the dial to a quiet spot. Set the Function Selector Switch of the G-30 to the MOD. RF position and adjust the dial to a setting somewhere between 2.6 and 2.7MC (approximately 1/4 of 10.7MC). The 400 cycle modulation note should be heard and there should be a null or quiet spot in the region of 2.6 to 2.7MC (with the 400 cycle note on either side of the null). The null or quiet spot is the exact IF frequency of the FM receiver. This final point is actually 1/4 of the IF frequency of the FM receiver. If the FM receiver has been originally aligned to exactly 10.7MC, the final dial setting of the G-30 will be 2.675MC (which would be exactly between 2.65 and 2.7 calibration marks on Band "C"). In any event, observe the actual final setting on Band "C", multiply it by 4 and you will now have the actual IF frequency of the FM receiver being used.

For actual calibration of Band "D", the Band Switch is set to "D" and the dial is adjusted in the vicinity of the 10.7MC dial calibration. Again, the 400 cycle audio note should be heard; The final dial setting should be made at the null or quiet spot on the dial with the 400 cycle note on either side (reduce the modulation control setting if necessary to obtain a distinct null). If, in the previous step, the IF frequency had been determined as 10.8MC for example, then the tuning slug of coil "D" would be adjusted until the null is obtained from the speaker with the G-30 dial set in this example to 10.8MC.

NOTE: Band "G" is calibrated before Bands "E" and "F" are calibrated because the adjustments made on Band "G" disturb the calibration of Bands "E" and "F".

5 Calibration of Band "G" (80MC to 120MC)

Set the G-30 Band Switch to Band "G". Leave all other controls and the RF cable the same as in Step 4. Tune the FM receiver to a station in the vicinity of 100MC and turn the G-30 dial through the FM band until the 400 cycle audio note is heard. (The station signal will usually disappear, which is normal.) Tune the G-30 dial carefully for the null point of the 400 cycle note as in Step 4. The exact frequency of the station must be determined and the reading on the G-30 dial should be the same. If the dial reading is high; shorten the buss lead, from the ground lug to lug SB-27 on the Selector switch, by changing the point at which the ground lug is soldered to the buss lead. An eighth of an inch can make a big change in frequency. If the dial reads low lengthen the buss lead by repositioning the ground lug farther away from lug SB-27.

6 Calibration of Band "F" (28MC to 60MC)

Set the G-30 Band Switch to Band "F". Leave all other controls and RF cable the same as in Step 5. A station should now be tuned in on the FM receiver and its exact carrier frequency noted. Set the G-30 tuning dial to the frequency which is 1/2 of the frequency of the FM station carrier frequency (Example: 1/2 of 100MC would equal 50MC). Adjust the tuning of coil "F" for null or zero beat.

7 Calibration of Band "E" (15MC to 30.5MC)

Set the G-30 Band Switch to Band "E" and the Function Selector Switch to the MOD RF position. A station should now be tuned in on the FM receiver and its exact carrier frequency noted. Adjust the G-30 tuning until the dial reads 1/4 of the frequency of the FM station carrier frequency (Example 1/4 of 100MC would equal 25MC). Adjust the tuning slug of Band "F" coil until a null is obtained from the speaker of the receiver.

NOTE In steps 5, 6 and 7, the signal from the G-30 should be kept as low as possible to avoid spurious signals from being generated in the receiver. It may be necessary, on a sensitive FM receiver, to disconnect the output cable entirely from the antenna terminal to avoid the generation of unwanted signals.

NOTE All of the preceding calibration steps have been performed with the G-30 out of its metal carrying case. If a slight shift in calibration on the higher bands is noticed when the case is installed, you may over-compensate slightly on the slug adjustments to allow for the effect of the metal case.

OPERATING INSTRUCTIONS

The PACO Model G-30, or G-30PC RI Signal Generator has been carefully engineered to meet the various requirements needed to correctly align and test RF, Osc., IF and AUDIO sections as well as FM Discriminator and Ratio Detector circuits. The accuracy and flexibility of this instrument also makes it a valuable aid in TV alignment and troubleshooting.

The following instructions are intended to briefly summarize the most common uses for an IF signal generator. While many methods of test and alignment are used many of these have become standard with only slight variations. Service literature outlining the alignment procedure of the equipment involved should be used.

To insure accuracy and minimize frequency drift the generator should be allowed to warm-up for a period of at least 10 minutes. When all component parts have reached their normal operating temperature, the generator will remain very stable.

NOTE In many instances it will be found necessary to couple the signal generator to a receiver point that has a potential difference with respect to ground. In these cases it is necessary to insert a capacitor in series with the "hot" RF lead to block DC voltages which may damage the attenuation controls or place a low resistance short across the circuit being tested. A capacitor having a rating of .002 mfd at 600V is recommended for this application.

Particular attention should be given to circuits which employ AVC. When making stage gain tests, or during alignment, it may be advisable to disable the AVC and connect a battery or a bias supply unit from ground or B- to AVC buss. The negative terminal of the battery is connected to the AVC buss and the positive to ground. For most work 1-1/2 volts will suffice, however, some circuits may require higher voltages to prevent oscillation or to lower the gain.

The following alignment practices are typical and service literature covering the equipment to be aligned should be consulted for generator connections, frequencies and adjustment procedures.

AM RADIO

In the alignment of an AM Superheterodyne radio there are three sections to be considered and alignment should normally be in this order:

1. IF section 2. Oscillator section, 3. RF section

1. IF section — Set the PACO G-30 Signal Generator to the intermediate frequency (IF) Place the Function Selector Switch in the MOD RF position and connect the RF lead to the grid

of the mixer or converter tube. All controls of the receiver under test should be set to maximum. An output meter, or a meter having a low AC voltage range (PACO Model M-40), is connected across the output transformer secondary, or speaker voice coil, to indicate relative strength of the output. The RF output of the generator should now be adjusted to give a slight reading on the meter.

The IF transformers are then adjusted for maximum meter reading. The last IF should be adjusted first and on back through the set to the first IF. The output of the generator should be kept at the lowest possible level which will give a readable meter deflection.

2. Oscillator section — The RF cable of the PACO G-30 may be left connected to the mixer, or it may be connected to the antenna post, and the ground lead attached to the receiver ground terminal or chassis. (For receivers that use a loop antenna, coupling is best achieved by clipping a single turn loop to the RF cable clips and placing this loop close to the receiver loop antenna). The generator is set to a specified frequency near the high end of the band and the receiver dial is set to indicate this same frequency. The oscillator adjustments are now made for maximum indication on the meter.

3. RF section — The PACO G-30 RF cable must now be connected to the antenna post, and the ground lead attached to the receiver ground terminal or chassis. (See - 2. Oscillator section - for receivers using a loop antenna). In general practice it is good to connect an all-wave dummy antenna between the generator and the receiver. See Figure 22.

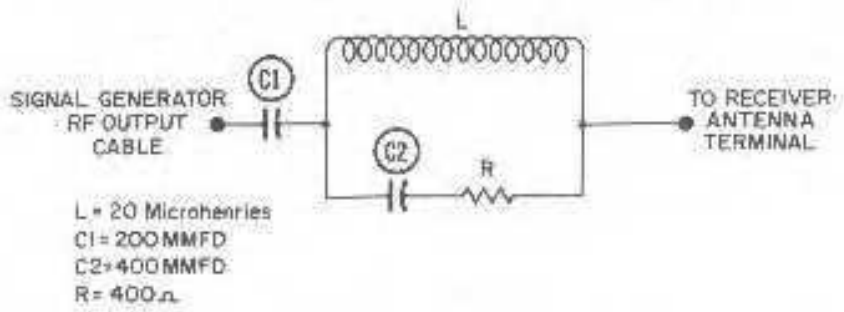


FIGURE 22

The signal generator is set to a frequency at the high end of the band and the receiver is tuned for maximum output. The RF adjustments should now be set for maximum receiver output as read on the PACO M-40 (output indicator).

The generator should now be set to the low end of the band and the tuning capacitor of the receiver "rocked" through the signal while the RF and oscillator low frequency paddors are adjusted for maximum output. In some radios the only adjustment provided on the low end of the dial is split rotor plates and these may be bent to provide proper adjustment.

FM RADIO

Basically the IF, RF and Oscillator sections of an FM radio will be aligned in a manner very similar to AM radios. One of the main differences in alignment of an FM set, as compared to AM, is the alignment of the detector circuit. Two basic circuits are used. One combines a limiter tube and a discriminator, and is called a "discriminator detector". The other circuit is called a "ratio detector".

To align a discriminator detector, the Signal Generator is connected to the grid of the limiter tube, V1 in Figure 23, the Function Switch should be placed in the RF (unmodulated) position and the generator is then tuned to the IF frequency specified in the service literature. The generator must remain set at this frequency for all other IF and detector adjustments. A VTVM (PACO Model V-70) is then connected across the cathodes of V2 and V3 of Figure 23. The primary of the discriminator transformer is then adjusted for maximum output as indicated by the VTVM. If no indication of peaking is obtained on the meter the secondary may have to be

detuned slightly to obtain a reading. After the primary has been peaked the secondary is then adjusted for zero voltage reading.

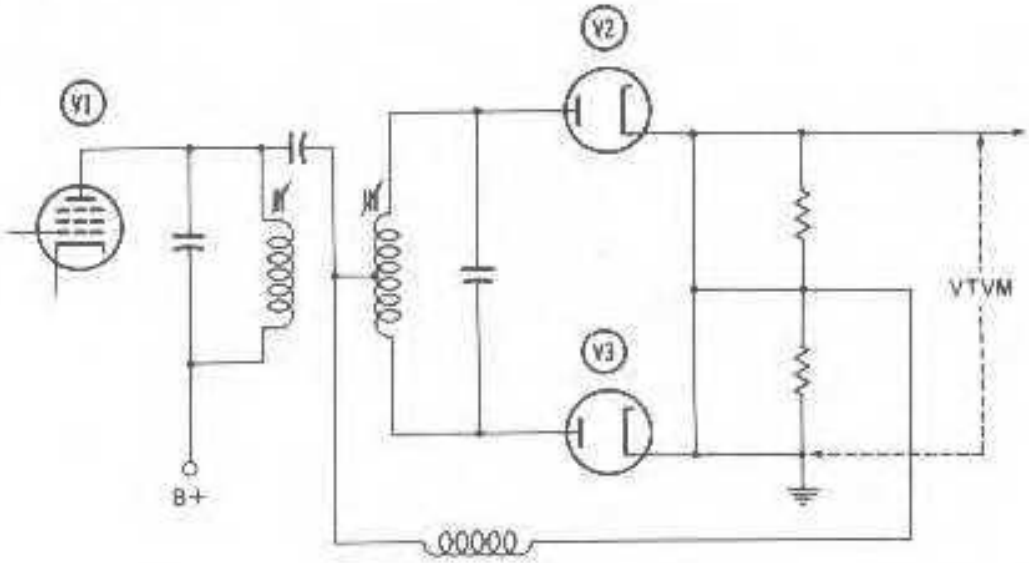


FIGURE 23

A ratio detector circuit (Figure 24) may be aligned by first connecting a VTVM at point A across the load resistor (R1) of the ratio detector diode. The signal generator is then connected to the input grid of the first sound IF stage and set to the IF frequency specified for the receiver being aligned. The primary of the ratio detector transformer can now be adjusted for maximum meter deflection on the VTVM. The frequency setting of the signal generator and the connections of the generator to the receiver remain the same for making the adjustment of the transformer secondary. The VTVM is connected across the output of the detector stage (Figure 24) at Point B and ground. The secondary is then adjusted for zero reading on the VTVM.

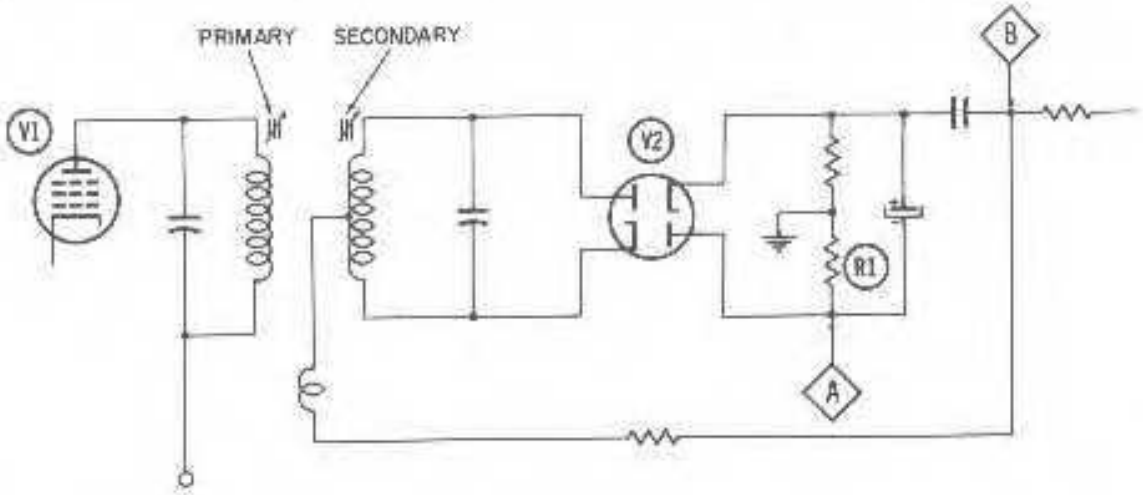


FIGURE 24

In some cases special techniques are required when aligning FM discriminators and ratio detectors. The alignment data for the particular receiver being aligned should be consulted.

TELEVISION

The most important use for this Signal Generator in TV service is its application as a Marker Generator when used in conjunction with a Sweep Generator and an Oscilloscope. See

Figure 25. The instruction manual furnished with a Sweep Generator will cover visual alignment and the use of an AM Signal Generator as a Marker very thoroughly and will not be included in this manual.

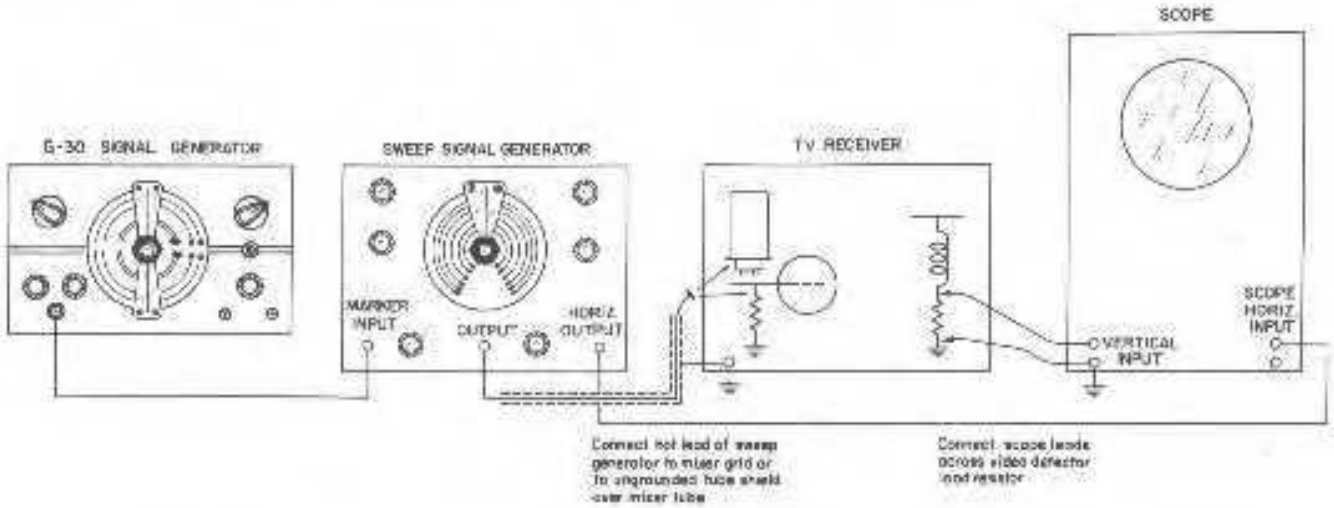


FIGURE 25

Complete alignment may also be made using only the Signal Generator and a VTVM. The video IF transformers and traps may be aligned by connecting a VTVM, such as the PACO Model V-70, across the output of the video detector. The Signal Generator is connected to the input grid of the first video IF amplifier. The alignment procedure specified in the service literature must be followed when making the IF and trap adjustments. In general, RF alignment is made by connecting the Signal Generator to the antenna terminals of the TV receiver, connecting the VTVM across the output of the video detector and making adjustments according to the service literature.

The sound section of TV receivers operate on frequency modulation (FM) principles, therefore the sound IF transformers, sound limiter and discriminator, or ratio detector, are adjusted by the same procedure used to align an FM radio. Reference should be made to the FM radio alignment section of this manual for details on procedure.

It is convenient to make a preliminary alignment with the signal generator and VTVM before making a visual alignment on a TV receiver that has been tampered with or badly misadjusted.

SIGNAL SUBSTITUTION

The PACO Model G-30 Signal Generator can be a valuable aid in rapidly locating defective stages in AM, FM or TV receivers and audio amplifiers by the "Signal Substitution" method. A Modulated (400 cycle) RF signal is generated for testing RF, Mixer, IF and detector stages by this method. A 400 cycle audio signal is provided for testing audio stages.

FIGURE 26

A block diagram of a typical AM Radio is shown in Figure 26. To locate a defective stage in this receiver, the appropriate signal from the Signal Generator is injected at the input of each stage and the output from each following stage is checked until the stage in which the signal is lost or distorted is located. It is usually logical to begin testing at the output stage, then the audio amplifier stage, and continuing back through the receiver towards the RF stage. The output signal can be checked with the speaker, phones, VTVM or oscilloscope, which ever is most convenient.

The receiver being tested and the signal generator should be turned "ON" and allowed to warm up. A test lead is placed in each audio jack and the Function Selector Switch is turned to the AUDIO position. The generator will now deliver a 400 CPS audio signal to the AUDIO jacks. The amplitude of this audio signal is controlled by the AUDIO MOD. - OUTPUT control. The volume control of the receiver under test should be fully advanced and the test lead from the black or negative jack connected to the receiver chassis. The lead from the positive or red jack is then clipped to the input of the audio output stage and the generator output control advanced until the 400 cycle signal is heard clearly through the receiver speaker. If a push-pull output stage is to be tested, the test lead should be clipped to the input of one audio output tube and the audio level should be noted. The test lead should then be connected to the grid of the other output tube and the audio level should be the same as in the first test. If no signal is heard from the speaker, in either case or if the output of the push-pull amplifiers differ greatly, then it may be assumed that the trouble exists in the audio output section. The next step would be to inject the signal into the input of the audio amplifier stage. If this section proves all right the RF cable is then attached to the generator and the Function Selector Switch is placed in the MOD. RF position. The inner conductor (HOT lead) of the RF cable is connected to the input of the detector stage and the shield is connected to the chassis. The BAND switch is then set to the band covering the IF frequency of the radio under test and the dial is set to this frequency. If this stage is operating satisfactorily the signal should now be heard from the speaker. Each IF stage may be tested in this manner. First checking the 2nd IF, then the 1st IF. If all tests conducted so far prove satisfactory the receiver and generator should now be set to the same frequency. The RF output of the generator should now be fed to the input of the mixer stage. This test will show if the mixer section is functioning and also if the local oscillator is operating. The RF output of the generator is now fed to the input of the RF stage of the receiver. For receivers using a loop antenna, coupling is best achieved by using a single turn loop which is clipped to the RF cable of the generator and placed close to the receiver loop. This test is used to check the RF section of the receiver and a good conclusion of the overall performance of the receiver may be taken.

VERNIER SCALE

A vernier scale is placed at the top of the plastic pointer to enable the operator to note the exact position of the dial for any certain frequency. This vernier, or auxiliary scale, should NOT be used to make frequency readings or to sub-divide frequency calibration marks. Its purpose is to enable the operator to find the exact position on the dial for a previously used frequency. This is a convenient feature since the user can make adjustments at a certain frequency, shift the Signal Generator frequency to make other adjustments and then return to the exact dial position necessary to make further adjustments at the previously used frequency.

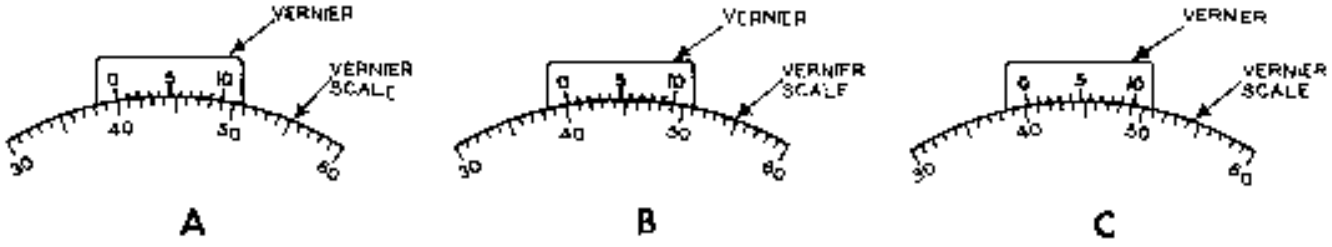


FIGURE 27

The method of reading a vernier scale is illustrated in Figure 27 and as may be seen, any reading from 40.1 to 40.9 may be obtained and this setting may be returned to at any time. The reading on the vernier scale in Figure 27A is 40. Note that the zero on the vernier plate is directly over the 40 on the vernier scale. The reading on the vernier scale is Figure 27B is 40.1 since the one mark on the vernier plate is directly over a vernier scale division. Figure 27C indicates a reading of 40.2 because the two mark on the vernier plate is directly over a vernier scale division.

MAINTENANCE SUGGESTIONS

The PACO Signal Generator should give long and trouble-free service, however, occasional maintenance will give added life and satisfaction from the instrument. The tubes should be tested and the output voltage from the selenium rectifier should be about 130 volts DC plus or minus 20%. The controls and switch contacts should be cleaned and any dust particles should be blown out of the variable capacitor.

WHAT TO DO IN CASE OF TROUBLE

If the instrument fails to function properly, the following tests should be made:

1. Recheck all wiring and make certain all connections have been properly made. Inspect each solder joint and be sure they are all solid.

2. The correct voltages are indicated on the schematic and these should be checked. A variation of 20% is permissible.

3. Check all tubes or substitute tubes that are known to be good.

4. Check all construction visually for wire clippings and drops of solder which could become lodged against, and cause shorting of, control terminals, switch contacts, etc.

PARTS LIST

RESISTORS

Part No	Quantity	Description
P15-930	1	330 Ohms 10% Carbon
P15-697	1	660 Ohms 10% Carbon
P15-824	1	1K Ohms 10% Carbon
P15-829	1	2200 Ohms 10% Carbon
P15-931	1	3600 Ohms 10% Carbon
P15-726	1	10K Ohms 10% Carbon
P15-709	1	22K Ohms 10% Carbon
P15-731	1	100K Ohms 10% Carbon
P15-726	1	470K Ohms 10% Carbon

CAPACITORS

P16-174-1	1	50 mmfd. Ceramic Insulated
P16-187-1	1	250 mmfd Ceramic Insulated
P16-146	1	.0015 Mfd Ceramic Disc 1.5K mmf.
P16-143	4	.01 Mfd. Cer. Disc (10Kmmf.)
P16-153	1	.01 MFD Dual Ceramic Disc Dual 10K mmf
P16-159	1	.02 MFD. 400V Tubular
P16-108	1	1 Mfd. 400V Tubular
P16-232	1	Dual 20 Mfd at 150V Electrolytic
P16-241	1	Variable Capacitor

CONTROLS-SWITCHES

P17-219	1	250K Ohm Control w/Switch
P17-120D-1	2	500 Ohm Control
P14-247	1	Band Switch
P14-240	1	Shorting Switch

TRANSFORMER-COILS

P18-173	1	Power Transformer
P18-173	1	Choke
P18-170	1	"A" Band Coil
P18-177	1	"B" Band Coil
P18-178	1	"C" Band Coil
P18-179	1	"D" Band Coil
P18-180	1	"E" Band Coil
P18-181	1	"F" Band Coil
P21-163	1	"G" Band Coil (L shaped heavy wire)
P21-108	5	Special Pre Cut heavy wire

TUBE-LAMPS

Part No	Quantity	Description
P19-128-1	1	6AQ6 Tube
P19-117-1	1	6C4 Tube
P19-126	1	#47 Pilot Lamp
P32-120	1	Selenium Rectifier

SOCKETS-JACKS-TERMINAL STRIPS

P20-285	1	Small Pilot Assembly
P35-128	1	Pilot Lamp Jewel
P20-115	2	Alligator Clip
P20-108	1	Cable Connector
P20-109	1	Panel Connector (with ground lug)
P20-194	1	7 Pin Miniature Tube Socket
P20-193-1	1	7 Pin Miniature Tube Socket (low loss type)
P20-106-2	1	Red Pin Jack
P20-106	1	Black Pin Jack
P23-271	1	4 Lug Terminal Strip
P23-228	1	3 Lug Terminal Strip
P23-227	1	1 Lug Terminal Strip
P11-269	1	Tube Shield Clip
P11-270	1	Tube Shield

KNOBS-GROMMENTS-FEET

P10-457-1	3	Skirted Knob
P10-480	2	Pointer Knob
P10-168-1	1	Dial Knob
P29-132	5	3/8" Rubber Grommet
P29-149	4	Rubber Feet

HARDWARE

P33-197A	4	Bushing
P24-225	4	4-40 x 1/4" Screw
P24-284	4	4-40 x 1/2" Screw
P24-248	4	0-32 x 3/8" Screw (oval)
P24-244	9	6-32 x 3/8" Screw.
P21-213	2	40 x 3/8" Sheet Metal Screw.
P24-261	1	6-32 x 1" Screw
P24-252	1	6-32 x 3/16" Slotted Set Screw
P24-168	8	4-40 Nut
P24-125	12	6-32 Nut
P24-150	6	Control Nut

PARTS LIST (Continued)

HARDWARE (Continued)

Part No.	Quantity	Description
P24-269	1	9/32 32 Pilot light hex nut
P24-253	7	#4 Lockwasher
P24-215	15	#6 Lockwasher
P24-175	4	Control Lockwasher
P23-267	3	#4 Solder Lug
P23-257	2	Control Ground Lug
P23-224	5	Bakelite Control Washer
P24-268	2	Innerman (for Pin Jack)

WIRE-SLEEVING

P21-171	1	probe Cable
P21-168	1 length	Bare Wire
P21-148	1 roll	Hook-up wire (red yellow orange)
P21-172	1 length	Insulating Sleeving (large)

WIRE-SLEEVING (Continued)

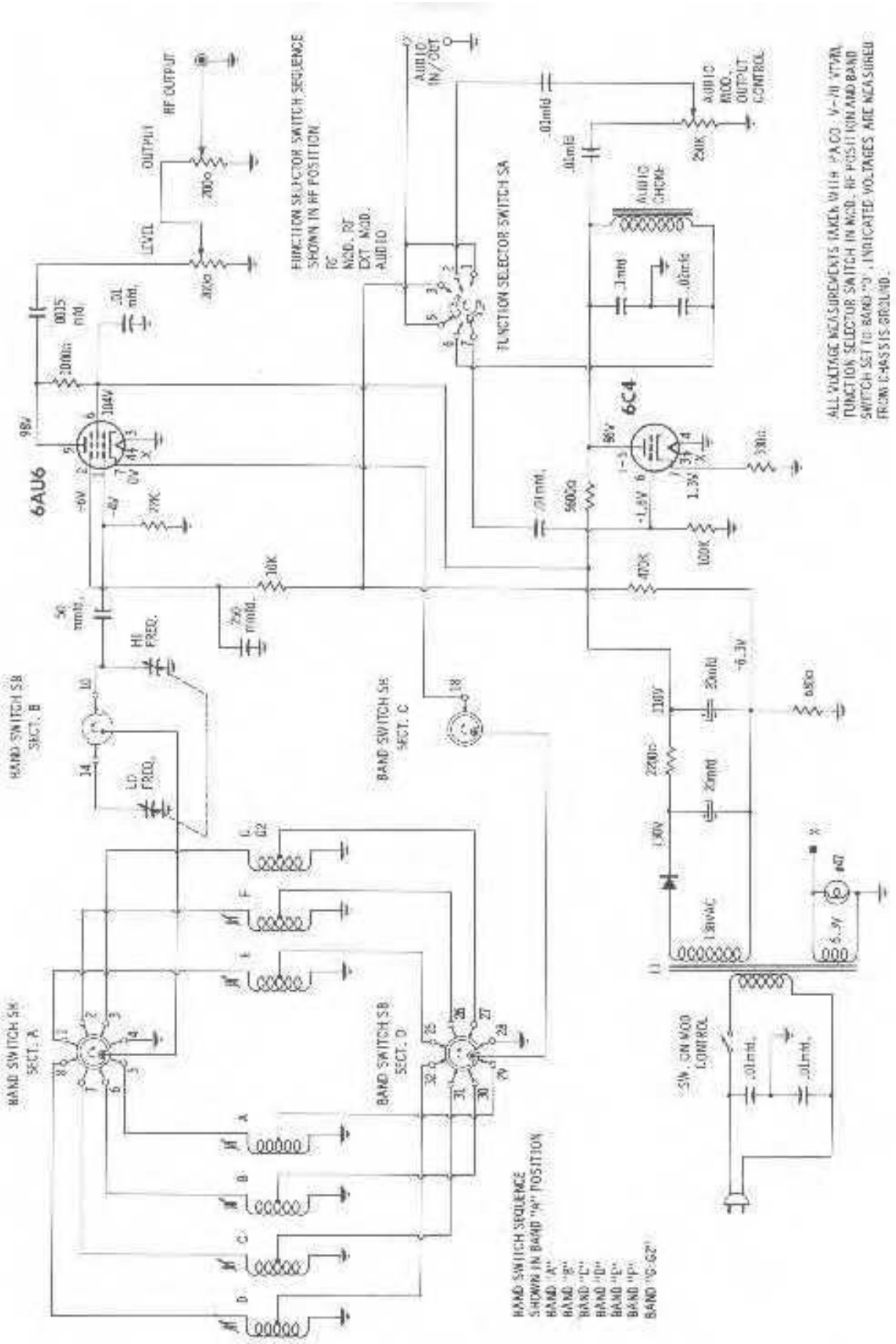
Part No	Quantity	Description
P21-169	1 length	Insulating Sleeving (small)
P21-141-1	1	Line Cord

SHEET METAL PARTS

P13-388	1	Panel
P13-390	1	Dial & Hub Assembly
P13-391	1	Dial Pointer
P22-170	1	Carrying Case
P11-298	1	Chassis
P23-243	1	Grey Handle
P23-244	2	Handle Hardware

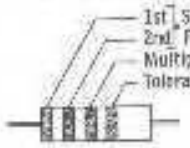
MISCELLANEOUS

P25-157	1	Instruction Manual



SCHEMATIC DIAGRAM — MODEL G-30 AND G-30PC RF SIGNAL GENERATOR

COLOR BAND SYSTEM



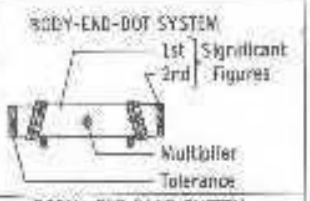
Resistors With Black Body Color Are Composition, Non-Insulated.
Resistors With Colored Bodies Are Composition, Insulated.
Wire Wound Resistors Have The 1st Digit Color Band Double Width.

RESISTOR CODES (RESISTANCE GIVEN IN OHMS)

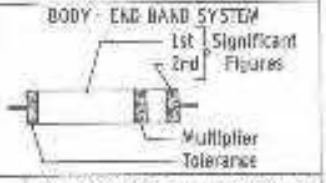
COLOR	DIGIT	MULTIPLIER	TOLERANCE
BLACK	0	1	±20%
BROWN	1	10	±1%
RED	2	100	±2%
ORANGE	3	1000	±3 % ONLY*
YELLOW	4	10000	±4% (RETMA Alternate)
GREEN	5	100000	±5%*
BLUE	6	1000000	±6 1/2%*
VIOLET	7	10000000	±10%,-
GRAY	8	.01 (RETMA Alternate)	±20% (RETMA Alternate)
WHITE	9	1 (RETMA Alternate)	±5% (JAN and RETMA Pref.)
GOLD		.1 (JAN and RETMA Preferred)	±10% (JAN and RETMA Pref.)
SILVER		.01 (JAN and RETMA Preferred)	±10%
NO COLOR			±20%

*"ONLY" = guaranteed minimum value, or -0 + 170% tolerance.
±3, 8, 12 1/2, and 25% are ABA 40, 20, 10, and 5 step tolerances.

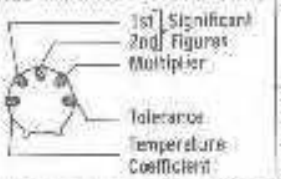
BODY-END-DOT SYSTEM



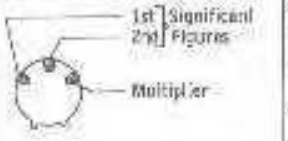
BODY-END-BAND SYSTEM



DISC CERAMICS (5-DOT SYSTEM)



DISC CERAMICS (3-DOT SYSTEM)



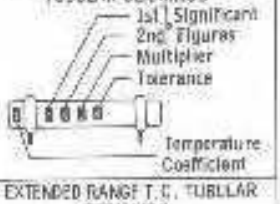
CERAMIC CAPACITOR CODES (CAPACITY GIVEN IN MMF)

COLOR	DIGIT	MULTIPLIER	TOLERANCE 10MMF or LESS	TOLERANCE OVER 10MMF	TEMPERATURE COEFFICIENT PPM/°C	EXTENDED RANGE TEMP. COEFF. SIGNIFICANT FIGURE	EXTENDED RANGE TEMP. COEFF. MULTIPLIER
BLACK	0	1	±1.0MMF	±20%	0±30	0.0	+1
BROWN	1	10	±0.1MMF	±1%	-33±30		-10
RED	2	100		±2%	-75±30	1.0	-100
ORANGE	3	1000		±2.5%	-150±30	1.5	-1000
YELLOW	4	10000			-220±30	2.2	-10000
GREEN	5		±0.5MMF	±5%	-330±30	3.3	+1
BLUE	6				-470±30	4.7	+10
VIOLET	7				-750±30	7.5	+100
GRAY	8	.01	±0.25MMF		-30±30		+1000
WHITE	9	.1	±1.0MMF	±10%	Other Temp. Coeff. for Special Purpose Bypass & Coupling		+10000
SILVER					-1000±60		
GOLD					+100		

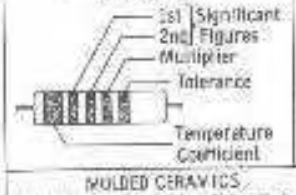
Ceramic capacitor voltage ratings are standard 500 volts for some manufacturers, 1000 volts or other manufacturers, unless otherwise specified.

HIGH CAPACITY TUBULAR CERAMICS INSULATED OR NON-INSULATED

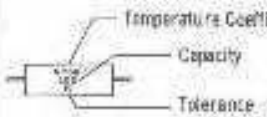
TEMPERATURE COMPENSATING TUBULAR CERAMICS



MOLDED INSULATED AXIAL LEAD CERAMICS

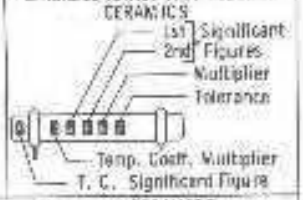


TYPOGRAPHICALLY MARKED CERAMICS



LETTER	TOLERANCES 10MMF or LESS	TOLERANCES OVER 10MMF
C	±0.25MMF	
D	±0.5MMF	
F	±1.0MMF	±1%
G	±2.0MMF	±2%
J		±5%
K		±10%
M		±20%

EXTENDED RANGE T.C. TUBULAR CERAMICS



MOLDED CERAMICS

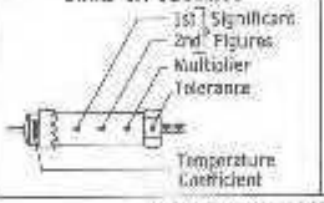
Using Standard Resistor Color Code

Distinguishes Capacitor From Resistor

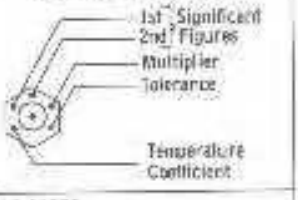
BUTTON CERAMICS

Viewed From Soldered Surface

STAND-OFF CERAMICS



FEED-THRU CERAMICS



MOLDED MICA CAPACITOR CODES

(Capacity Given In MMF)

COLOR	DIGIT	MULTIPLIER	TOLERANCE	CLASS OR CHARACTERISTIC
BLACK	0	1	±20%	A
BROWN	1	10	±1%	B
RED	2	100	±2%	C
ORANGE	3	1000	±3%	D
YELLOW	4	10000		E
GREEN	5		±5%(JAN)	F(JAN)
BLUE	6			G(JAN)
VIOLET	7			
GRAY	8			H(RETMA)
WHITE	9			J(RETMA)
GOLD		0.1	±5%(JAN)	
SILVER		.01	±10%	

Class or characteristic denotes specifications of design involving Q factors, temperature coefficients, and production test requirements.
All axial lead mica capacitors have a voltage rating of 300, 500, or 1000 volts. Tol. ±1.0 MMF, whichever is greater.

MOLDED PAPER CAPACITOR CODES

(Capacity Given In MMF)

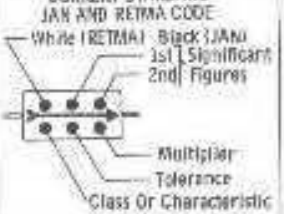
COLOR	DIGIT	MULTIPLIER	TOLERANCE
BLACK	0	1	20%
BROWN	1	10	
RED	2	100	
ORANGE	3	1000	
YELLOW	4	10000	
GREEN	5	100000	5%
BLUE	6	1000000	
VIOLET	7		
GRAY	8		
WHITE	9		10%
GOLD			5%
SILVER			10%
NO COLOR			20%

MOLDED PAPER TUBULAR

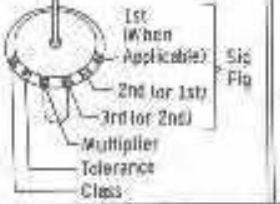
Indicates Outer Foil. May Be On Either End. May Also Be Indicated By Other Methods Such As Typographical Marking Or Black Stripe.

Add Two Zeros To Significant Voltage Figures. One Band Indicates Voltage Ratings Under 1000 Volts.

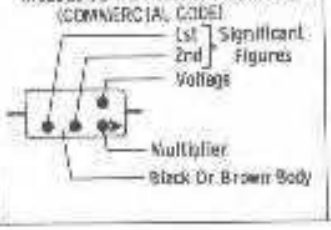
CURRENT STANDARD JAN AND RETMA CODE



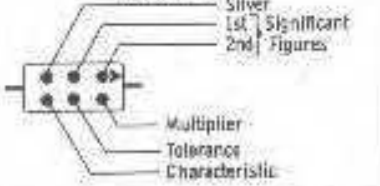
BUTTON SILVER MICA

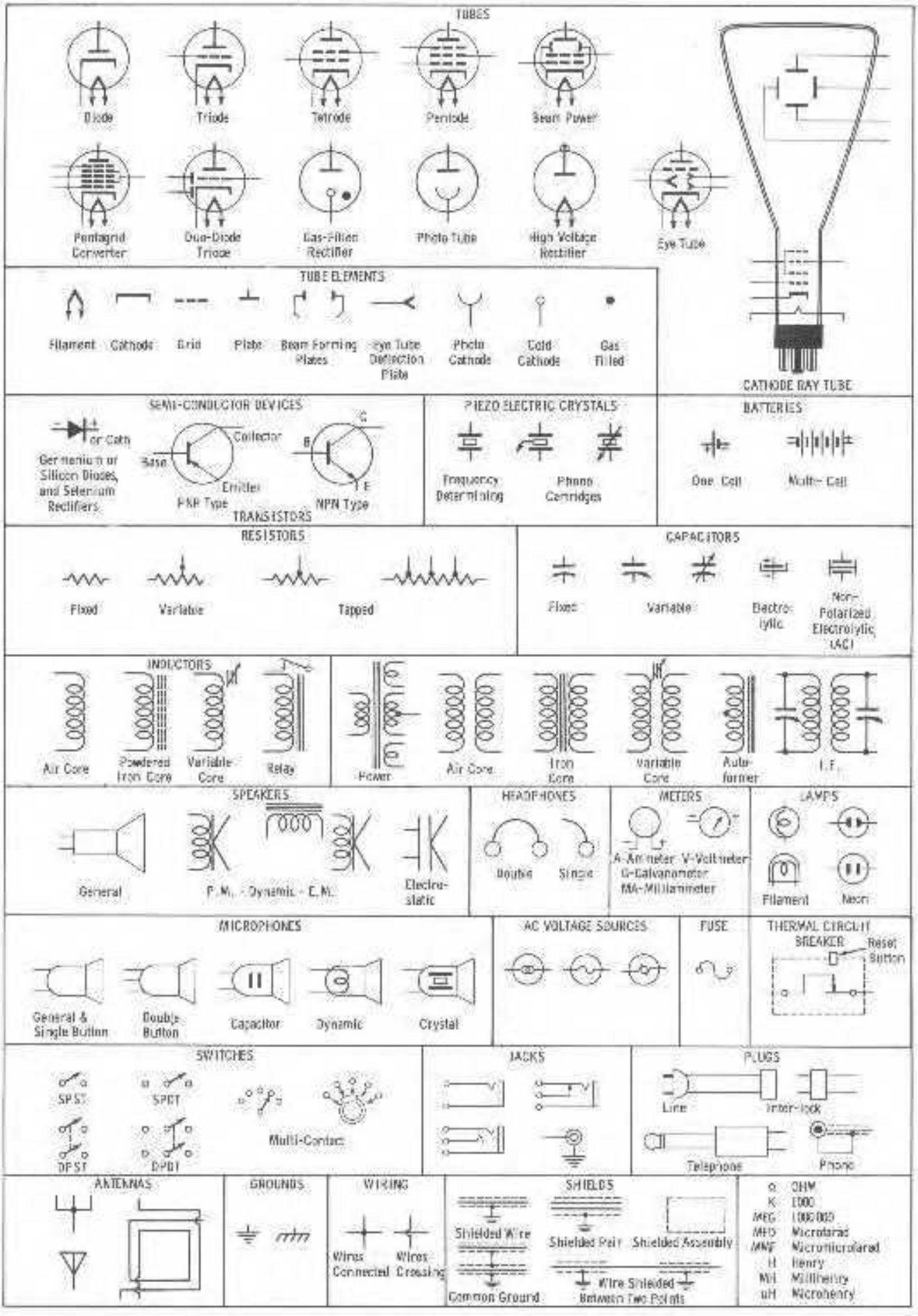


MOLDED FLAT PAPER CAPACITORS (COMMERCIAL CODE)



MOLDED FLAT PAPER CAPACITORS (JAN CODE)




TUBES
Diode
Triode
Tetrode
Pentode
Beam Power
Pentagrid Converter
Duo-Diode Triode
Gas-Filled Rectifier
Photo Tube
High Voltage Rectifier
Eye Tube
CATHODE RAY TUBE
TUBE ELEMENTS
Filament
Cathode
Grid
Plate
Beam Forming Plates
Eye Tube Deflection Plate
Photo Cathode
Cold Cathode
Gas Filled
SEMI-CONDUCTOR DEVICES
or Cath
Germanium or Silicon Diodes, and Selenium Rectifiers
Collector
Base
Emitter
PNP Type
NPN Type
TRANSISTORS
PIEZO ELECTRIC CRYSTALS
Frequency Determining
Phono Cartridges
BATTERIES
One Cell
Multi-Cell
RESISTORS
Fixed
Variable
Tapped
CAPACITORS
Fixed
Variable
Electro-lytic
Non-Polarized Electrolytic (AC)
INDUCTORS
Air Core
Powdered Iron Core
Variable Core
Relay
Power
Air Core
Iron Core
Variable Core
Auto-former
I.F.
SPEAKERS
General
P.M. - Dynamic - E.M.
Electro-static
HEADPHONES
Double
Single
METERS
A-Ammeter V-Voltmeter
G-Galvanometer
MA-Milliammeter
LAMPS
Filament
Neon
MICROPHONES
General & Single Button
Double Button
Capacitor
Dynamic
Crystal
AC VOLTAGE SOURCES
FUSE
THERMAL CIRCUIT BREAKER
Reset Button
SWITCHES
SPST
SPDT
DPST
DPDT
Multi-Contact
JACKS
PLUGS
Line
Inter-lock
Telephone
Phone
ANTENNAS
GROUNDS
WIRING
Wires Connected
Wires Crossing
SHIELDS
Shielded Wire
Shielded Pair
Shielded Assembly
Common Ground
Wire Shielded Between Two Points
Ω OHM
K 1000
MEG 1000000
MFD Microfarad
MMF Microfmicrofarad
H Henry
MH Millihenry
uH Microhenry

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PRINTED IN U. S. A.