PRICE $3.00

Assembling and Using Your...

heathkit

"CHEYENNE" MOBILE TRANSMITTER

MODEL MT-1

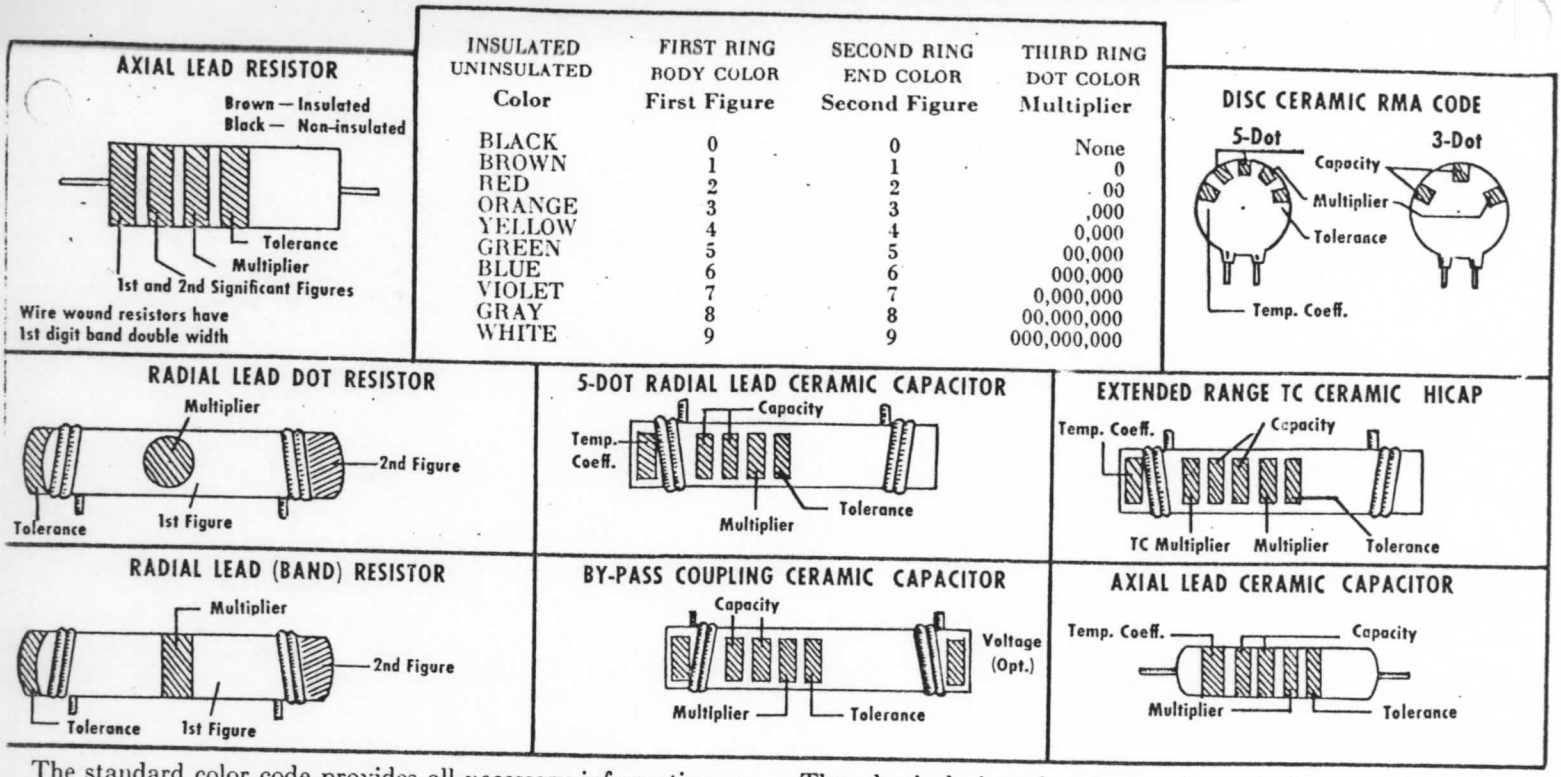
HEATH COMPANY

A Subsidiary of Daystrom Inc.

BENTON HARBOR, MICHIGAN

595-240

STANDARD COLOR CODE — RESISTORS AND CAPACITORS

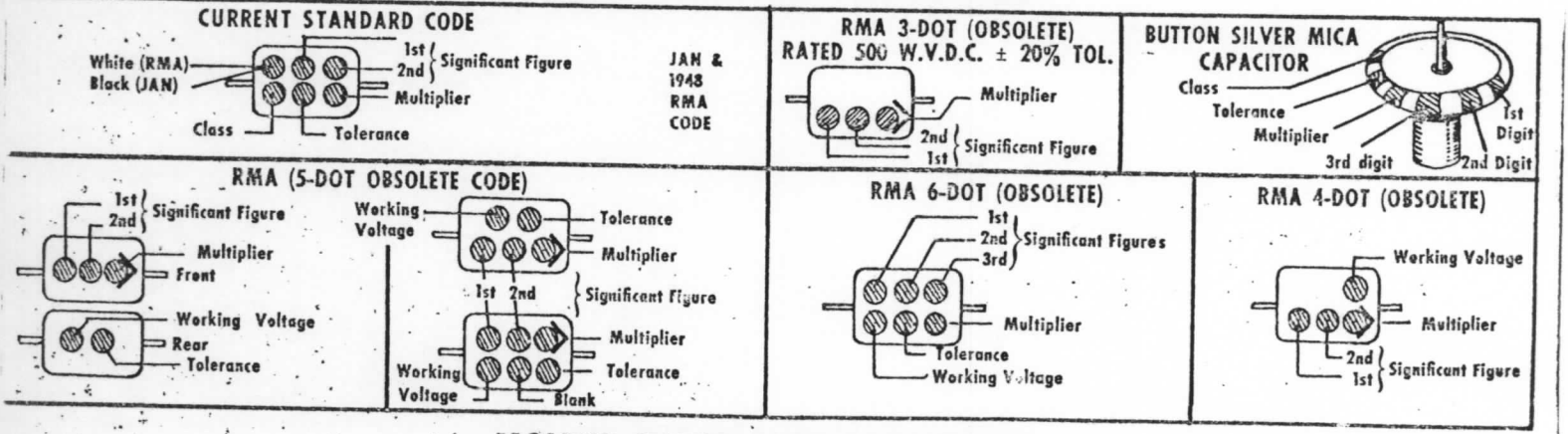


INSULATED UNINSULATED Color	FIRST RING BODY COLOR First Figure	SECOND RING END COLOR Second Figure	THIRD RING DOT COLOR Multiplier
BLACK	0	0	None
BROWN	1	1	0
RED	2	2	00
ORANGE	3	3	,000
YELLOW	4	4	0,000
GREEN	5	5	00,000
BLUE	6	6	000,000
VIOLET	7	7	0,000,000
GRAY	8	8	00,000,000
WHITE	9	9	000,000,000

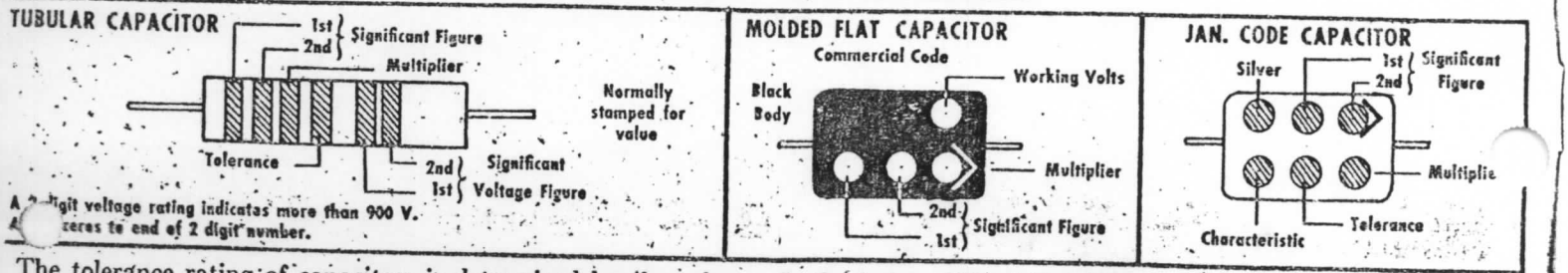
The standard color code provides all necessary information required to properly identify color coded resistors and capacitors. Refer to the color code for numerical values and the zeroes or multipliers assigned to the colors used. A fourth color band on resistors determines tolerance rating as follows: Gold = 5%, Silver = 10%. Absence of the fourth band indicates a 20% tolerance rating.

The physical size of carbon resistors is determined by their wattage rating. Carbon resistors most commonly used in Heathkits are ½ watt. Higher wattage rated resistors when specified are progressively larger in physical size. Small wire wound resistors ½ watt, 1 or 2 watt may be color coded but the first band will be double width.

MOLDED MICA TYPE CAPACITORS



MOLDED PAPER TYPE CAPACITORS

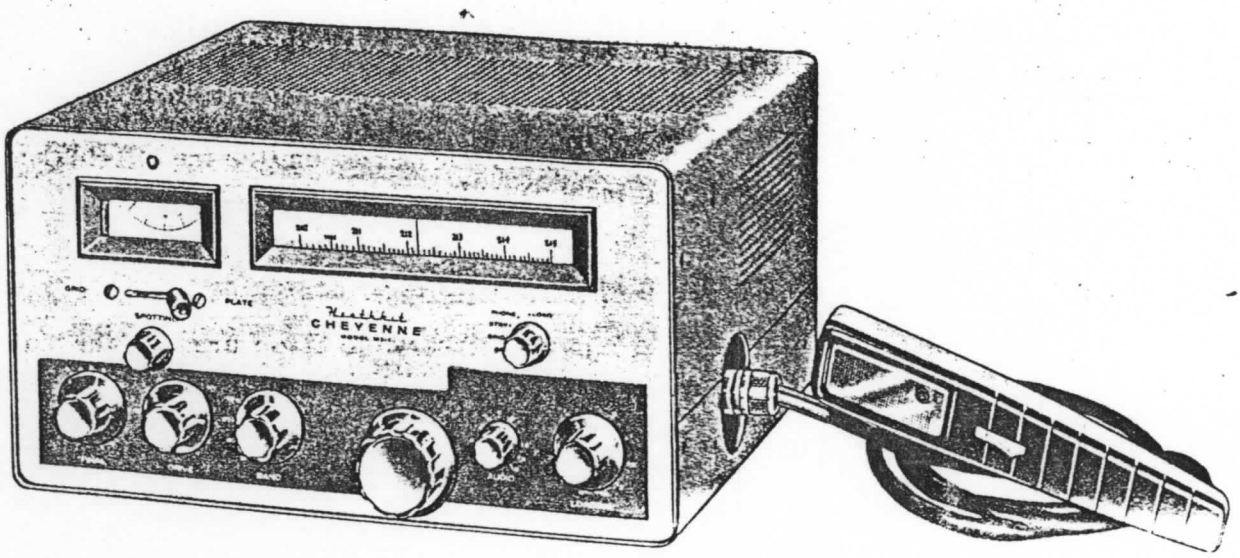


The tolerance rating of capacitors is determined by the color code. For example: red = 2%, green = 5%, etc. The voltage rating of capacitors is obtained by multiplying the color value

In the design of Heathkits, the temperature coefficient of ceramic or mica capacitors is not generally a critical factor and therefore Heathkit manuals avoid reference to temperature coeffi-

ASSEMBLY AND OPERATION OF THE HEATHKIT "CHEYENNE" MOBILE TRANSMITTER

MODEL MT-1



SPECIFICATIONS

Power Input:	90 watt peak carrier controlled phone and CW.
Output Impedance:	50 - 72 Ω.
Output Coupling:	Pi network (coaxial).
Band Coverage:	
80 Meter Band:	3.5 - 4.0 mc.
40 Meter Band:	7.0 - 7.3 mc.
20 Meter Band:	14.0 - 14.35 mc.
15 Meter Band:	21.0 - 21.5 mc.
10 Meter Band:	28.0 - 29.7 mc.
Panel Controls:	Meter Switch.
	Spotting Switch.
	Final Tuning.
	Drive Tuning.
	Band Switch.
	VFO Tuning.
	Audio (gain).
	Loading.
	Function Switch.
Tube Complement:	12AX7 Speech Amplifier.
	6DE7 Carrier Control Modulator.
	6AU6 VFO.
	6CL6 Buffer.
	5763 Driver.
	6146 Final Amplifier.
	OA2 Voltage Regulator.

Power Requirements:

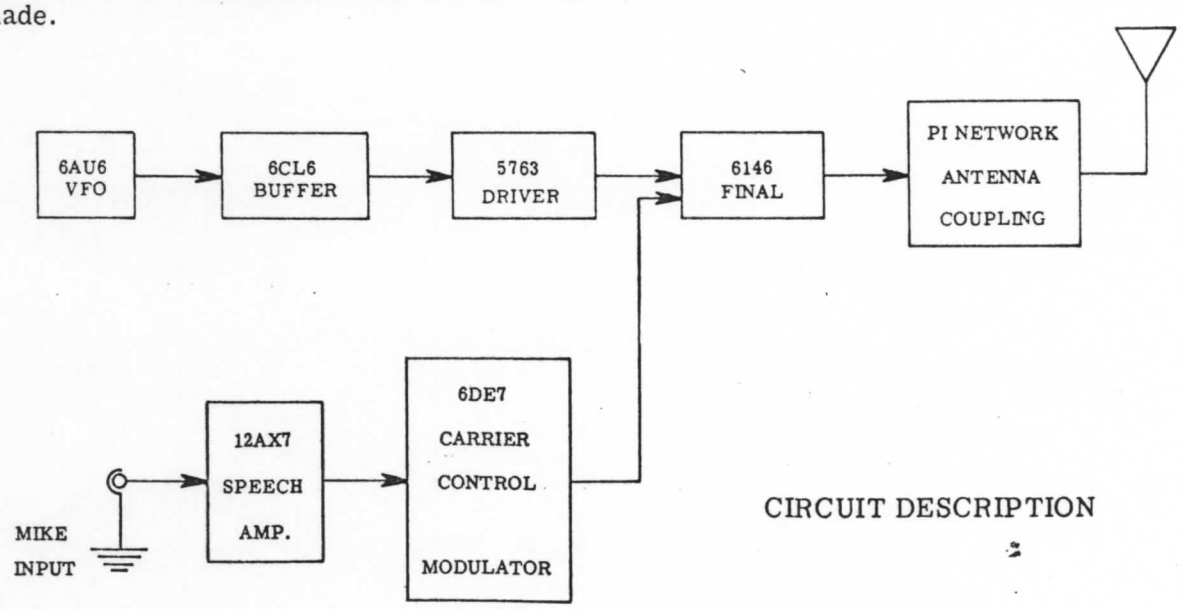
Filaments:	6.3 Volts at 4.7 amperes. 12.6 Volts at 2.35 amperes.
B+:	500-600 Volts DC at 150 ma. 300 Volts DC at 100 ma.
Cabinet Size:	6 1/8" high x 12 1/8" wide x 9 15/16" deep.
Net Weight:	15 1/2 lbs.
Shipping Weight:	19 lbs.

INTRODUCTION

The Heathkit MT-1 "Cheyenne" Transmitter was designed to provide maximum power capabilities in mobile operation consistent with minimum battery drain. This has been accomplished through the use of carrier control modulation and low drain circuitry. Power levels up to 90 watts input on modulation peaks are obtained. This is ample output to drive larger transmitters if used in fixed station operation. Other features include a stable, voltage-regulated VFO, VFO spotting switch and provision for CW operation. Designed as a companion unit for the MR-1 "Comanche" Receiver, the "Cheyenne" has an identical front panel layout and tuning mechanism.

The MT-1 consists of a 6AU6 VFO, a 6CL6 buffer, a 5763 driver and a 6146 final amplifier. The modulator utilizes two dual triodes: a 12AX7 and a 6DE7.

The following block diagram and circuit description will serve to better acquaint the builder with the operation of the Transmitter. This knowledge is an invaluable aid to construction and, as such, is well worth reading thoroughly. Lethal voltages are present at many points above and below the chassis, consequently, great care must be exercised when any tests or adjustments are made.



CIRCUIT DESCRIPTION

VFO

The VFO circuit consists of a 6AU6 tube operating as a Clapp oscillator in the frequency ranges of 1750 to 2000 kc, 7000 to 7175 kc, and 7000 to 7425 kc. The tube is mounted on top of the rigid enclosed chassis partition, thus placing all heat generating components outside the VFO enclosure. A double bearing ceramic insulated tuning capacitor is used as a frequency control. The VFO tuning capacitor, consisting of two stator assemblies of different capacities, permits a large bandspread at both high and low frequencies.

The coils are wound on heavy ceramic slug-tuned coil forms, heavily doped and baked. The result is a high Q coil upon which varying ambient conditions have a minimum effect. Careful placement of temperature compensating capacitors near the coils tends to cancel drift due to coil heating. In addition, a temperature compensating capacitor across the grid circuit of the tube, carefully positioned physically, provides additional compensation for other varying inductive parameters.

The VFO switch is operated by an interrupted switching mechanism on the band switch. VFO output frequency is correlated with the band in use as follows: 80 meters - 1750 to 2000 kc; 40 meters - 7000 to 7425 kc; 20 meters - 7000 to 7175 kc; 15 meters - 7000 to 7175 kc; and 10 meters - 7000 to 7425 kc. This unique switching system, coupled with the vernier slide rule full gear dial drive mechanism, provides more than adequate frequency spread on all bands.

The Clapp or series tuned Colpitts oscillator circuit presents a very low impedance to the tube grid at resonance. This minimizes the effect of shift in tube capacitance upon the output frequency. The capacitive voltage divider, necessary for operation of the Colpitts circuit, also lessens the effect of tube capacitance upon frequency. Both screen and plate voltages are stabilized by an OA2 regulator tube.

The untuned output circuit of the VFO operates at 80 meters when the 80-meter band is used and at 40 meters when all other bands are used. This circuit consists of the output coaxial cable capacitance, plus the RF choke in the VFO plate circuit. The VFO output thus obtained insures more than adequate drive on all bands. The output is fed to the 6CL6 buffer stage.

A 6CL6 tube is employed as a buffer stage to further isolate the oscillator and, at the same time, insure adequate drive even under low battery conditions. The plate circuit of the 6CL6 is untuned when operating 80 meters, slug-tuned to 40 meters for operation at 40, 20 and 15 meters, and slug-tuned to 20 meters when operating 10 meters. An untuned RF choke and the two slug-tuned coils are in series with the B+ lead to the 6CL6 plate. One section of the exciter band switch shorts out the coils not being used for a given band. The RF ground is provided by a large capacitor, since a direct ground would short the B+ lead. The output of the 6CL6 is capacitively coupled to the 5763 driver stage.

Driver

A 5763 tube is employed as a driver for the 6146 final amplifier. Pi network interstage coupling is used between the driver and the final amplifier, with the input capacitor of the pi section variable, and the output capacitor fixed. The pi section inductance is tapped and the proper tap for each band is selected by a section of the exciter band switch. The use of a pi network interstage coupling helps reduce the harmonic output of the Transmitter. The fixed output capacitor of the pi interstage coupling appears from grid to ground of the final amplifier and shorts out the higher frequency harmonics. The driver is keyed in the cathode circuit along with the final amplifier for CW operation.

Final Amplifier

The plate circuit of the final amplifier is shunt fed with a 2.5 mh RF choke and is capacity coupled into the pi network tank circuit. A tapped inductance is used for tuning all bands and the tap is selected by the band switch. In the 80-meter position, a 68 mmf 4 KV capacitor is automatically paralleled with the plate tuning capacitor. The loading capacitor consists of a three-gang, 450 mmf per section, variable capacitor with the sections in parallel.

Modulator

The 12AX7 tube is used as a high-gain two stage resistance-coupled speech amplifier. The output of the speech amplifier is coupled to the 6DE7 modulator tube through a low capacity coupling capacitor. This low coupling capacity serves in shaping the response to favor the voice frequencies, thus allowing a higher average level to be maintained at frequencies where it will be most effective.

The audio energy from the speech amplifier is coupled to the grid of one triode section of a 6DE7. This tube contains two dissimilar triode sections: one triode section is rated at 1.5 watts dissipation, and the other at 7 watts dissipation. The lower rated triode is used as a direct coupled driver, its plate being tied to the control grid of the heavier duty triode, which forms the modulator. The heavy duty triode is biased sufficiently to limit its conduction, and therefore

the screen voltage on the final 6146 amplifier. This results in a low resting carrier and, consequently, very low battery drain.

With modulation, the conduction of the heavy duty triode section is varied in accordance with the average voice level. This gives a controlled carrier effect by varying the screen voltage on the 6146 tube, and at the same time, the audio signal is superimposed. The net result is to produce a carrier output which increases with the percentage of modulation applied.

Microphones

Since mobile operation demands that properly shaped audio response be employed, a very carefully designed ceramic microphone is included with the MT-1 "Cheyenne" Mobile Transmitter. This is to insure very effective modulation with plenty of "punch". The microphone serves to suppress all but the upper middle range of the voice frequencies and the audio system, as described above, is designed around this response. If other microphones are used, it may be necessary to alter the circuit components and the modulator for best results. In any case, the microphone should be a high impedance type and preferably ceramic, since crystal or carbon microphones can be damaged by the hot sun to which they are often subjected in mobile operation.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. While the arrangement shown is probably not the only satisfactory arrangement, nevertheless it is the result of extensive experimentation and trial. If followed carefully, it will result in a stable instrument, operating at a high degree of accuracy and dependability. We suggest that you retain the manual in your files for future reference, both in the use of the instrument and for its maintenance.

UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with them. Refer to the charts and other information shown on the inside covers of your manual to help you identify the components. If some shortage is found in checking the parts, please notify us promptly and return the inspection slip with your letter to us. Hardware items are counted by weight and if a few are missing, please obtain them locally if at all possible.

In order to expedite delivery to you, we are occasionally forced to make minor substitution of parts. Such substitutions are carefully checked before they are approved and parts supplied will work satisfactorily. In checking the Parts List for resistors, for example, you may find that a resistor with a 5% tolerance has been substituted for a resistor with a 10% tolerance, as shown on the Parts List. These changes are self-evident and are mentioned here only to prevent confusion in checking the contents of your kit.

Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -50% are common for electrolytic capacitors.

PROPER SOLDERING TECHNIQUES

Only a small percentage of Heathkit purchasers find it necessary to return an instrument for factory service. Of these kits, by far the largest proportion of malfunctions are due to poor or improper soldering.

Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For wiring in this kit, a 75 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat all the multiple connections and ground connections enough to flow the solder smoothly over the joints. Keep the iron tip clean and bright by wiping it from time to time with a piece of cloth.

SOLDERING PROCEDURE

1. If the connection is to be made with hookup wire, strip 5/16" of insulation from the end to be connected, unless otherwise directed.

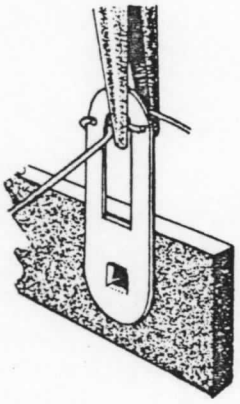
2. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the wire is too large to allow bending, position the wire so that a good solder connection can still be made.

3. Position the work, if possible, so that gravity will help to keep the solder where you want it.

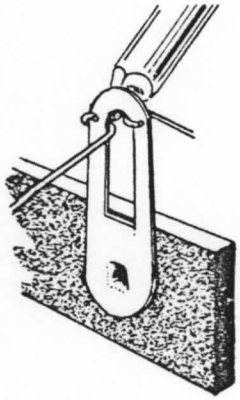
4. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

5. Then place the solder against the heated terminal, using only enough solder to cover the junction, and it will immediately flow over the joint; it is usually not necessary to fill the entire hole in the terminal with solder.

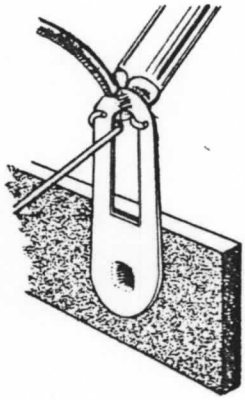
6. Remove the solder and then the iron from the completed junction. Use care not to move the leads until the solder is solidified.



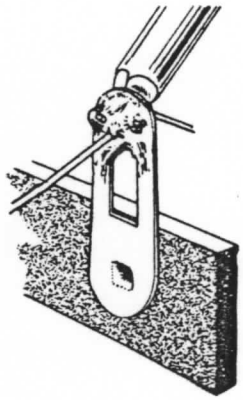
CRIMP WIRES



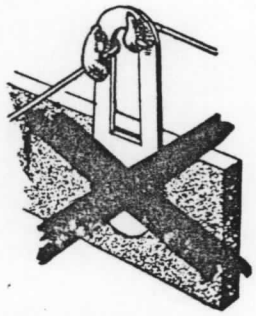
HEAT CONNECTION



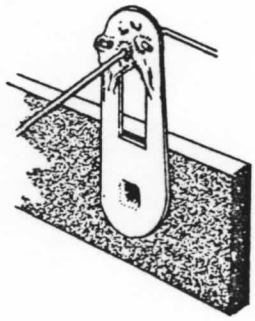
APPLY SOLDER



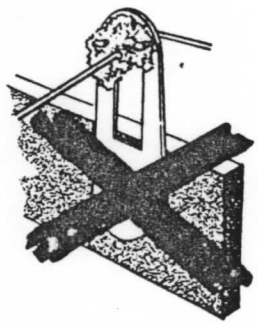
ALLOW SOLDER TO FLOW



COLD SOLDER JOINT CONNECTION MOVED WHILE COOLING



PROPER SOLDER CONNECTION



COLD SOLDER JOINT CONNECTION INSUFFICIENTLY HEATED

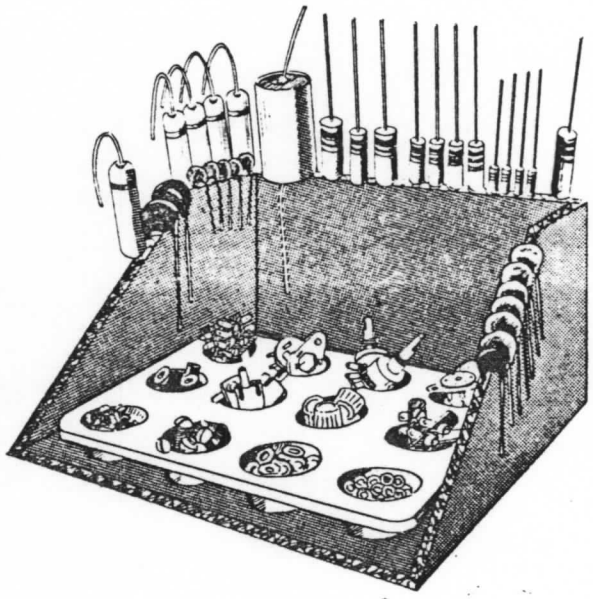
A poor or cold solder joint will usually look crystalline and have a grainy texture, or will stand up in a blob, and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly over the entire junction. In some cases, it may be necessary to add a little more solder to achieve a smooth, bright appearance.

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

We suggest that you do the following before work is started:

1. Attach the large fold-in pictorials to the wall above your work bench.
2. Go through the entire assembly and wiring instructions to familiarize yourself with the procedures.
3. Lay out all parts so they are readily available.

Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends stuck in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.



STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted.

The abbreviation "NS" indicates that a connection should not be soldered as yet because other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that should be connected to the terminal before it is soldered. For example, if the instruction reads, "Connect one lead of a 47 KΩ resistor to lug 1 (S-2)", it will be understood that there should be two leads connected to the terminal at the time it is soldered. This additional check will help avoid errors.

STEP-BY-STEP ASSEMBLY

Assembly of the Dial Mechanism

Extreme care should be taken in the assembly and adjustment of the dial mechanism. It will be difficult to readjust the mechanism once the MT-1 Transmitter is completed. Judicious effort at this time will result in a great deal of operating pleasure later and will result in a precise tuning mechanism of which the kit builder may be justifiably proud.

( ) Locate and identify the main dial plate (#100-M212) with two Oilite bushings and slotted holes in the bottom portion. Orient with the flange side of the bushings toward you. See Figure 1 on page 8 for detailed illustration.

( ) Place a dial plate spacer (#255-16) in each hole at locations #14 and #18, securing from the back with a 6-32 x 1/4" BHMS, #6 lockwasher and #6 large flat washer.

( ) Locate the top plate bracket (#204-M213). With the main dial plate oriented as before, mount this bracket behind the main dial plate, large flange up, using 6-32 x 3/8" BHMS in holes #3, #4, #16 and #20, with #6 lockwashers and 6-32 nuts on the rear of the dial plate. Center the screws in these slotted holes until final shaft alignment.

( ) Locate the 7-14 mmf dual variable tuning capacitor (#26-43). This is the capacitor with one stator plate on one side and two stator plates on the opposite side. The section with the larger number of stator plates is the 14 mmf section. Bend the solder lugs toward the rear of the capacitor. Leave the rotor solder lug in its vertical position. NOTE: Keeping the plates of this capacitor fully meshed while mounting will prevent damage to the unit.

( ) Place a 3/8" control nut and a 3/8" lockwasher on the capacitor shaft and, mounting from the rear through hole #12 on the main dial plate, secure with a second 3/8" control nut from the front. Position so that the 7 mmf section (one stator plate) is toward the bottom of the tuning mechanism. Tighten securely.

( ) Locate the antibacklash gear (#451-16) and insert an 8-32 x 1/4" Allen head setscrew in the bushing. Mount this gear on the capacitor shaft riding lightly on the bushing flange with the gear bushing toward the front and tighten the setscrew.

( ) Locate the pointer drive pulley shaft assembly (#100-202) (the one with the largest gear attached).

( ) Locate the small individual tuning drive gear (#451-15) and insert an 8-32 x 1/8" setscrew in the bushing. Slide this gear on the pointer drive pulley shaft assembly, with the bushing facing the bushing of the large gear, and spaced 1/4" from the shaft end. Tighten the setscrew temporarily. Place a 1/2" spring washer over the shaft end adjacent to the large gear.

( ) Place the pointer drive pulley shaft assembly, small gear first, in hole #6. Move the bottom half of the antibacklash gear two full teeth forward, then slide the small tuning drive gear down so that it is resting on the bushing flange. This gear should now be in full mesh with the antibacklash gear, with spring tension between the two.

( ) Slide the cluster gear pivot shaft (#453-78) through the nylon cluster gear (#451-12) with the short ball at the end opposite the gears. Place this end in hole #11. The small gear should now be in mesh with the large gear.

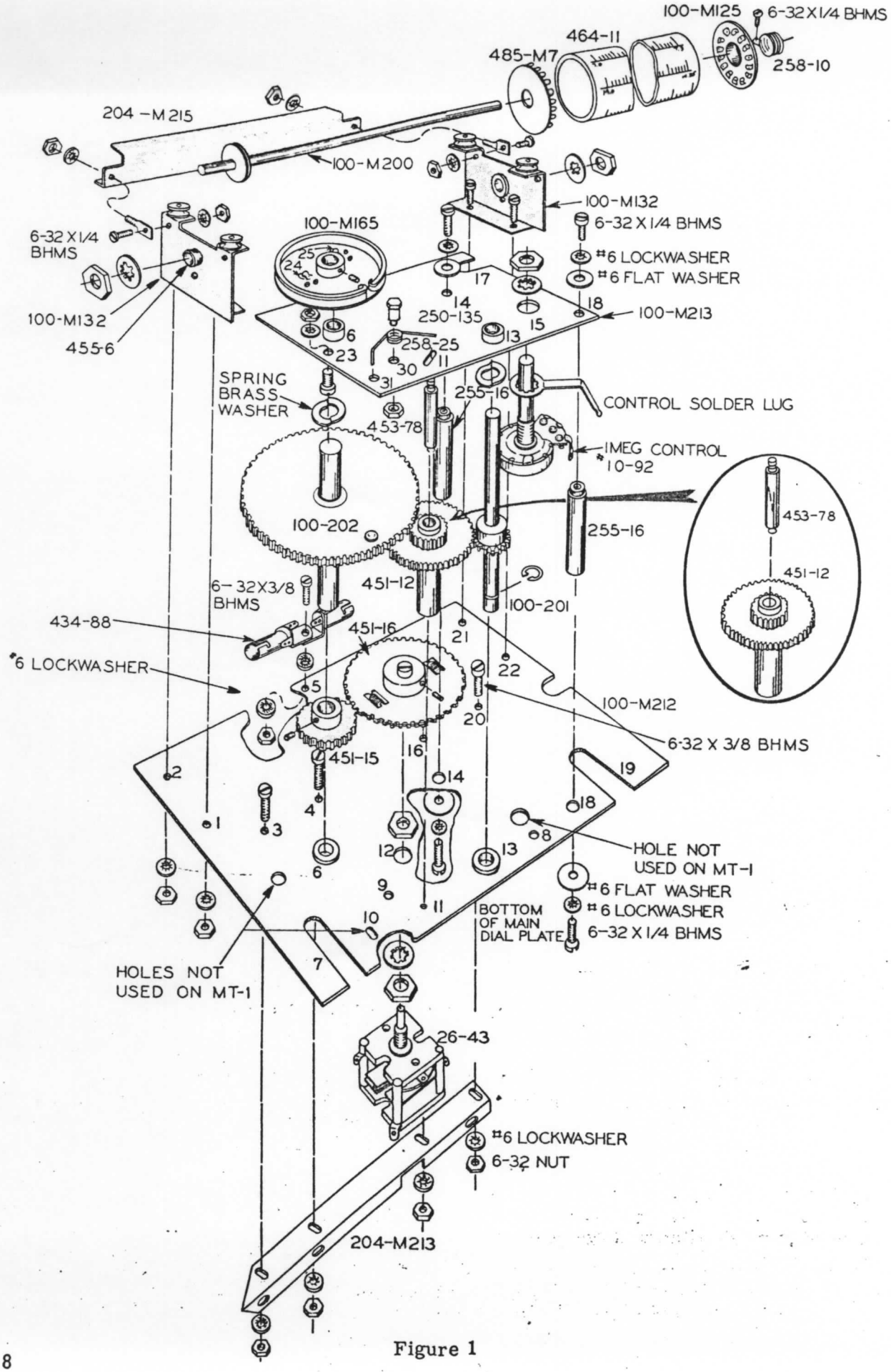

100-M125
6-32 X 1/4 BHMS
464-11
485-M7
258-10
204 -M 215
100-M200
100-M132
6-32 X 1/4 BHMS
100-M165
#6 LOCKWASHER
#6 FLAT WASHER
6-32 X 1/4 BHMS
100-M132
455-6
250-135
100-M213
258-25
SPRING BRASS WASHER
255-16
CONTROL SOLDER LUG
453-78
IMEG CONTROL #10-92
100-202
255-16
453-78
451-12
6-32 X 3/8 BHMS
451-12
100-201
434-88
451-16
#6 LOCKWASHER
100-M212
6-32 X 3/8 BHMS
451-15
HOLE NOT USED ON MT-1
#6 FLAT WASHER
#6 LOCKWASHER
6-32 X 1/4 BHMS
BOTTOM OF MAIN DIAL PLATE
HOLES NOT USED ON MT-1
26-43
#6 LOCKWASHER
6-32 NUT
204-M213

Figure 1

( ) Locate the pinion gear shaft assembly (#100-201, small gear and shaft with groove at one end). Place an E retaining ring in the groove and mount at hole #13, with the E ring against the bushing flange. Note that this gear now meshes with the nylon gear. Now place a 1/2" spring washer over the other end of this shaft.

( ) Locate the front dial plate (#100-M213). Place a 6-32 x 3/16" fillister head machine screw in hole #23, from the Oilite bushing flange side, and fasten with a #6 lockwasher and 6-32 nut on the opposite side.

( ) Locate the cluster gear tension spring (#258-25), 5-40 hex shoulder screw (#250-135) and 5-40 nut. Now place the spring on the screw shoulder with the bent portion pointing away from the screw head.

( ) Place the screw through hole #30 in the front dial plate, at which time the spring end will project through hole #31.

( ) Now secure this hex shoulder screw and spring, fastening with the small 5-40 nut from the rear of the front dial plate. At this time, bend the projecting spring length at hole #31 so that it points away from the large gear on assembly (#100-202).

( ) Locate the 1 megohm audio gain control (#10-92) and mount in hole #15 on the Oilite bushing flange side of the front dial plate. Use a control solder lug between the control bushing and the plate and secure on the opposite side with a 3/8" control nut. Orient this control as shown.

( ) Orient the front dial plate with the bushing flanges down so that holes #6, #13, #14 and #18 correspond to the same holes on the main dial plate. Slide the plate over the shafts at holes #6 and #14, making certain that the plate seats firmly in the spacers at holes #14 and #18. Fasten the plate to the spacers with 6-32 x 1/4" BHMS, #6 lockwashers and #6 large flat washers, at holes #14 and #18.

( ) At slotted hole #11, the grooved end of the cluster gear pivot shaft will project. The free end of the cluster gear tension spring fits in this groove and provides sufficient tension to maintain firm mesh with the other gears. Care should be exercised not to bend this spring end.

( ) Now, using pliers, place the tension spring end in the cluster gear pivot shaft groove opposite to the main tuning shaft (#100-201).

( ) With this shaft rotated fully counterclockwise against the stops, loosen the #451-15 tuning drive gear setscrew and, being careful to maintain the tension on the antibacklash gear, close the plates of the tuning capacitor to full mesh. Now, permanently tighten the Allen head setscrew.

( ) Locate the pointer drive pulley assembly (#100-M165) and insert an 8-32 x 1/4" Allen head setscrew in the bushing. Place this assembly on the dial drum drive pulley shaft at hole #6 so that the rear of the pulley bushing rides lightly on the neck of the Oilite bushing in the front dial plate. Secure to the shaft with the pulley rim opening down when the shaft is in full counterclockwise position by tightening the setscrew.

( ) Locate the two dial drum support bracket assemblies (#100-M132). Insert in both a 1/4" shaft bushing from the bracket flange side, placing a 3/8" control lockwasher and nut on the outside. Tighten securely.

( ) Using 6-32 x 3/8" BHMS, secure one bracket at holes #21 and #22 with flanges toward the center of the assembly. Note that this bracket is positioned to the extreme right. Fasten with #6 lockwashers and 6-32 nuts on the rear of the main plate. Do not tighten excessively.

( ) Locate two pilot light sockets (#434-88) and bend the solder lugs on each to run parallel with the bracket foot, but in opposite directions. Refer to Figure 1 for detailed illustration.

( ) Using a 6-32 x 3/8" BHMS through both mounting feet with a #6 lockwasher under the feet, mount these pilot light sockets at hole #5. Fasten securely from the rear of the main plate with a #6 lockwasher and a 6-32 nut. Notice that the brackets will be facing in opposite directions.

( ) Locate the dial drum plug button assembly (#100-M125, plug with bushing attached) and the dial drum (#464-11). Place the plug button firmly in the right end of the dial drum (end with the highest frequency reading). Make sure the button fits the drum firmly. If the button fingers fit too loose, carefully spread them to provide a firm internal fit.

( ) Locate the coil spring (#258-10) and, using a 6-32 x 1/4" BHMS, place this screw first through the loop in the spring, then into the setscrew hole in the plug button bushing.

( ) Locate the dial drum plug button (#485-M7, button with hole only) and plug firmly into the left end of the dial drum (end with the low frequency reading).

( ) Locate the dial drum shaft assembly (#100-M200, shaft with pulley attached) and slide the long end first through the left end plug button, through the dial drum and then through the right end plug button (button with bushing). Do not tighten as yet.

( ) Now locate the other dial drum support bracket (#100-M132) in which bushing has previously been inserted and, placing this support bracket assembly with flanges toward the center of the main dial plate on the drum shaft, slide the drum and bracket so that the coil spring engages the small hole in the right hand support bracket nearest the shaft and the right end of the shaft fits through the bushing in the right hand bracket.

( ) Now, using 6-32 x 3/8" BHMS at holes #1 and #2, fasten the left hand support bracket to the main dial plate with #6 lockwashers and 6-32 nuts from the rear of the main plate. Position the left hand support bracket to the right as far as possible. Check to make sure the dial drum is parallel with the top edge of the main dial plate and the shaft rotates freely. Slight vertical adjustment is available by moving the brackets up or down. When in a satisfactory position, fasten securely.

( ) Now bend the end of the coil spring into a hook with the bent end running opposite in direction to that which it enters the hole, forming a "U" shape.

( ) At this time, move the dial drum shaft with pulley to the left end so that the pulley is resting on the bushing flange, then move the drum and the right end plug button to the right so that the plug button bushing rides against the right hand support bracket bushing. The drum should rotate freely, but should have no excess movement which will interfere laterally with the calibration of the VFO.

( ) Tighten the setscrew in the right end plug button bushing at this time.

( ) At the top of each support bracket there is a 5/32" hole. From the outside edge of each bracket mount a spade lug, using 6-32 x 1/4" BHMS through the spade lug and bracket, and secure on the inside of the bracket with #6 lockwashers and 6-32 nuts. Tighten securely.

( ) Locate the dial pointer bracket (#204-M215) and place it on top of the spade lugs just mounted, flanges up. Secure the bracket with #6 lockwashers and 6-32 nuts at each end. Check the dial drum at this point to be sure no binding action is present. Slight changes of position in the support brackets will bring realignment of the dial drum, if necessary.

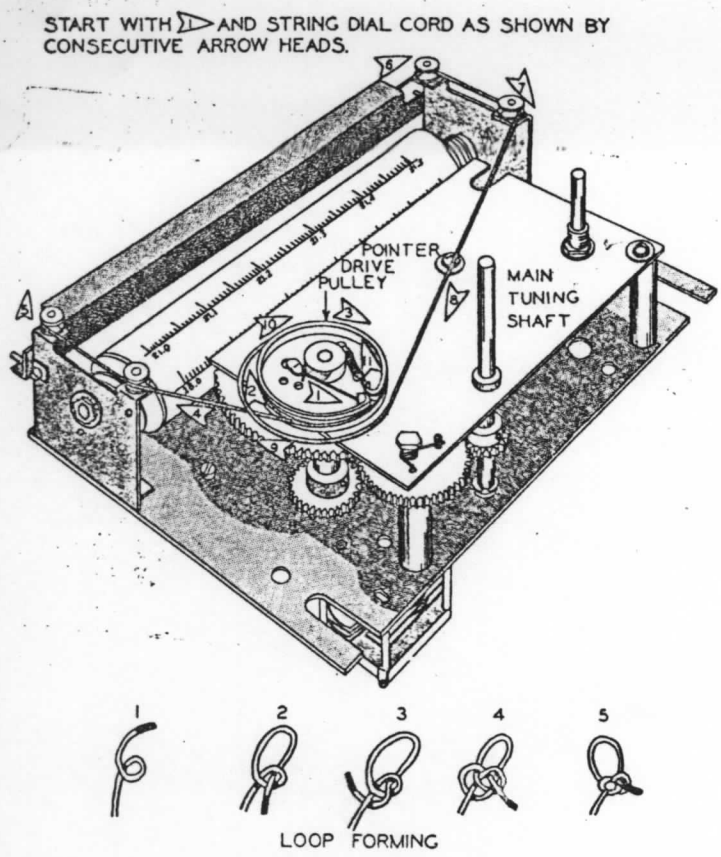


Figure 2

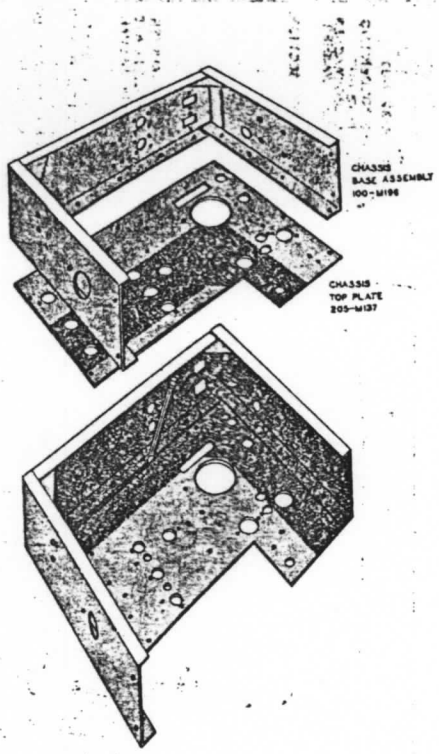


Figure 3

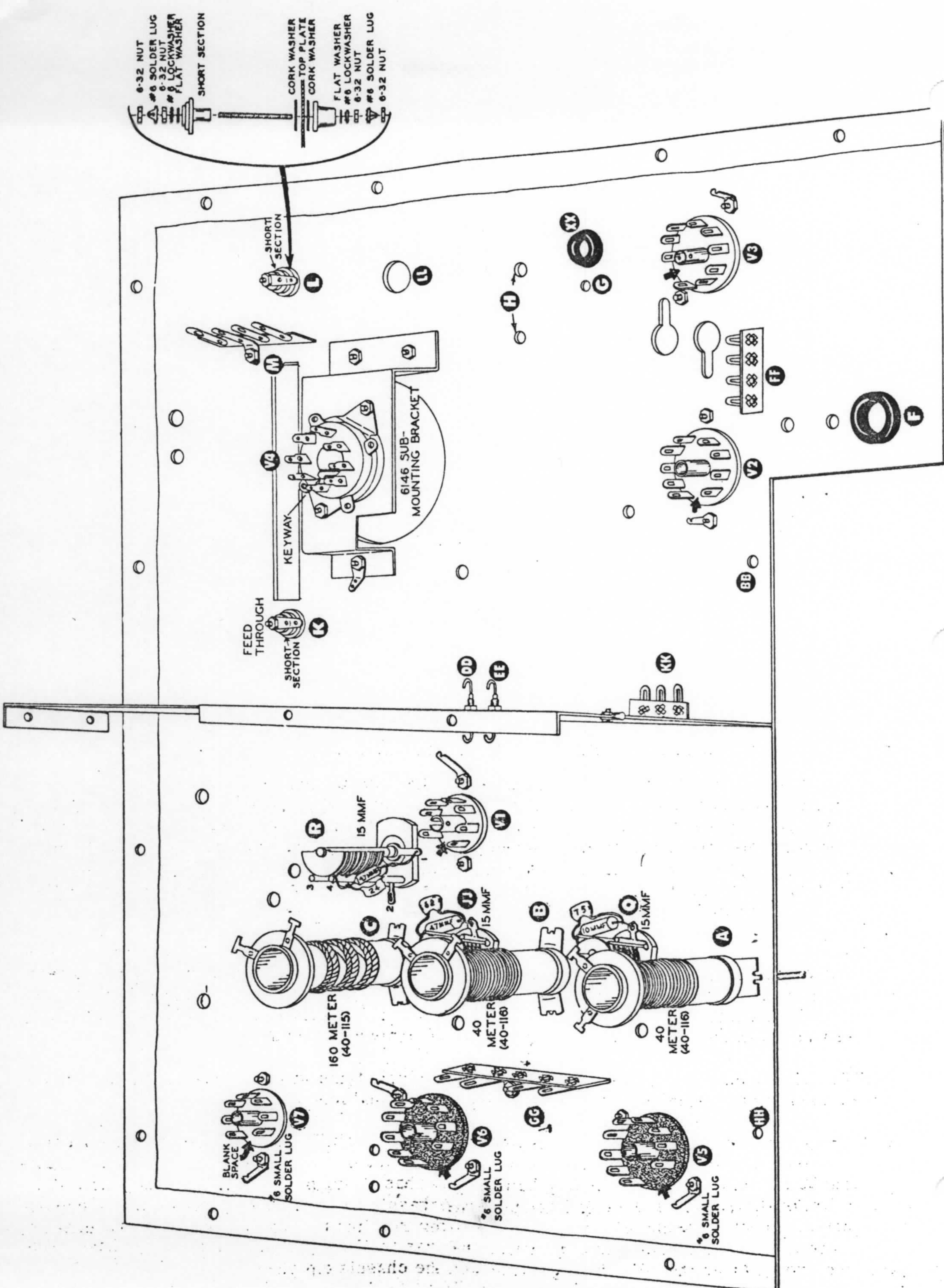
NOTE: See Figure 2 for the dial cord stringing operation and position the tuning assembly in front of you, dial drum up, with main tuning shaft set full counterclockwise. In this position, the opening in the pointer drive pulley should be at the bottom.

( ) Using the full length of dial cord supplied, make a small secure loop (see Figure 2 insert on the forming of this loop) in one end and place over the left hand hook on the drive pulley. Now, pass the cord through the opening in the pulley rim and, proceeding to the left, make one complete turn in a clockwise direction around the pulley; pass the cord up around the small pulleys following the arrows as marked; then, route the cord directly down to the bottom of the pulley past the rim opening, making one more turn in a clockwise direction back to the pulley rim opening.

( ) Locate the dial cord spring and place one end over the other pulley hook, then pass the free end of the dial cord through the other end of the spring. Pull the cord tight enough to stretch the spring about 1/4" and secure the cord to the spring with several overhand knots, then cut off and save the balance of the cord for use on the drum rotating pulley, the stringing of which will be performed later. Set this assembly aside temporarily.

NOTE: When mounting small #6 solder lugs or terminal strips without serrations a lockwasher should be placed on each side of the solder lug or terminal foot.

( ) Refer to Figure 3 and locate the chassis top plate (#205-M137) and the chassis base assembly (#100-M196). Place the chassis base into its proper position with the side containing mounting holes in line with the mounting holes in the chassis top plate. Now, using a pencil, draw a line on the top plate and along the edge of the chassis base. In placing the following components, do not allow any of them to extend over this line toward the outside of the chassis, since this would interfere with mounting the base to the top plate. Now set the base aside and proceed with the following operations on the chassis top plate.


6-32 NUT
#6 SOLDER LUG
6-32 NUT
#6 LOCKWASHER
FLAT WASHER
SHORT SECTION
CORK WASHER
TOP PLATE
CORK WASHER
FLAT WASHER
#6 LOCKWASHER
6-32 NUT
#6 SOLDER LUG
6-32 NUT
SHORT SECTION
L
LL
M
H
G
XX
V3
FF
F
V4
6146 SUB-MOUNTING BRACKET
KEYWAY
V2
BB
FEED THROUGH
SHORT SECTION
K
DD
EE
KK
R
15 MMF
V1
JJ
15 MMF
B
15 MMF
G
A
160 METER (40-115)
40 METER (40-116)
40 METER (40-116)
V7
BLANK SPACE
#6 SMALL SOLDER LUG
V6
#6 SMALL SOLDER LUG
GG
V5
#6 SMALL SOLDER LUG
HH

Pictorial 1

Refer to Pictorial 1 for the following steps:

( ) Mount a 7-pin ceramic shield socket at location V1. Use 3-48 x 1/4" PHMS, 3-48 nuts and #3 lockwashers. Include a small #6 solder lug under the nut nearest the center of the top plate and position as shown.

( ) Mount a 9-pin ceramic shield socket at location V2. Fasten with 3-48 hardware, position as shown, and include a small #6 solder lug under the nut nearest the center of the top plate with #3 lockwashers over and under the lug.

( ) Mount a 9-pin ceramic shield socket at location V3. Include a small #6 solder lug under the nut nearest the chassis edge; bend up and position as shown.

( ) Mount a 9-pin molded black Bakelite shield socket at location V5. Include a small #6 solder lug under the nut nearest the chassis edge; bend up and position as shown.

( ) Mount another 9-pin molded black Bakelite shield socket at location V6 and include a small #6 solder lug under both nuts; bend up both solder lugs and position as shown.

( ) Mount a 7-pin ceramic shield socket at location V7 and include a small #6 solder lug under the nut nearest the chassis edge; bend up and position as shown.

( ) Locate the 6146 submounting bracket (#204-M217) and mount the mica octal socket on it, using 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nuts. Refer to Figure 4, and position as shown.

( ) Mount the socket and bracket assembly at location V4, as shown in Pictorial 1, using 6-32 x 1/4" BHMS. Include a #6 solder lug under the nut nearest the center of the chassis and #6 lockwashers over the other two screws. Secure with 6-32 nuts.

( ) Locate the chassis center section (#200-M203). Refer to Figure 5 and mount three spade screws on the two straight sides as shown. Use 6-32 x 1/4" hardware with #6 lockwashers under the nuts, and a 3-lug, center terminal ground, terminal strip under the nut at KK. Clip off 1/16" of the mounting foot on this terminal strip before mounting. Tighten securely.

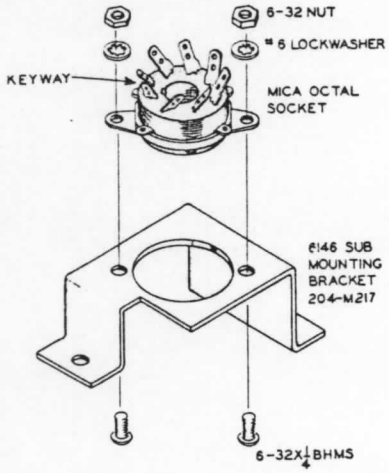


Figure 4

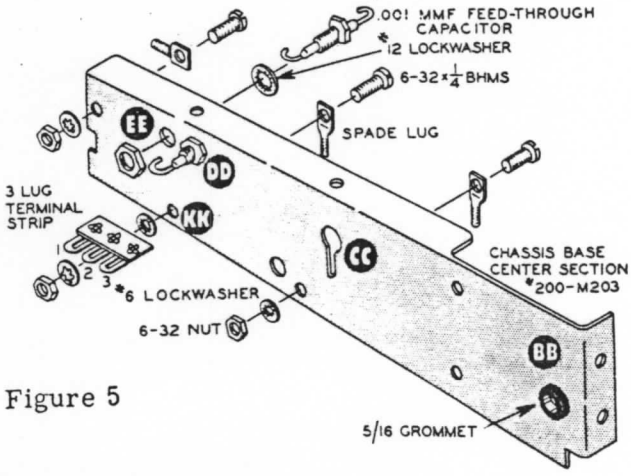


Figure 5

( ) Locate the two .001 mmf feed-through capacitors (brown-black-red) and mount them at locations DD and EE using a #12 lockwasher under the mounting flanges. Note that they are mounted on the center partition and inserted through the side with the flange on it. Position as shown and use care when tightening these capacitors.

( ) Insert a 5/16" grommet at hole BB.

( ) Refer to Pictorial 1 and mount the chassis center section between V1 and V4. Secure from the chassis top with 6-32 nuts and #6 lockwashers on the spade lugs.

( ) Using a 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nut, mount a 4-lug #2 ground terminal strip at location M. Position as shown, using a lockwasher on each side of the mounting foot, as explained in the NOTE on page 11.

( ) Mount a 4-lug, #3 ground, terminal strip at location FF using a 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nut. Position as shown.

( ) Mount a 4-lug, no ground, terminal strip at location GG using a 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nut.

( ) Mount the 160-meter VFO coil (#40-115) at location C. Press the cap into the mounting hole until the small tabs snap over the hole on the top of the chassis top plate. Position as shown, with the locating lug toward the outer edge of the chassis top plate and centered in the locating slot.

( ) In the same manner, mount the two (#40-116) 40-meter VFO coils at locations A and B. Position as shown.

( ) Mount the two feed-through insulators (#71-2) at locations K and L with the longest section above the chassis. Orient the solder lugs above chassis to the rear of the unit. Include hardware on both ends of each insulator as shown in Pictorial 1 insert.

( ) Install a 3/8" grommet at location F.
( ) Install a 5/16" grommet at location XX.

NOTE: Due to the extreme compactness of this kit, it is imperative that all parts be placed as shown. When connecting resistors, capacitors, chokes, etc., be sure that you have cut the leads to the absolute shortest possible length necessary to reach the connection. However, if leads approach 1/4", solder quickly to avoid heat damage to the component. Do not allow any of these components to extend outside of the line previously drawn on the chassis top plate; bear in mind that many places will be difficult to reach later. Check and double check all wiring against the Step-By-Step and the Pictorials.

( ) Carefully wrap the leads of a 75 mmf 5% silver mica capacitor around the leads of a 10 mmf N750 capacitor. Position them so that their values can be easily read without having to turn either one. See Figure 6A. Now solder both connections. Keep the leads of the 75 mmf capacitor as short as possible.

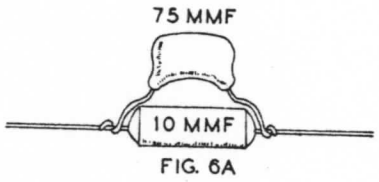


FIG. 6A

15 MMF VARIABLE CAPACITORS #26-44

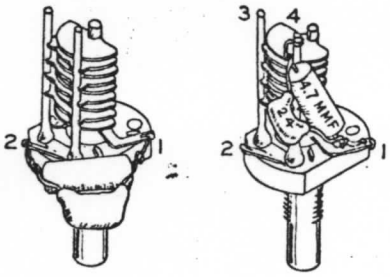


FIG. 6B FIG. 6C

Figure 6

( ) Locate the three 15 mmf variable capacitors (#26-44) and connect the above combination from lug 1 to lug 2 of one of the variable capacitors. Position them so that both values can be read from the rear of the 15 mmf variable, as in Figure 6B. Solder lug 2 only. Now mount the assembly at location Q as shown in Pictorial 1 and Figure 7.

( ) In the same manner wrap the leads of a 62 mmf 5% silver mica capacitor around the leads of a 4.7 mmf N750 capacitor and solder both connections, then, using the same procedure, connect the combination between lug 1 and lug 2 of another 15 mmf variable capacitor as in Figure 6B. Solder lug 2 only. Now mount the assembly at location JJ.

( ) Again, wrap the leads of a 24 mmf 5% silver mica capacitor around the leads of another 4.7 mmf N750 capacitor and solder both connections. See Figure 6C. Connect this combination between lug 1 and lug 4 on the third 15 mmf variable capacitor. Solder lug 4 only. Now mount the assembly at location R.

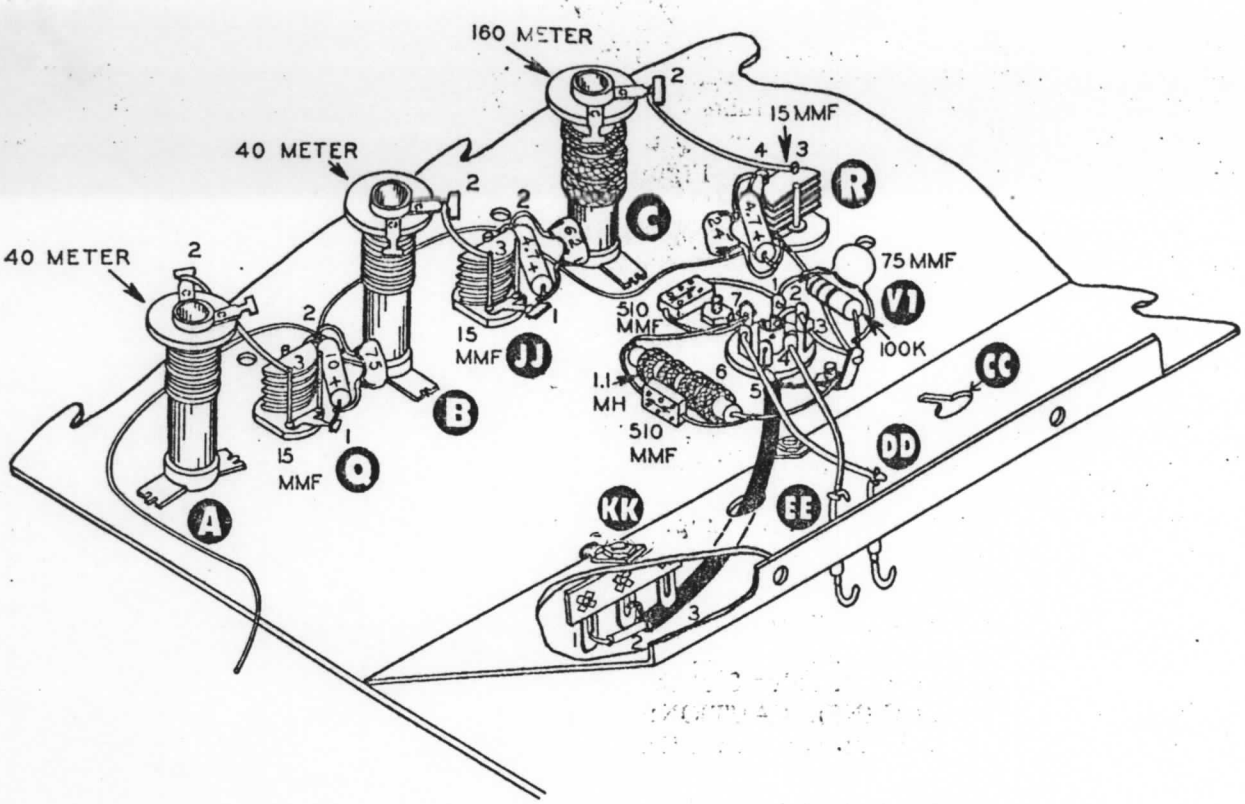


Figure 7

( ) Refer to Figure 7 and connect one end of a 12" #20 bare wire to the ground lug opposite pin 3 of tube V1 (NS). Route the wire AS SHOWN against the chassis through lug 1 of the 15 mmf variable capacitor at location R (NS). Continue the wire against the chassis through lug 1 of variable capacitor at JJ (NS) and then through lug 1 of the capacitor at Q. Now solder all #1 capacitor lugs and leave the remaining length of wire free temporarily. Check to be sure this wire touches none of the rotor plates of the 15 mmf capacitors.

( ) Run a length of #20 bare wire through pin 2 of tube V1 (NS), through pin 3 of tube V1 (NS), and connect one end to the ground lug opposite pin 3 of tube V1 (NS). Connect the other end to the socket center post (S-1). Now solder pins 2 and 3 of tube V1.

( ) Connect a 510 mmf silver mica capacitor (green-brown-brown) between pin 1 of tube V1 (NS) and pin 7 of tube V1 (NS). Position as shown.

( ) Wrap the leads of a 75 mmf N750 disc ceramic capacitor around the leads of a 100 KΩ 1/2 watt resistor (brown-black-yellow). Keep the capacitor leads short and solder both connections.

( ) Connect this combination between pin 1 of tube V1 (NS) and the ground lug opposite pin 3 of tube V1 (NS), positioning as shown.

( ) Refer to Figure 8 and cut a 4" length of shielded cable. Strip 1" of outer insulation off one end and 3/4" of outer insulation off the other end. Unwind the shield on the 1" end, then cut the center conductor to 1/2" and strip 1/4". Unwind the shield at the 3/4" end and strip the center conductor 1/4". Lightly tin all leads to hold in place.

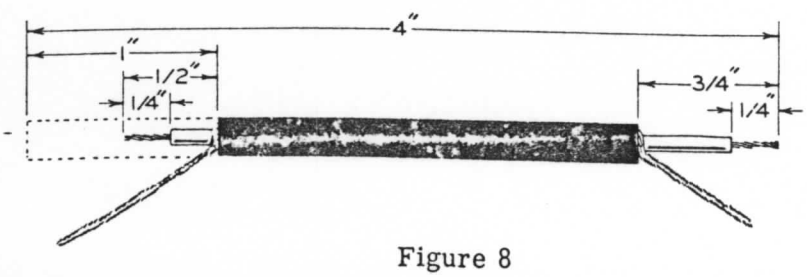


Figure 8

( ) On the 1/2" end, connect the center conductor to pin 5 of tube V1 (S-1). Connect the shield to the ground lug opposite pin 3 of tube V1 (NS). Run the other end through the nearby hole in the chassis center partition and connect the center conductor to terminal strip KK-1 (NS). Connect the shield to KK-2 (NS). See Figure 7.

( ) Connect one length of #20 bare wire between pin 4 of tube V1 (S-1) and feed-through capacitor EE (S-1). Run this lead straight from point to point and keep it as short as possible.

( ) Connect another length of #20 bare wire between pin 6 of tube V1 (S-1) and feed-through capacitor at DD (S-1). Keep this lead short and be sure it touches no other lead.

( ) Wrap the leads of a 510 mmf silver mica capacitor (green-brown-brown) around the leads of a 1.1 mh RF choke (#45-4) (see coil set #140-1) and solder both connections.

( ) Connect the above combination between pin 7 of tube V1 (S-2) and the ground lug opposite pin 3 of tube V1 (S-5).

Keep the following wiring from point to point and be sure that all leads are as short as possible.

( ) Connect a #20 bare wire between lug 3 of the 15 mmf variable capacitor at R (S-1) and lug 2 of the 160-meter coil at C (NS). CAUTION: Exercise care in soldering to the capacitor so that no excess solder will interfere with the movement of the rotor plates.

( ) Connect a #20 bare wire between lug 3 of the 15 mmf variable capacitor at JJ (S-1) and lug 2 of the coil at B (NS).

( ) Connect a #20 bare wire between lug 3 of the 15 mmf variable capacitor at Q (S-1) and lug 2 of the coil at A (NS).

( ) Refer to Figure 9 and locate the single deck VFO band switch (#63-154). Placing a 3/8" lockwasher on the shaft, insert it through hole CC and secure with a 3/8" control nut. Be sure the locating lug is locked in the locating groove.

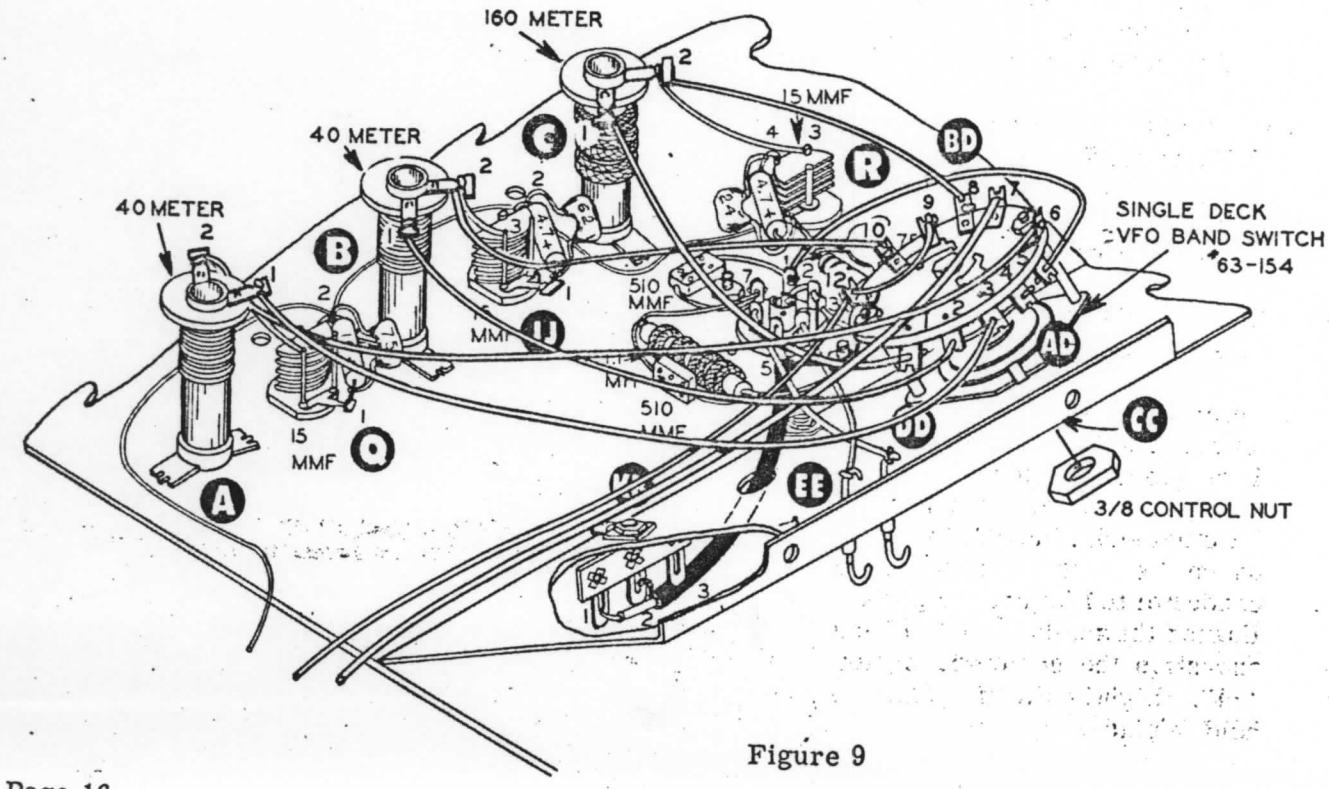


Figure 9

( ) The VFO band switch is numbered clockwise as viewed from the shaft end; the front terminals being numbered from AD-1 through AD-5 and the rear terminals from BD-6 to BD-12.

( ) Connect a#20 bare wire between pin 1 of tube V1 (S-3) and the VFO band switch lug AD-5 (S-1). Route this wire exactly as shown, away from the 15 mmf variable capacitor at R, and clear of the switch mounting post.

( ) Connect a short bare #20 wire between lug C-2 (S-2) on the 160-meter coil and lug BD-8 (S-1) on the VFO band switch.

( ) Cut a #20 bare wire to a length of 4". Slip one end through BD-12 to BD-9. Be sure it does not short to BD-10, then solder both connections. Leave the other end free temporarily.

( ) Connect a short #20 bare wire between BD-10 (S-1) and the 40-meter VFO coil lug B-2 (S-2).

( ) Cut a #20 bare wire to 4 1/2". Connect one end to BD-7 (S-1). Dress the lead straight toward the front of the chassis, and leave free temporarily.

( ) Connect a short #20 bare wire between AD-1 (S-1) and the 160-meter coil lug C-1 (S-1).

( ) Run a #20 bare wire through AD-2 and connect to AD-4. Be sure it does not touch AD-3, then solder both connections. Connect the other end to 40-meter coil lug B-1 (S-1).

( ) Connect a #20 bare wire between AD-3 (S-1) and 40-meter VFO coil lug A-1 (S-1).

( ) Connect a #20 bare wire between BD-6 (S-1) and coil lug A-2 (S-2).

NOTE: Position all bare wires away from each other to prevent any possible shorts.

( ) Locate the right angle VFO shield (#206-M97), and refer to Figure 10. Mount the three spade lugs along the edge away from the flange; one at the leading edge and the two right angle brackets on the opposite vertical side. Use 6-32 x 1/4" BHMS and 6-32 nuts. Use #6 lockwashers under all nuts. Slip the shield into position by tilting it toward the rear of the top plate and inserting the rear spade lug first, then the two along the side through their respective top plate holes. Fasten with 6-32 nuts and #6 lockwashers from the chassis top. Secure the shield to the chassis center partition with two 6-32 x 1/4" BHMS and #6 lockwashers through the center partition and into the threaded right angle brackets. Tighten all mounting hardware securely.

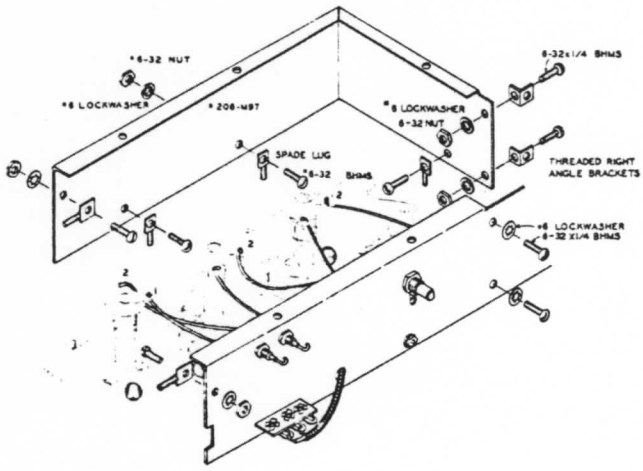


Figure 10

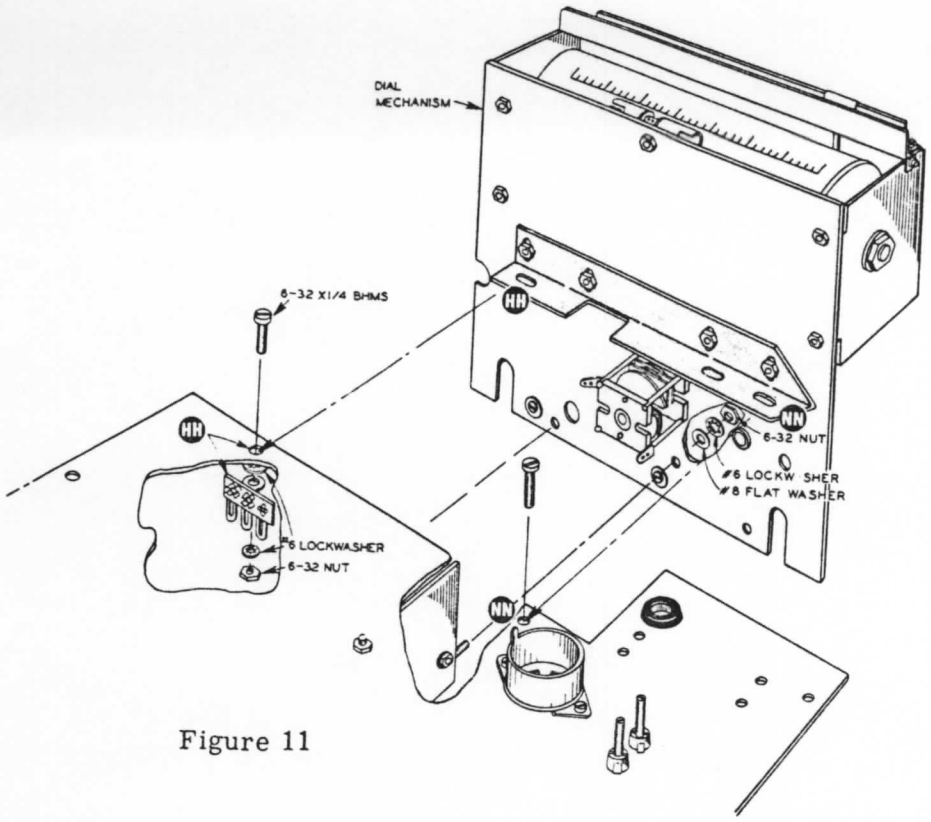


Figure 11

( ) Turn the top plate right side up at this point.

( ) The dial mechanism is mounted at this time. Since this same mechanism is also used on the Heathkit MR-1 Mobile Receiver, there are some holes which are not utilized in this kit. Refer to Figure 11 for those which apply.

( ) Mount the dial mechanism to the chassis top plate at this time using 6-32 x 1/4" BHMS at locations NN and HH on the top plate mounting bracket which correspond to similarly marked holes on the chassis top plate. At location HH mount a 3 lug #2 ground terminal strip under the chassis with a #6 lockwasher over and under the mounting foot. Using a #6 lockwasher at NN secure both screws with 6-32 nuts temporarily.

( ) Fasten the two spade bolts from the chassis center frame and VFO shield to the main dial plate using #8 small flat washers, #6 lockwashers and 6-32 nuts. The 1/4" wrench supplied may be used to tighten these nuts temporarily.

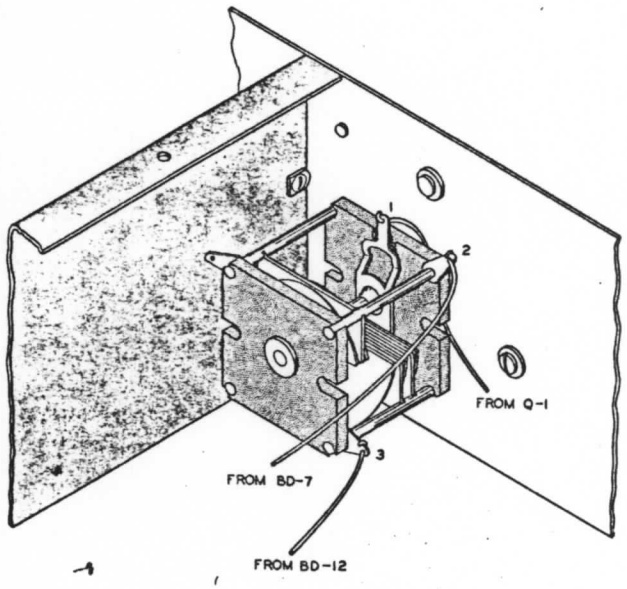


Figure 12

NOTE: The slotted holes in the top plate bracket are used to later align the shafts with the front panel and panel mounting bracket. The screws should be centered initially in these holes and fastened temporarily. Later they may be loosened for this alignment along with the spade lugs from the center frame and VFO shield.

( ) Referring to Figures 9 and 12, connect the free end of the #20 bare wire from BD-12 to lug 3 on the VFO tuning capacitor (S-1). Trim off any excess lead length.

( ) Connect the #20 bare wire from BD-7 to lug 2 of the VFO tuning capacitor (S-1). Remove excess lead length and keep the lead short and clear of all other wiring.

( ) Connect the free wire from Q-1 to the rotor ground lug 1 (S-1) on the VFO tuning capacitor. Keep this lead away from the coil at A. Trim off any excess lead length.

( ) Set the three 15 mmf variable capacitors to full open (unmeshed) position and mark this position on the top of the chassis so that it will be identified after the VFO is enclosed.

( ) Locate the VFO cover plate (#205-M136) and secure it to the VFO shield and chassis center partition with five #6 sheet metal screws.

This completes the wiring of the VFO compartment.

Installation of Cable Harness

( ) Refer to Pictorial 2 on page 20 and position the cable harness as shown. Dress the wires from BO#2 toward H and G, and the wires from BO#3 toward V4. Form the rest of the harness as shown, bending it at the corners, and dress it around the edge of the top plate and under the notched corner of the chassis center partition.

At BO#1, connect the wires as follows, after clipping them to proper length and stripping if necessary:

( ) The black wire to pin 4 of tube V3 (NS).

( ) The gray wire to pin 5 of tube V2 (NS).

( ) The orange wire to KK-3 (NS).

( ) The yellow wire to FF-4 (NS).

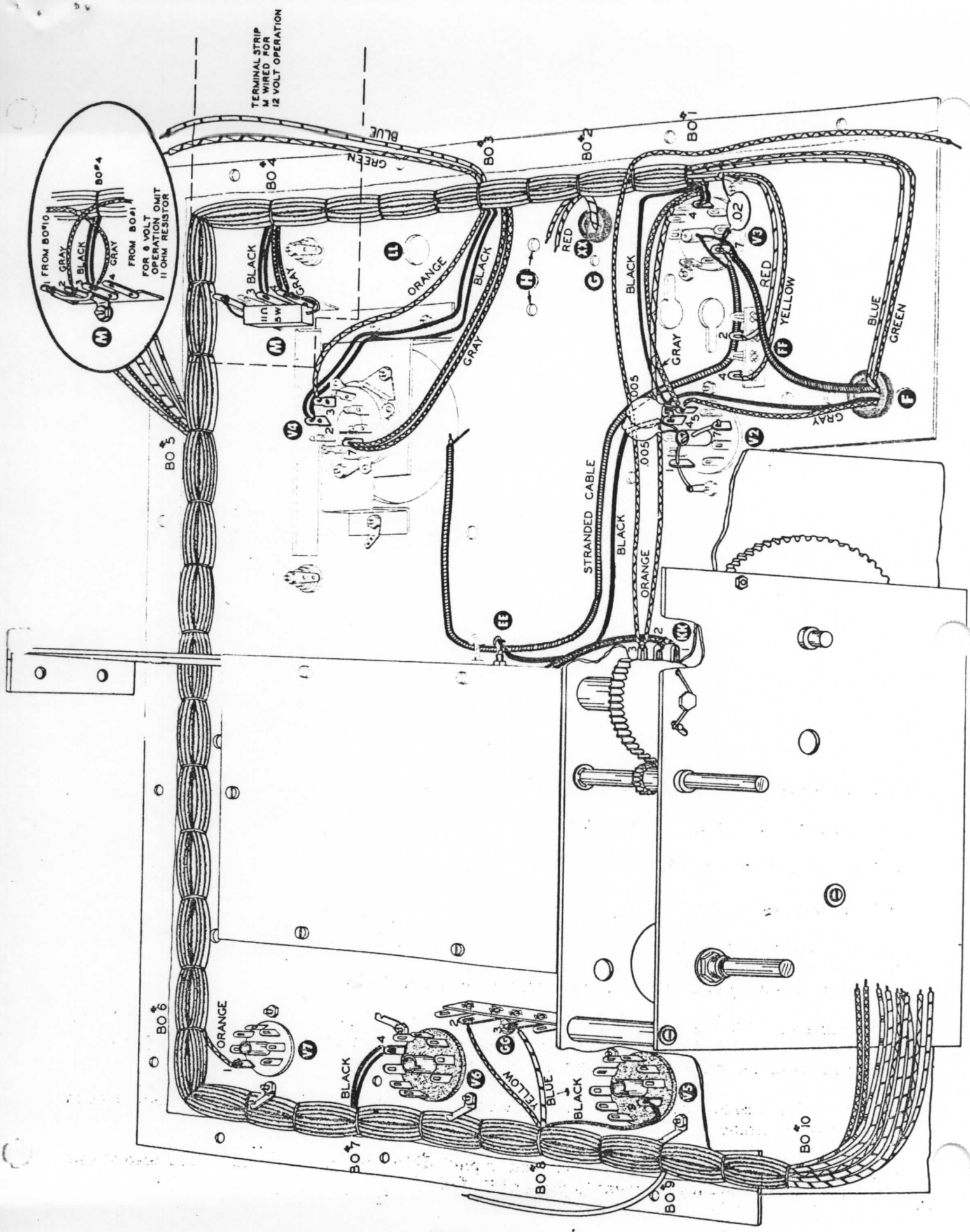
( ) The red wire to FF-2 (NS).

( ) Pass the blue and green wires through grommet F and leave free.

( ) Prepare a 7" length of shielded cable as before. Remove the outer cover 3/4" at each end. Unbraid the shield braid forming a ground lead by twisting this braid together. Remove 3/8" of the center conductor insulation and lightly tin both leads.

( ) Cut off the ground lead at one end of this cable close to the outer jacket and insert this end through grommet F.

( ) Connect the center lead at the other end to pin 7 (NS) of V3. Connect the ground lead at this end to the ground lug adjacent to pin 4 of V3 (NS).


TERMINAL STRIP M WIRED FOR 12 VOLT OPERATION
FOR 6 VOLT OPERATION OMIT 11 OHM RESISTOR
FROM BO#10
FROM BO#1
BLUE
GREEN
BLACK
GRAY
ORANGE
RED
YELLOW
STRANDED CABLE
.005
.02
BO#1
BO#2
BO#3
BO#4
BO#5
BO#6
BO#7
BO#8
BO#9
BO#10

Pictorial 2

At BO#2, connect as follows:

(✓) Pass the heavy red wire through nearby grommet XX and leave free.

(✓) Leave the two small red wires free temporarily.

At BO#3, connect as follows:

(✓) Both black wires to pin 2 of tube V4 (NS).

(✓) Both gray wires to pin 7 of tube V4 (NS).

(✓) The orange wire to pin 3 of tube V4 (NS).

(✓) Leave the blue and green wires free.

NOTE: Decide now which filament voltage will be used, 6 or 12 volts. Follow ONE of the following filament wiring instructions BUT NOT BOTH!

For 12 Volt Operation:

( ) At BO#4 connect both black wires to M3 (S-2).

( ) Connect both gray wires to M4 (NS).

( ) Connect an 11 Ω 5 W resistor from M4 (S-3) to M1 (NS).

For 6 Volt Operation:

( ) At BO#4 connect both black wires to M3 (NS).

( ) Connect THE ONE GRAY WIRE at BO#4 coming from BO#10 to M3 (NS).

( ) Connect THE ONE GRAY WIRE at BO#4 coming from BO#1 to M2 (S-1).

( ) Omit the 11 Ω resistor.

At BO#5, leave the wires free.

At BO#6, connect as follows:

( ) The orange wire to pin 1 of tube V7 (S-1).

At BO#7, connect as follows:

( ) Both black wires to pin 4 of tube V6 (S-2).

At BO#8, connect as follows:

( ) The black wire to lug 9 of tube V5 (NS).

( ) The yellow wire to GG2 (NS).

( ) The blue wire to GG3 (NS).

At BO#9 and BO#10, leave the wires free.

( ) Run a #20 bare wire through pin 7 of tube socket V2 (NS), through the socket center post (NS), through pin 1 (NS) over to the ground lug opposite pin 1 (NS). Now solder pin 7 and pin 1 of tube socket V2.

( ) Cut a 10" length of orange hookup wire, stripping both ends 1/4". Connect one end to KK3 (NS). Run the other end toward the chassis edge and leave free.

NOTE: When connecting components to the socket center posts, where the center post holes are not in line, it will be necessary to insert the lead into the top of the post. Be especially certain that it makes a good solder connection.

( ) Clip the leads of a .005 mfd disc ceramic capacitor to 3/8" and connect between pin 4 of tube V2 (NS) and the center post (NS). Position exactly as shown.

( ) Clip the leads of another .005 mfd disc ceramic capacitor to 3/8" and connect between pin 5 of tube V2 (NS) and the socket center post (S-3). Position exactly as shown.

( ) Clip the leads of a .02 mfd disc ceramic capacitor to 5/8" and connect between pin 7 of tube socket V3 (NS) and the ground lug adjacent to pin 4 (NS). Use sleeving on the lead to pin 7.

( ) Connect a 5" length of black hookup wire between pin 4 of tube V2 (NS) and the feed-through capacitor EE (S). Run this lead exactly as shown, against the chassis.

( ) Using 3 3/4" black hookup wire and routing exactly as shown, connect pin 4 of tube V2 (NS) to pin 4 of tube V3 (S-2).

( ) Connect one end of an 8" black wire to pin 4 of tube V2 (S-4). Route the wire as shown, and insert the other end through grommet F and leave free temporarily.

( ) Prepare a 10 1/2" length of shielded cable as before, stripping the outer cover 3/4", unbraiding the shield forming a twisted ground lead, and stripping the inner conductor 3/8". Tin all leads lightly to hold in place.

( ) Connect the center lead at one end to pin 7 of tube V3 (S-3). Connect the shield braid at this end to the eyelet of FF3 (S-1).

( ) Route this cable over to the center frame as shown and leave the other end free temporarily.

( ) Connect an 8" length of gray hookup wire to pin 5 of tube V2 (S-3). Dress the wire as shown and insert through grommet F. Leave this end free.

( ) Connect a 100 KΩ 1/2 watt resistor (brown-black-yellow) between pin 2 of tube V2 (S-1) and the nearby ground lug (NS). See Figure 13.

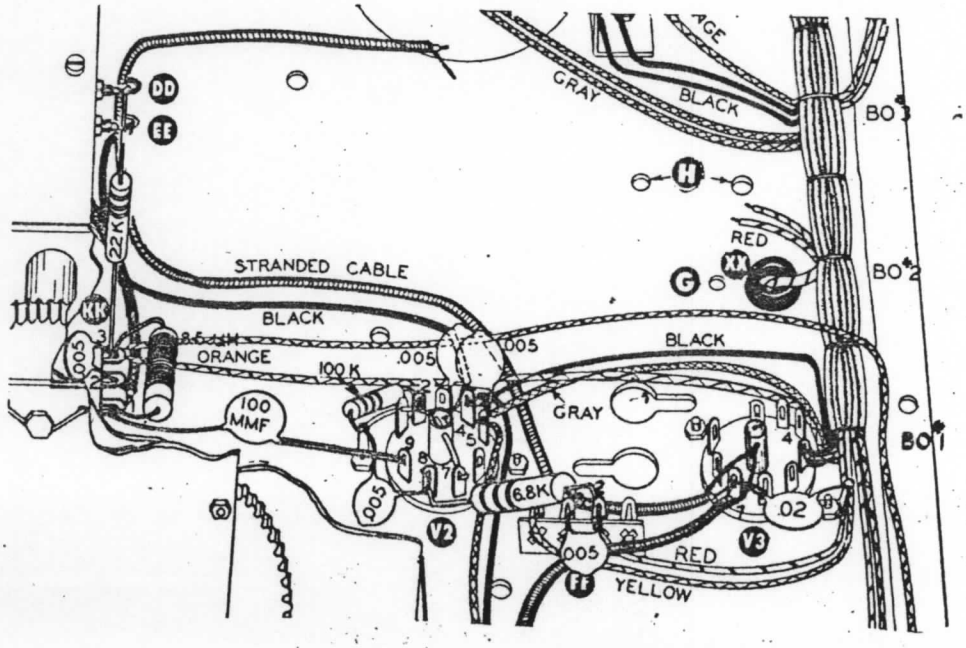


Figure 13

( ) Connect a .005 mmf disc ceramic capacitor between pin 8 of tube V2 (NS) and the ground lug adjacent to pin 1 (S-3). Position flat against chassis, as shown.

( ) Connect a .005 mfd disc ceramic capacitor between KK2 (S-2) and KK3 (NS).

( ) Connect the 8.5 μh RF choke between KK1 (NS) and KK3 (NS).

( ) Connect a 22 KΩ 1/2 watt resistor (red-red-orange) between KK3 (S-5) and the feed-through capacitor DD (S-1).

( ) Connect a 100 mmf disc ceramic capacitor between pin 9 of tube V2 (S-1) and KK1 (S-3). Use sleeving on the lead to pin 9.

( ) Connect a 6.8 KΩ 1 watt resistor (blue-gray-red) between FF2 (NS) and pin 8 of tube V2 (S-2).

( ) Connect a .005 mfd disc ceramic capacitor between FF2 (NS) and FF3 (S-1).

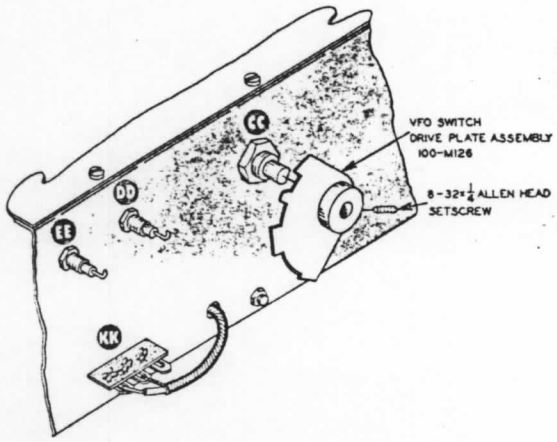


Figure 14

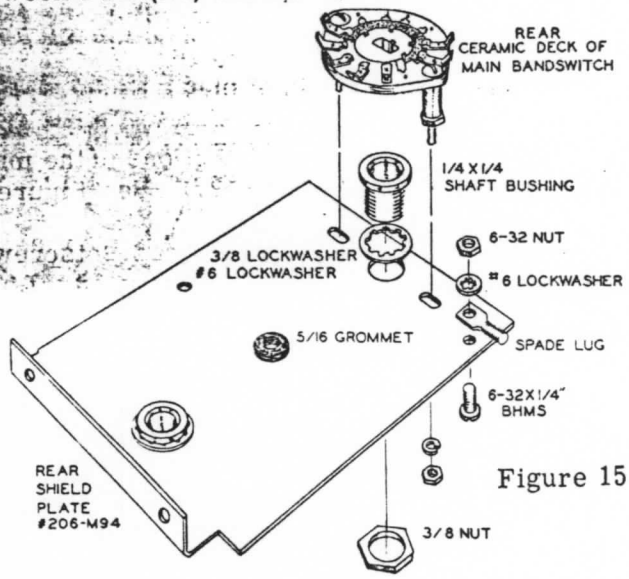


Figure 15

( ) Locate the VFO switch drive plate assembly (#100-M126) and start an 8-32 x 1/4" Allen head setscrew in the threaded hole. Use the wrench provided. Now slip the plate on the VFO band switch shaft and, with the end of the bushing about even with the end of the switch shaft, tighten the setscrew on the shaft flat at this time. See Figure 14.

( ) Locate the rear shield plate (#206-M94) and, referring to Figure 15, mount a 1/4" x 1/4" shaft bushing in the hole farthest from the flange on the rear shield plate as shown. Using a 3/8" lockwasher, secure the bushing with a 3/8" control nut on the opposite side.

( ) In like manner, mount another 1/4" x 1/4" shaft bushing in the hole nearest the flange.

( ) Locate the ceramic rear deck of the main band switch (#63-179) and mount it over the bushing on the flanged side of the shield with the switch studs through the slotted holes. Use the hardware provided with the switch. Observe the position of switch lugs as shown in Figure 15. Secure the studs temporarily.

( ) Mount a spade lug in the hole directly beneath the ceramic deck of the band switch, using a 6-32 x 1/4" BHMS, a #6 lockwasher and 6-32 nut.

( ) Mount a 5/16" grommet in the center of the shield plate.

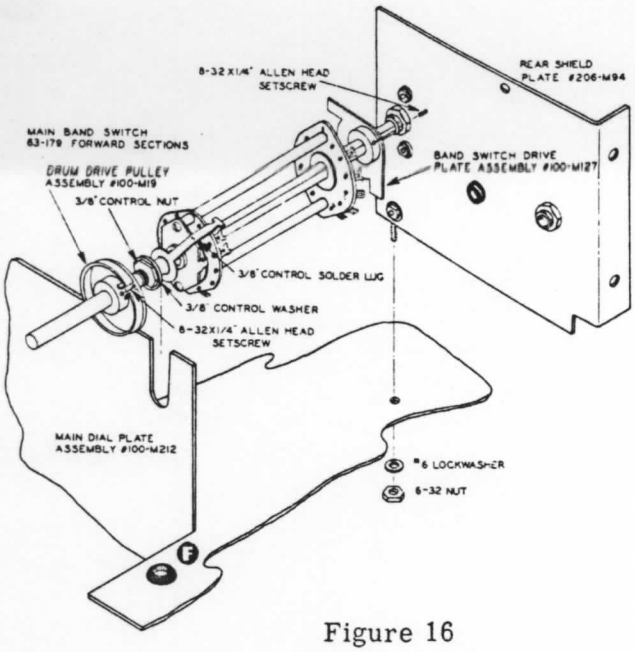


Figure 16

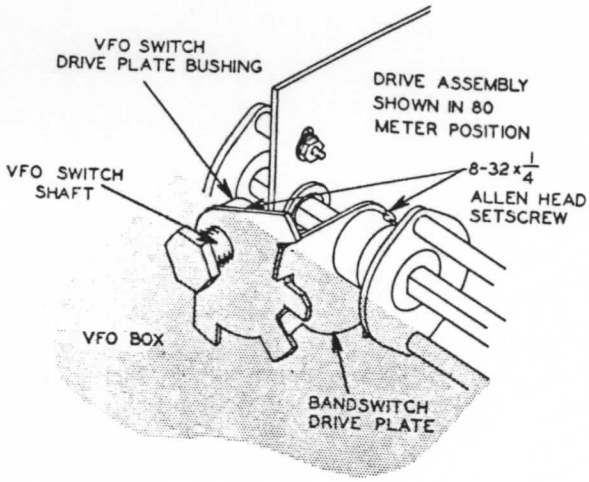


Figure 17

( ) Locate the two forward sections of the main band switch (#63-179) and the band switch drive plate assembly (#100-M127). See Figure 16.

( ) Start an 8-32 x 1/4" Allen head setscrew in the drive plate bushing and slip it on the band switch shaft, as shown in Figure 16. Do not secure yet.

NOTE: Care must be exercised in the following steps to prevent damage to the ceramic deck of the band switch.

( ) Rotate the band switch shaft to its full counterclockwise position. (It may be necessary to temporarily fasten a knob on the shaft to rotate the band switch, after which the knob may be removed.)

( ) Slide the rear portion of the band switch shaft through the rear shield plate bushing as shown, then through the rotor of the ceramic band switch deck. (Do not force - if necessary loosen the ceramic deck studs and retighten.) Be sure all decks are positioned as shown in Figures 15 and 16 and the key mark openings in all rotors point away from the rear shield flanges. Tighten the ceramic switch studs after shaft alignment.

( ) Place a 3/8" control solder lug over the switch mounting bushing, followed by a 3/8" control flat washer and 3/8" control nut.

( ) Locate the drum drive pulley (#100-M19) and insert an 8-32 x 1/4" Allen head setscrew in the bushing.

( ) Place the pulley on the band switch shaft and position 1/4" in front of the switch bushing. Tighten the setscrew but do not fasten permanently yet.

( ) Move the assembly into position, inserting the switch bushing into the slotted hole in the right side of the main dial plate so the control solder lug is located on the switch side of the main dial plate (positioned as shown) and the 3/8" control flat washer and nut are on the opposite side of the main dial plate. Insert the single spade lug on the rear shield plate through its corresponding top plate hole to the left of tube V4. Now secure the shield plate with a #6 lockwasher and 6-32 nut. Be sure the wires from BO#3 are all on the flanged side of the rear shield plate. Secure the assembly to the main dial plate by tightening the 3/8" nut on the band switch bushing permanently. Use care to position so this shaft does not touch the large gear.

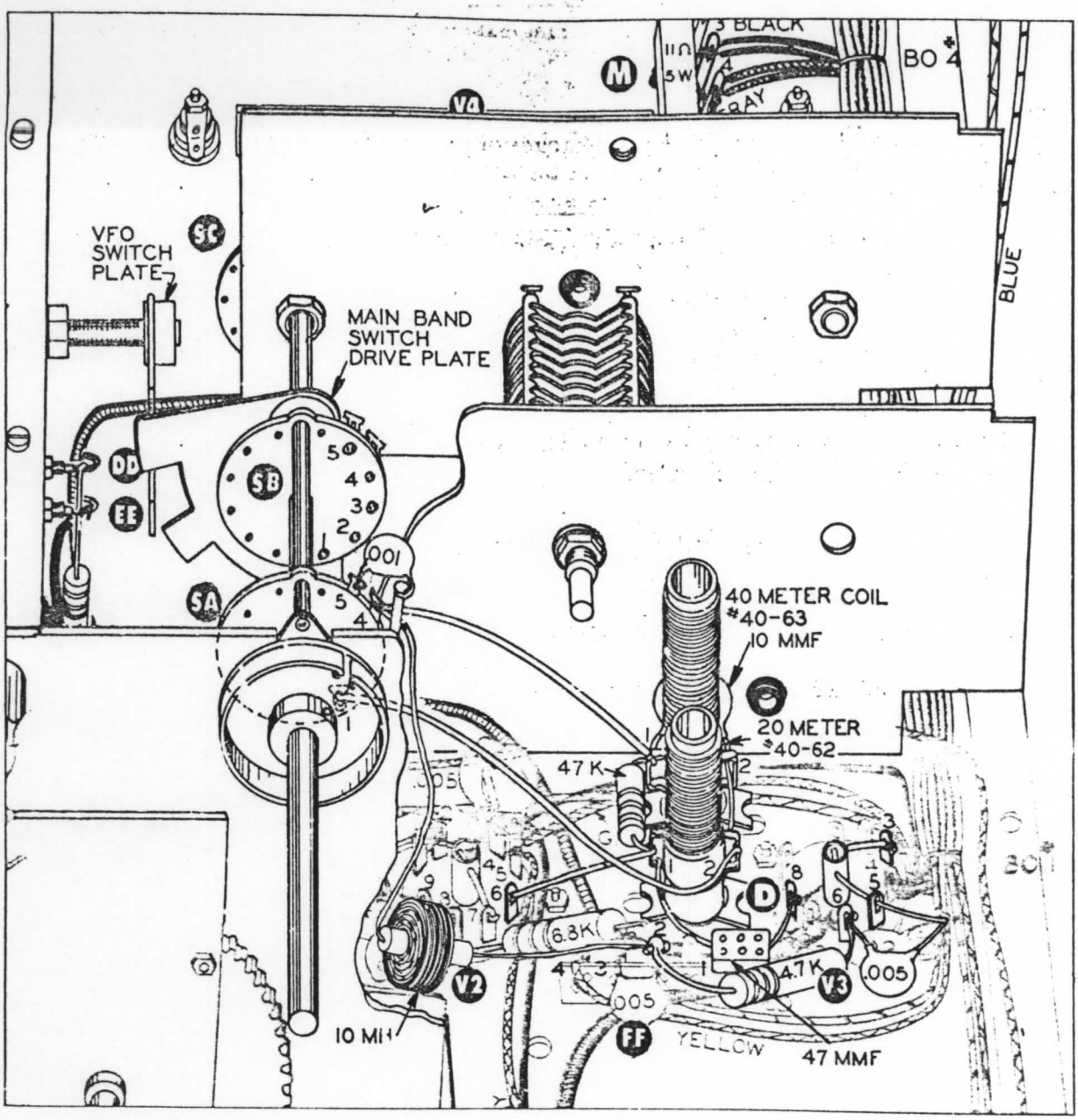


Figure 18

( ) Set the VFO switch and the band switch in their extreme counterclockwise positions. Referring to Figure 17, engage the two drive plates as shown. Secure the band switch drive plate with the Allen head setscrew. Cycle the switch at this time to observe its correct action. Note as the band switch is rotated clockwise from full counterclockwise, the VFO band switch is actuated twice, skipped once, then actuated once more. Adjust until a smooth action is obtained and secure permanently.

Refer to Figure 18 for the following steps:

( ) Mount the 40-meter slug-tuned coil (#40-63) at location E. This is the coil with the larger number of turns. Position it with the red dot toward the outside of the chassis. This coil mounts by "snapping" the cap into the mounting hole.

( ) Mount the 20-meter slug-tuned coil (#40-62) at location D, with the red dot toward the outside edge of the chassis.

NOTE: Position the following coil to switch wiring exactly as shown, taking special precautions against shorting to other wiring and components.

( ) Connect a short #20 bare wire between D1 (NS) and pin 6 of tube V2 (S-1).

( ) Pass one lead of a 10 mmf disc ceramic capacitor through coil lug E2 (NS) then over through coil lug D2 (NS). Now solder E2. Connect the other lead to E1 (NS). Position the capacitor behind the 40-meter coil straight up, as shown.

( ) Connect a 47 mmf silver mica capacitor (yellow-violet-black) between D1 (NS) and pin 8 of tube V3 (NS).

( ) Connect a 47 KΩ 1/2 watt resistor (yellow-violet-orange) between D1 (S-3) and E1 (NS).

( ) The main band switch (#63-179, including the ceramic deck to the rear of the rear shield plate) is numbered as follows: The front deck is designated as "SA", the middle deck as "SB", and the rear deck as "SC". Terminal 1 on all wafers is located to the right of the switch stud nearest the chassis top plate when viewed from the shaft end. Numbering proceeds in a counterclockwise direction.

( ) Connect one end of a #20 bare wire to the band switch terminal SA1 (S-1). Connect the other end to D2 (S-2).

( ) Connect a #20 bare wire between terminal SA4 (NS) and E1 (S-3).

( ) Connect the 10 mh RF choke (#45-16) between SA4 (S-2) and FF2 (NS).

( ) Connect a .001 mfd disc ceramic capacitor between SA5 (S-1) and the control solder lug on the switch shaft (S-1).

( ) Connect a 4.7 KΩ 1 watt resistor (yellow-violet-red) between FF2 (NS) and pin 6 of tube V3 (NS).

( ) Run a #20 bare wire through pin 5 of tube V3 (NS) through the socket center post (NS) and connect to pin 3 of tube V3 (S-1). Solder all connections and connect the other end to the ground lug adjacent to pin 5 (NS).

( ) Connect a .005 mfd disc ceramic capacitor between pin 6 of tube V3 (S-2) and the ground lug adjacent to pin 5 (NS).

( ) Wrap the leads of a .005 mfd disc ceramic capacitor around the leads of an 18KΩ 1 watt resistor (brown-gray-orange). Solder both connections. Now connect the combination between FF1 (NS) and the ground lug adjacent to pin 5 of tube V3 (S-5). Refer to Figure 19A.

( ) Connect a 1.1 mh RF choke (#45-4) between pin 8 of tube V3 (S-2) and FF1 (S-2). Use 1/8" diameter sleeving on the lead to pin 8.

( ) Locate the 2.5 mh RF choke (#45-14) and mount at hole G, using a 6-32 x 3/8" BHMS from the top of the plate, then a #6 solder lug, then a #6 fiber washer, then the RF choke. The solder lug is placed next to the plate, and the fiber washer next to the RF choke. Use care in mounting since excessive tightening could damage the choke form.

( ) Connect both light red wires from BC#2 to RF choke terminal G1 (NS).

( ) Connect a .005 mfd disc ceramic capacitor between RF choke terminal G1 (S-3) and the ground lug at the base of the choke (S-1).

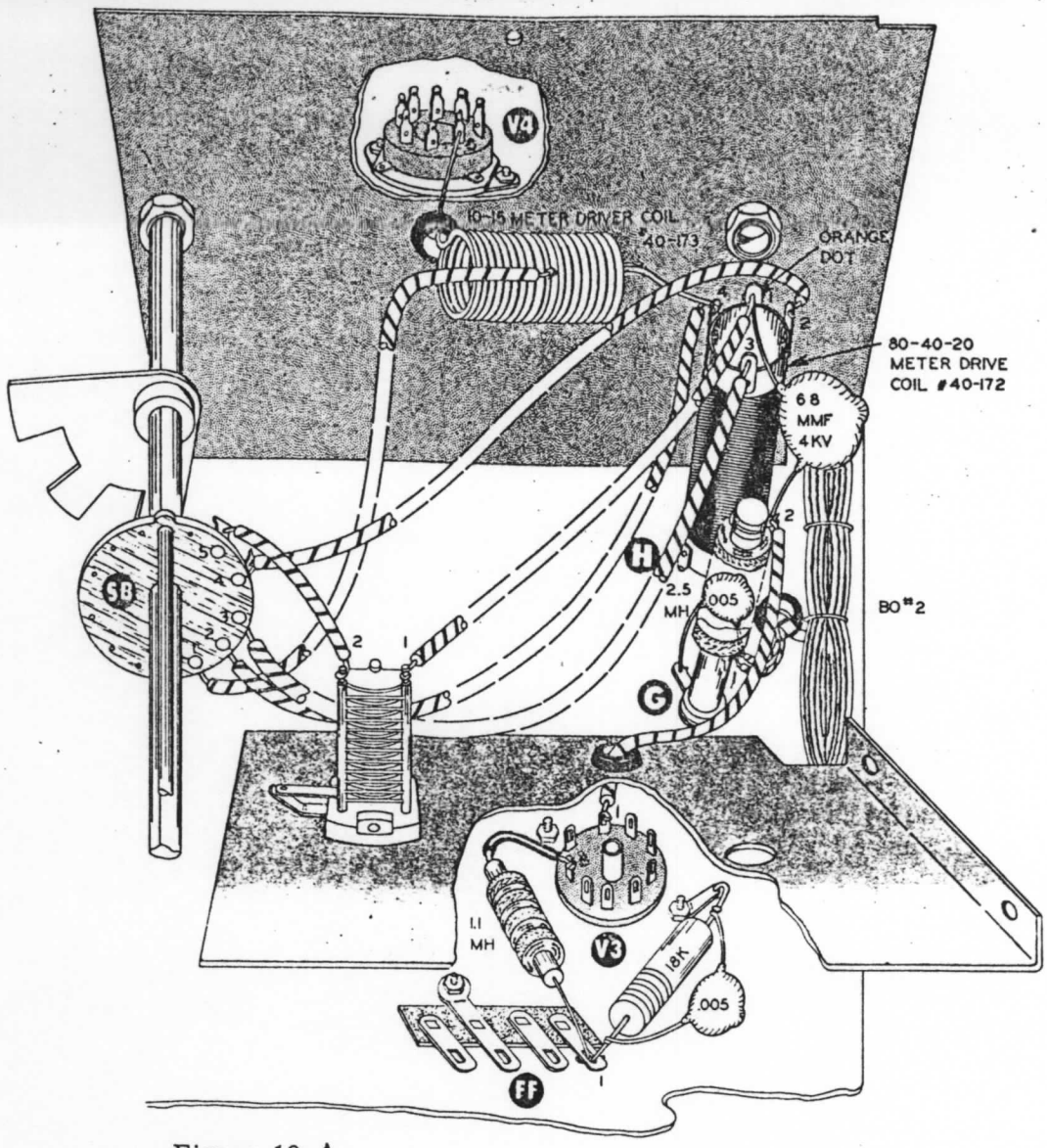


Figure 19 A

(✓) Locate the center shield plate (#206-M95) and, referring to Figure 19B, mount the 5/16" grommet in the smallest hole.

(✓) Mount a spade lug in the corner opposite the flange using a 6-32 x 1/4" BHMS, #6 lockwasher and 6-32 nut.

(✓) Placing a 3/8" control solder lug on its shaft mount the 77 mmf variable capacitor (#26-50) in the hole nearest the spade lug and position with stator plates up as shown. Secure with the flat control washer and nut supplied on the capacitor on the opposite side of the center shield plate.

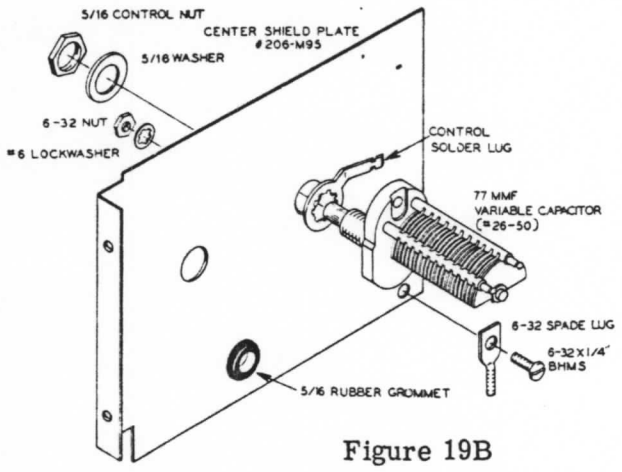


Figure 19B

(✓) Now mount the shield to the top plate just to the rear of the 40 and 20 meter slug-tuned coils and secure with a #6 lockwasher and 6-32 nut on the spade lug.

(✓) Bend the long lug on the rotor of the variable capacitor over so that it touches the control solder lug and solder. Excess solder lug length should be cut off.

(✓) Referring to Figure 19A, connect a heavy red #18 wire from pin 1 of tube V3 (S-1) through the grommet to G2 (NS).

( ) Locate the 80-40-20 meter driver coil (#40-172) and mount it at hole location H. Note that the orange dot faces the rear of the chassis. Include a #6 solder lug on the top side of the plate on the stud nearest the edge of the chassis. Position this lug toward the chassis side. Use 6-32 nuts and a #6 lockwasher on the other stud to secure.

NOTE: The orange dotted lug on the 80-40-20 driver coil "H" is lug 1 and the coil is numbered in a clockwise direction.

( ) Connect one end of a 3 1/2" #18 heavy red insulated wire to the band switch terminal SB1 (S-1). Dress the other end toward the rear shield plate and bend straight up. Leave free temporarily. See Figure 19A.

( ) Connect one end of a #18 heavy red insulated wire to SB2 (S-1). Dress the other end down under the variable capacitor, clearing it by 1/2", then up to lug H4 (NS).

( ) Connect a heavy red insulated wire to SB3 (S-1). Dress the other end as shown and connect to H3 (S-1).

( ) Connect a heavy red insulated wire to SB4 (S-1). Dress up and over the capacitor as shown and connect to H2 (S-1).

( ) Connect a short red heavy insulated wire between variable capacitor lug 1 (S-1) and H1 (NS).

( ) Similarly, connect capacitor lug 2 (S-1) to SB5 (S-1).
( ) Connect a 68 mmf 4 KV disc ceramic capacitor between G2 (S-2) and H1 (S-2).

( ) The 10-15 meter driver coil (#40-173) must be placed as shown, so it will not short to the other components. It would help to pre-shape the leads before soldering. Insert the end (with the largest number of turns from the center tap) through the grommet and connect to pin 5 of tube V4 (NS). It is normal for the coil body to touch the grommet, but nothing else. Connect the other end to H4 ~~(S-2)~~ (S-3).
( ) Connect the red wire from switch terminal SB1 to the center tap of the 10-15 meter driver coil as shown (S-1).

This completes the wiring of the buffer-multiplier stages.

Final Amplifier Partial Wiring

The following .005 mfd disc ceramic capacitor leads must be kept extremely short and must mount close to the socket V4, as shown in Figure 20. Connect these capacitors around the base of V4 as follows:

( ) From pin 1 of tube V4 (S-1) to ground lug 9 of tube V4 (NS).

( ) From pin 2 of tube V4 (S-3) to ground lug 9 of tube V4 (S-2).

( ) From pin 4 of tube V4 (S-1) to ground lug 10 of tube V4 (NS).

( ) From pin 6 of tube V4 (NS) to ground lug 11 of tube V4 (NS).

( ) From pin 7 of tube V4 (S-3) to ground lug 12 of tube V4 (S-1).

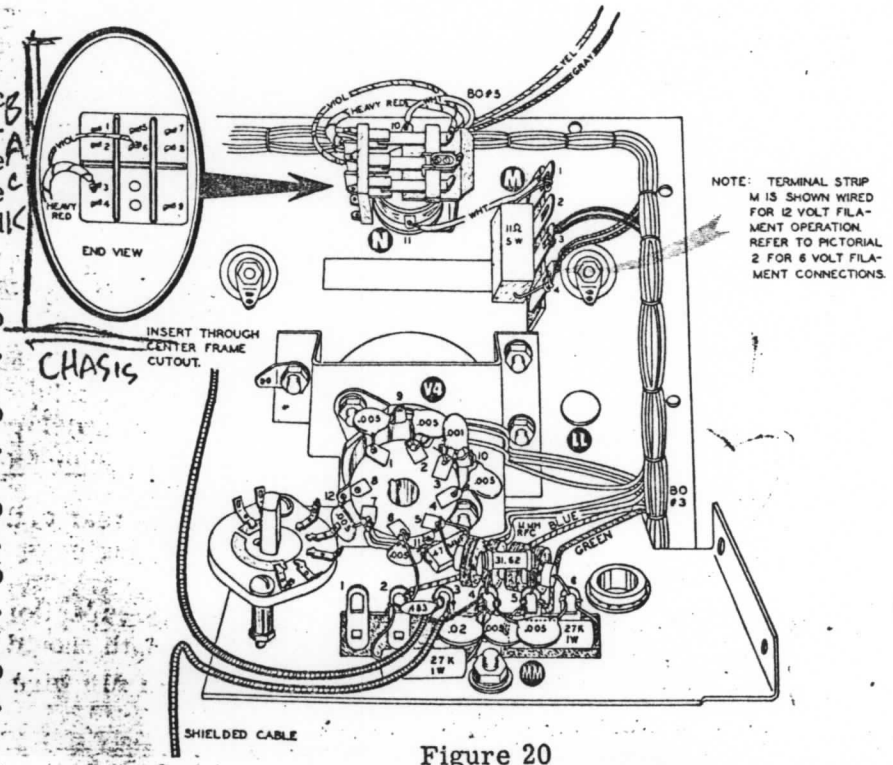


Figure 20

SPECIAL NOTICE
Model MT-1

Please turn to Page 28 in your manual and insert the following step between Steps 8 and 9.

( ) Insert one lead of a 10 mmf N750 capacitor through the rubber grommet in the rear shield plate and connect to pin 5 of V4 (NS). Connect the other capacitor lead to coil lug H4 (NS).

The last sentence of Step 9 should be corrected to read:

"Connect the other lead to coil lug H4 (S-3)".

Page 29, Step 3, change the soldering instruction for pin 5 of V4 from (S-3 to (S-4).

Change the number of Parts Per Kit for #21-28 10 mmf N750 capacitor from 1 to 2.

Thank you,

3-19-59

HEATH COMPANY

( ) Connect a .001 mfd disc ceramic capacitor from pin 3 of tube V4 (S-2) to ground lug 10 of tube V4 (S-2).
( ) Connect a 47 mmf silver mica capacitor (yellow-violet-black) from pin 5 of tube V4 (NS) to ground lug 11 of tube V4 (S-2).

( ) Refer to Figure 20 and, using 6-32 hardware, mount a 6-lug terminal strip (#4 ground) on the flanged side of the rear shield plate at the hole location near the top edge. Position as shown.

( ) Connect a 1.1 mh RF choke (#45-4) between pin 5 of tube V4 ~~(S-3)~~ S-4 and MM6 (NS). Position exactly as shown so as to clear a gear which will be mounted later.

Connect the wires from BO#3 as follows:

( ) Blue wire to MM2 (NS).
( ) Green wire to MM5 (NS).
( ) Connect a #20 bare wire between pin 6 of tube V4 (S-2) and MM2 (NS). Dress as shown.
( ) Connect a .483 meter shunt resistor between MM2 (NS) and MM3 (NS).
( ) Connect a 27 KΩ 1 watt resistor (red-violet-orange) between MM2 (S-4) and MM4 (NS).
( ) Connect the 31.62 meter shunt resistor between MM4 (NS) and MM5 (NS).
( ) Connect a 27 KΩ 1 watt resistor (red-violet-orange) between MM5 (NS) and MM6 (NS).
( ) Connect a .005 mfd disc ceramic capacitor between MM4 (NS) and MM5 (S-4).
( ) Connect another .005 mfd disc ceramic capacitor between MM4 (NS) and MM6 (S-3).
( ) Connect a .02 mfd disc ceramic capacitor between MM3 (NS) and MM4 (NS).

( ) Mount the three-pole double-throw relay (#69-8) at location N. The locating lug is inserted into the larger hole and the relay is secured with a 6-32 x 3/8" BHMS through the chassis top with a #6 lockwasher under the screw head.

( ) Connect the center lead of the shielded wire from pin 7 of tube V3 to MM3 (NS). Connect the ground lead at this end to MM4 (NS).
( ) Prepare another 12 1/2" length of shielded cable stripping as before. Connect the center lead at one end to MM3 (S-4). Connect the ground lead at this end to MM4 (S-7). Run the other end of this cable down to the chassis, then over to the center frame, through the cut out in the rear edge, leaving this end free temporarily.

Connect the wires at BO#5 as follows:

( ) Violet lead to relay terminal N6 (S-1).
( ) The heavy red wire to N3 (S-1).
( ) The white wire to N10 (S-1).
( ) Leave the yellow and gray wires free.
( ) Cut a 2 1/4" length of white hookup wire, stripping both ends 5/16". Connect from N11 (S-1) to M1 ((S-2) if for 12-volt filament operation, (NS) if for 6-volt operation).

NOTE: At this point if it has been decided this unit will operate at 12-volt filament voltage, proceed to Wiring of the Modulator Section. If, however, 6-volt filament operation has been chosen and the 11Ω resistor has been omitted from terminal strip M, run a white wire jumper from lug M1 (S-2) to M3 (S-4).

Wiring of the Modulator Section

( ) Connect a 100 mmf disc ceramic capacitor between HH1 (NS) and HH2 (NS). Cut off excess lead length. See Figure 21 and position as shown.

( ) Connect a 2.2 megohm 1/2 watt resistor (red-red-green) between pin 7 of tube V5 (NS) and the ground lug opposite pin 9 of tube V5 (NS).

( ) Connect a .001 mfd disc ceramic capacitor between pin 7 of tube V5 (S-2) and HH1 (NS).

( ) Connect a #20 bare wire from HH2 (NS) through pin 8 of tube V5 (NS), through the center post (NS), through pin 4 of tube V5 (NS) and connect to pin 5 of tube V5 (NS).

( ) Connect a 3 1/2" #20 bare wire to the center post of tube V5 (S-2). Leave the other end free. Now solder pins 4, 5 and 8 of tube V5.

( ) Connect a 470 KΩ 1/2 watt resistor (yellow-violet-yellow) between pin 6 of tube V5 (NS) and GG4 (NS).

( ) Connect a 510 mmf silver mica capacitor (green-brown-brown) between pin 6 of tube V5 (S-2) and HH3 (NS).

( ) Using 1 3/8" of 1/8" sleeving, connect a #20 bare wire between pin 1 of tube V6 (NS) and GG2 (NS).

( ) Connect a 10 megohm 1/2 watt resistor (brown-black-blue) between pin 7 of tube V6 (S-2) and the ground lug opposite pin 9 of tube V6 (NS).

( ) Connect a 2.7 KΩ 1/2 watt resistor (red-violet-red) between pin 3 of tube V5 (S-1) and the solder lug opposite pin 9 of tube V5 (NS).

( ) Connect a 510 mmf silver mica capacitor (green-brown-brown) between pin 1 of tube V5 (NS) and pin 7 of tube V6 (NS). Use 3/4" of sleeving on both leads.

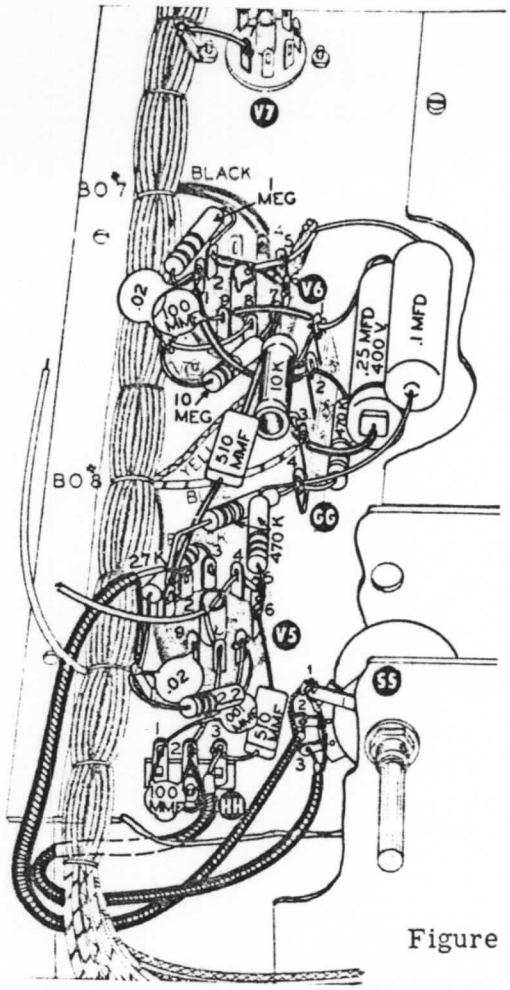


Figure 21

( ) Connect a 470 KΩ 1/2 watt resistor (yellow-violet-yellow) between pin 1 of tube V5 (S-2) and GG4 (NS).

( ) Connect a .02 mfd disc ceramic capacitor between pin 9 of tube V5 (S-2) and the ground lug opposite pin 9 of tube V5 (NS).

( ) Cut a length of shielded cable 5 1/2" long. Remove 1" of outer insulation from each end and unwind the shield wires to this point. Twist the shield wires together so as to form a pigtail. Cut the center conductor at each end to 1/2" from the outer insulation. Strip 1/4" at each end, tin lightly and connect the center conductor at one end to HH3 (S-2). The shield is connected to HH2 (S-3).

( ) The center conductor of the other end of the 5 1/2" cable is connected to control terminal SS3 (S-1). The shield connects to SS1 (NS).

( ) Prepare a second cable 6" long. Strip as above and connect the center conductor of one end to pin 2 of tube V5 (S-1). Slip 1/2" of 1/8" sleeving over the shield and connect to the ground lug opposite pin 9 of tube V5 (S-4).

( ) At the other end, connect the center conductor to SS2 (S-1), and the shield to the control solder lug (NS).

( ) Bend the control solder lug on the bushing of the 1 megohm control SS to contact terminal SS1. Now solder the control solder lug to terminal SS1, along with the two cable ground leads.

( ) Connect a 10 KΩ 5 watt resistor between GG1 (NS) and GG3 (NS). Position as shown.

( ) Connect a 470 KΩ 1/2 watt resistor (yellow-violet-yellow) between GG2 (S-3) and GG4 (NS).

(✓) Connect the .25 mfd 400 V paper capacitor between GG1 (NS) and GG3 (S-3). Use 1/2" sleeving on the lead to GG3. Place this capacitor over terminal strip GG and against the VFO shield.

(✓) Connect a .1 mfd molded paper capacitor between GG4 (S-4) and the ground lug opposite pin 5 of tube V6 (NS). Position on top of the .25 mfd capacitor and against the VFO shield.

(✓) Connect a #20 bare wire from the socket V6 center post (NS), through pin 5 of tube V6 (NS), and connect to the ground lug opposite pin 5 of tube V6 (S-2). Now solder the center post and pin 5 of tube V6.

(✓) Connect another #20 bare wire between pin 8 of tube V6 (S-1) and the ground lug opposite pin 9 of tube V6 (NS).

(✓) Slip one lead of a 1 megohm 1/2 watt resistor (brown-black-green) through pin 2 of tube V6 (NS), curve it around and clear of the center post and other pins, and connect to pin 6 of tube V6 (S-1). Use 1/2" of 1/8" sleeving between pins 2 and 6. Now solder pin 2 of tube V6. Connect the other end of the 1 megohm resistor to pin 1 of tube V6 (NS).

(✓) Connect a .02 mfd disc ceramic capacitor between pin 1 of tube V6 (S-3) and the ground lug opposite pin 9 of tube V6 (NS).

(✓) Slip one end of a 100 mmf disc ceramic capacitor through pin 9 of tube V6, bend up and over to GG1 (S-3). Use sleeving on this lead. Now solder pin 9 of tube V6. Connect the other end to the ground lug opposite pin 9 of tube V6 (S-4).

(✓) Connect a #20 bare wire between pin 7 of tube V7 (S-1) and the adjacent ground lug (S-1).

This completes the wiring of the modulator.

Final Wiring of the Final Amplifier Stage

Position the chassis so that you are looking at the rear and refer to Figure 22.

( ) Mount the amplifier plate coil (#40-86) by connecting the end farthest from the first tap to the solder lug at L on top of the chassis top plate (S-1).

( ) Dress the four coil taps up through the slot and connect the very end, or sixth coil lead to the solder lug at K (NS) on top of the chassis.

(✓) Slip four lengths of 1/8" sleeving over the four tap leads so that about 1/2" of wire shows at the switch end with the sleeving against the coil. Before connecting them in the following steps, form them as in Figure 22.

(✓) Form the tap closest to feed-through insulator K over to band switch terminal SC2 and solder. Be sure these taps do not touch the chassis.

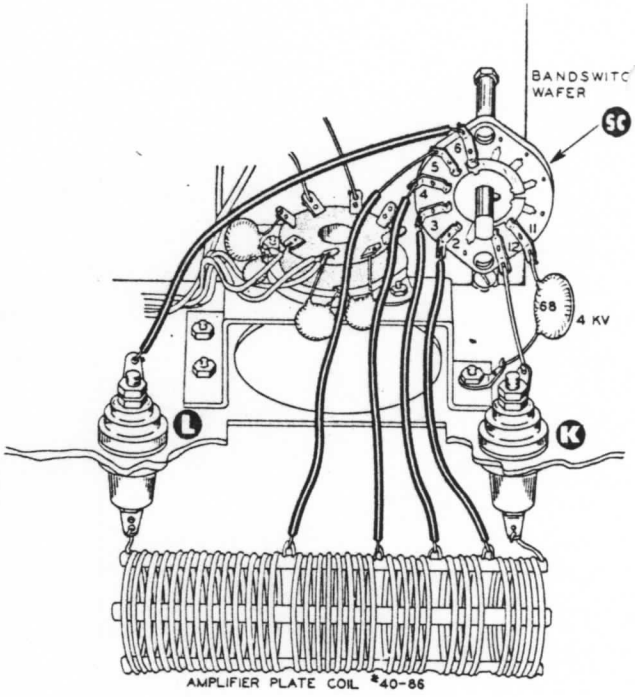


Figure 22

( ) Connect the next tap to SC3 (S-1).
( ) Connect the next tap to SC4 (S-1).
( ) Connect the next tap to SC5 (S-1). Trim this lead if necessary.

(✓) Form a #16 bare wire as shown and slip a 3 1/2" length of sleeving over it leaving 1/4" of wire exposed at each end. Connect one end to solder lug L below the top plate (S-1). Connect the other end to terminal SC6 (NS).

( ) Connect a 68 mmf 4 KV disc ceramic capacitor between SC11 (S-1) and the solder lug on the 6146 submounting bracket (S-1).

( ) Connect a length of heavy #16 bare wire between terminal SC12 (S-1) and feed-through insulator K (S-1).

This completes the wiring of the final amplifier.

Refer to Figure 23 for the following steps:

NOTE: Run the large hex nut all the way down on the female microphone connector before installing with the lockwasher and knurled nut on the outside of the frame.

( ) Locate the chassis base assembly (#100-M196) and mount the female microphone connector (#432-23) at location Z. Note that pin #2 is positioned toward the top of the chassis base.

( ) Mount a #6 solder lug in the hole next to the microphone connector using 6-32 x 1/4" BHMS and 6-32 nut.

( ) Mount the closed circuit key jack (#436-4) at location UU using a 3/8" control lockwasher on the bushing, securing with a 3/8" flat washer and nut on the rear apron.

( ) Pass one lead of a .02 mfd disc ceramic capacitor through pin UU2 (NS) to UU1 (S-1). Connect the other lead to UU3 (NS) and remove excess lead lengths.

( ) Mount the coaxial jacks (#436-5) at U and V from the inside of the chassis. Use 3-48 PHMS, #3 lockwashers and 3-48 nuts to secure.

( ) Mount the male Jones plug (#432-22) at W and the female plug (#432-25) at X from the inside of the chassis. Position as shown. Use 6-32 x 1/4" BHMS and include a #6 solder lug under the nut at W, nearest plug X. Use a #6 lockwasher on the other screw and secure both with 6-32 nuts.

( ) Mount the fuse block (#422-1) at Y. Position as shown and secure with a 6-32 x 3/8" BHMS, #6 lockwasher and 6-32 nut.

CAUTION: Refer to the note on Figure 23 regarding negative and positive ground vehicles before proceeding. The following steps are for negative ground vehicles.

( ) Run a #20 bare wire through X3 (NS), through X6 (NS) and connect to the ground lug opposite X6 (NS). Now solder X6 and X3.

( ) As before, run a #20 bare wire through W3 (NS), through W6 (NS) and connect to the ground lug opposite W6 (S-2). Now solder W6 and W3.

( ) Using black hookup wire, connect W4 (S-1) to X4 (S-1). Position this wire as shown.

( ) Connect one end of a 4 1/2" orange hookup wire to X1 (NS). Leave the other end free.

( ) Connect one end of a 4 1/2" #18 heavy red insulated wire to W2 (S-1). Leave the other end free.

( ) Connect one end of a 4 1/2" red hookup wire to W1 (S-1). Leave the other end free.

( ) Strip one end of a 2 1/2" heavy gray stranded plastic wire 3/4". Strip the other end 1/4". Tin both leads lightly. Run the 3/4" end through X5 (NS) and connect to fuse block terminal Y1 (S-1). Now solder X5.

( ) Connect the 1/4" end to W5 (S-1).

When assembling the chassis base (#100-M196) to the chassis top plate (#205-M137), it will be necessary to slide the base over and along the top plate from the rear. Lift the cable harness up as far as possible along the sides so that the base will slide under it.

( ) Now slide the base into position and see that there are no wires or components caught between the base and the top plate. See Figures 23 and 24.

CAUTION - NOTICE!
Model MT-1

6 or 12 VOLT POSITIVE GROUND AUTOMOBILE OWNERS

This kit is shown wired for negative grounded automobiles. If your car operates with a positive ground (as evidenced by the positive battery terminal being connected to the vehicle frame), regardless of the power supply to be used, the following steps should be changed to read:

Page 32, Steps 10 and 11

5 instead of 6

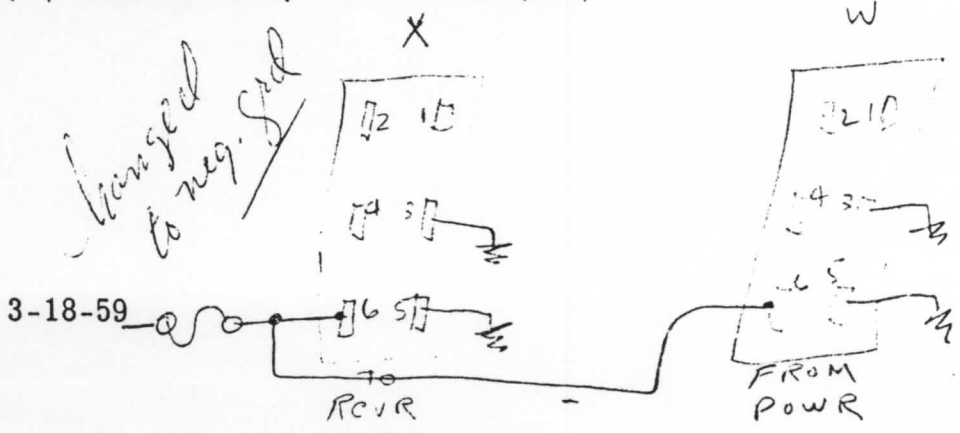
( ) Run a #20 bare wire through X3 (NS), through X5 (NS) and connect to the ground lug opposite X6 (NS). Now solder X5 and X3.

( ) As before, run a #20 bare wire through W3 (NS), through W5 (NS) and connect to the ground lug opposite W6 (S-2). Now solder W5 and W3.

Page 32, Steps 16 and 17

( ) Strip one end of a 2 1/2" heavy gray stranded plastic wire 3/4". Strip the other end 1/4". Tin both leads lightly. Run the 3/4" end through X6 (NS) and connect to fuse block terminal Y1 (S-1). Now solder X6.

( ) Connect the 1/4" end to W6 (S-1).



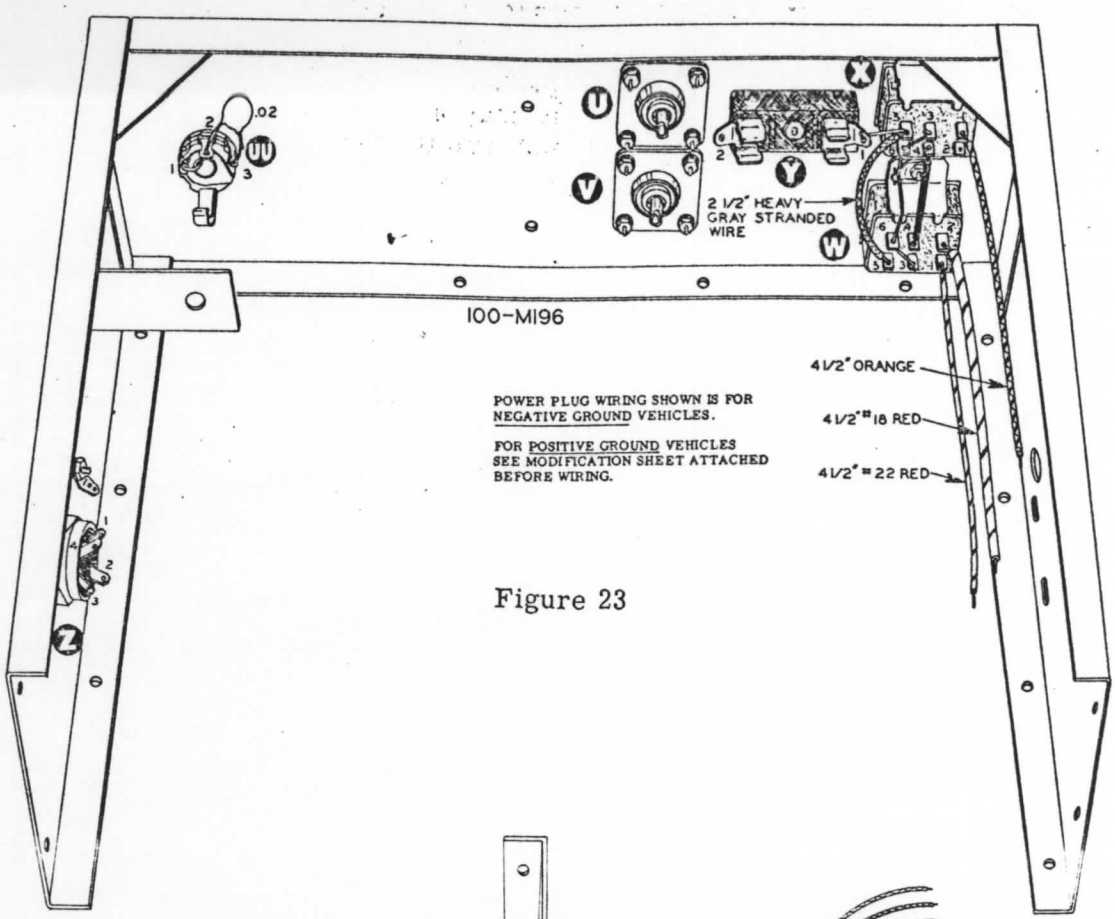


Figure 23

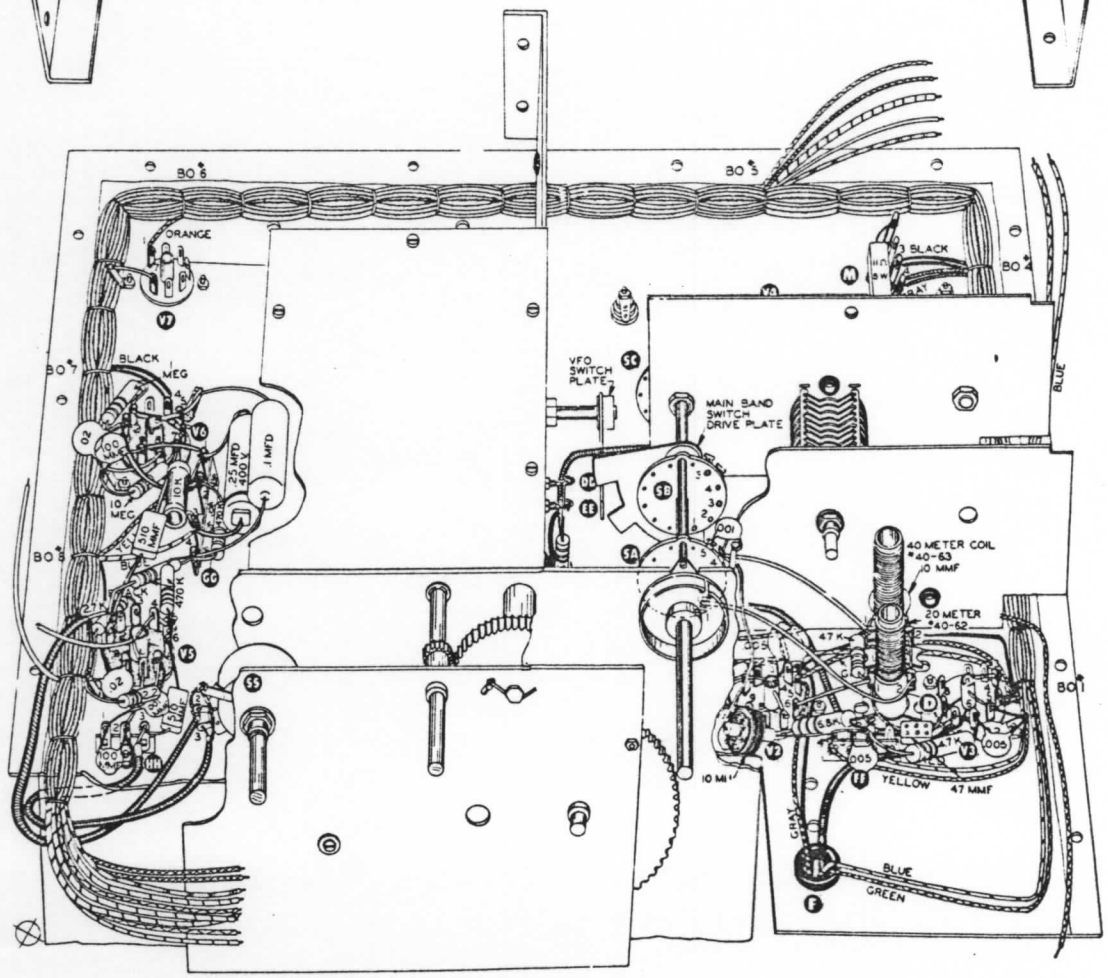


Figure 24

(✓) Secure this assembly with 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nuts around the edges of the top plate and through the chassis base side and rear. There should be a total of 17 fasteners used in this operation. Nut starters and screw holders will make this easier to perform. In extremely tight places nuts may also be held by laying a piece of solder across the nut and forcing the solder part way into the threads with pliers, thus forming a narrow handle. Allow the screws holding the front and rear shield plates to the chassis side, to remain loose for later shaft alignment.

Refer to Figure 25 for the following steps:

(✓) Connect the red wire from W1 to relay terminal N4 (S-1). Be careful not to burn the insulation on surrounding wires.

( ) Connect the #18 red wire from W2 to N2 (S-1).

(✓) Connect the yellow wire from BO#5 to X1 (S-2).

(✓) Connect the orange wire from X1 to relay terminal N5 (S-1).

( ) Connect the gray wire from BO#5 to fuse block terminal Y2 (S-1).

(✓) Connect a short length of the #16 heavy bare wire between N9 (S-1) and the coaxial jack V (S-1). Position as shown.

( ) Referring to Figures 23 and 39A, connect the center conductor of the shielded cable passing through the rear edge center frame cutout, to key jack terminal UU3 (S-2). Connect the shield braid at this end to UU2 (S-2).

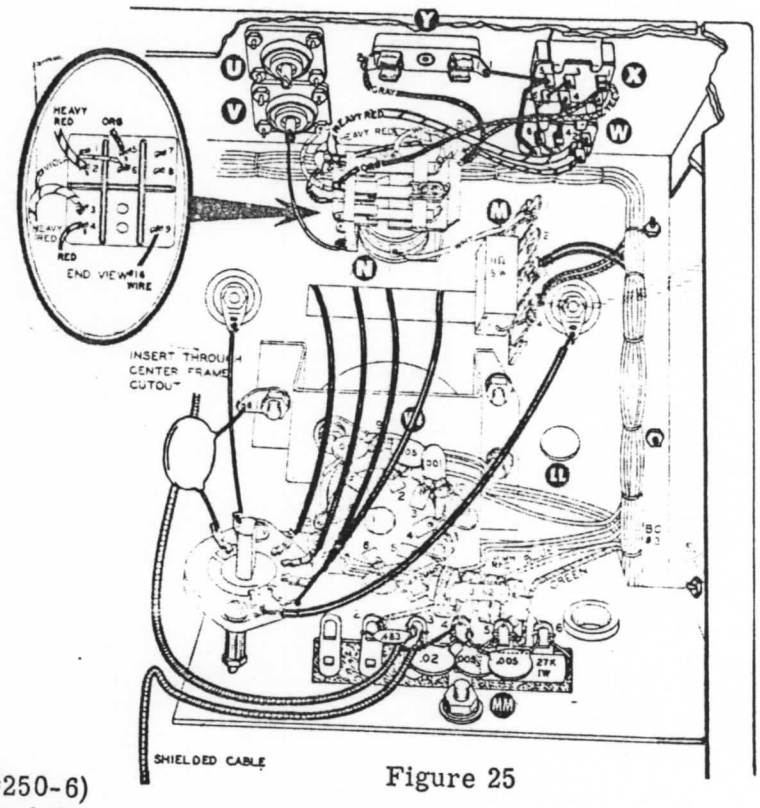


Figure 25

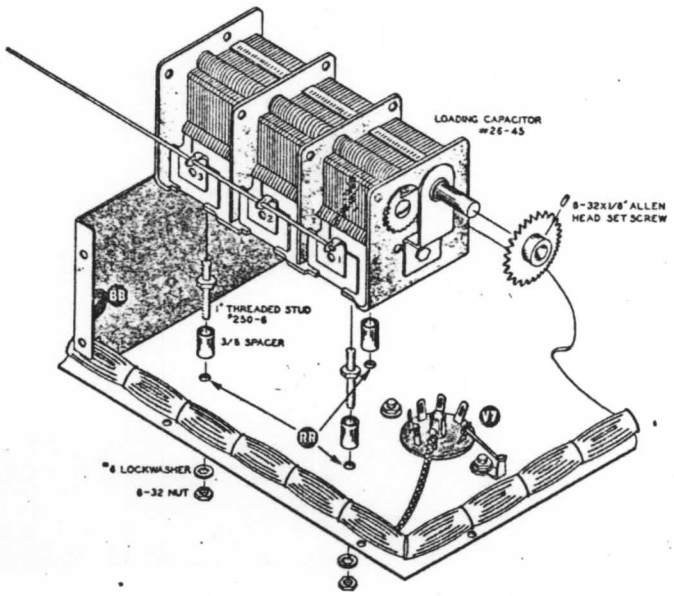
(✓) Locate the three 1" threaded studs (#250-6) with the hex cap 1/4" from one end and the large 3-gang variable loading capacitor (#26-45). See Figure 26.

(✓) Secure the 1/4" end of the threaded studs in the three tapped holes in the bottom of this capacitor.

(✓) Using a pair of pliers, position lugs 1, 2 and 3 of the loading capacitor to the side and carefully twist the lugs a quarter turn so the holes line up horizontally.

(✓) Run one end of a 5 1/2" length of #16 bare wire through lug 1 (NS), then on through lugs 2 and 3 making sure this wire does not touch the capacitor frame. Now solder all three.

(✓) Bend the lugs on the other side of the capacitor up so they will not touch the VFO shield.



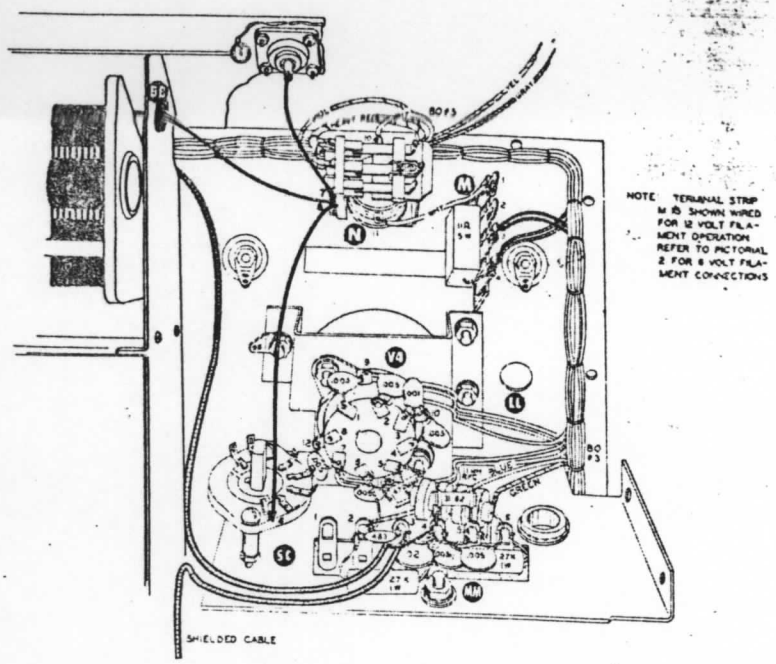


Figure 27

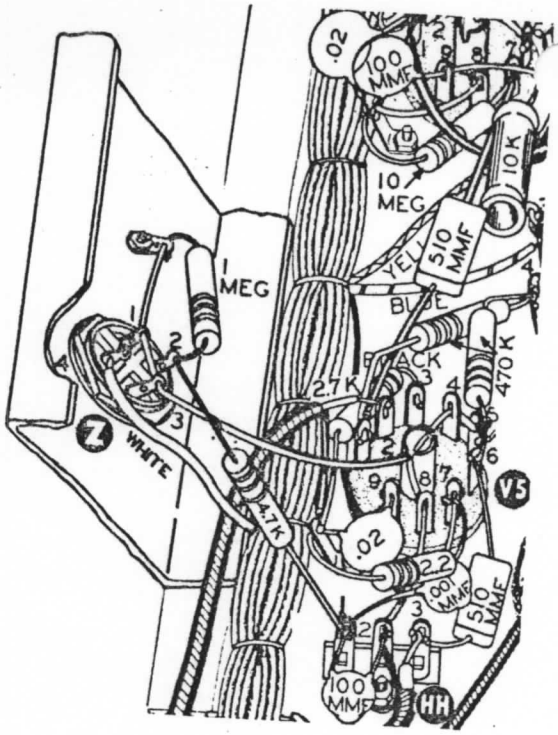


Figure 28

( ) Place the 3/8" spacers (#255-3) over the threaded studs and mount the capacitor at locations RR on the chassis top plate, as shown. Run the #16 wire through hole BB and leave free. Secure the threaded studs to the top plate with #6 lockwashers and 6-32 nuts.

( ) Now connect the #16 wire passing through grommet BB to relay lug N8 (NS). See Figure 27.

( ) Cut a #16 bare wire to 2 3/4". Connect one end to relay lug N8 (S-2).

( ) Connect the other end of this wire to band switch lug SC6 (S-2).

( ) Connect a #16 bare wire between relay lug N7 (S-1) and the coaxial jack at U (S-1).

( ) Refer to Figure 28 and connect the white wire from BO#9 to the microphone connector lug Z4 (S-1).

( ) Connect a 4.7 KΩ 1/2 watt resistor (yellow-violet-red) between Z2 (NS) and HH1 (S-3).

( ) Connect a 1 megohm 1/2 watt resistor (brown-black-green) between Z2 (S-2) and the ground lug opposite Z1 (NS).

( ) Connect the #20 bare wire from V5 center post through Z3 (NS), through Z1 (NS) and connect to the ground lug opposite Z1 (S-2). Now solder Z1 and Z3.

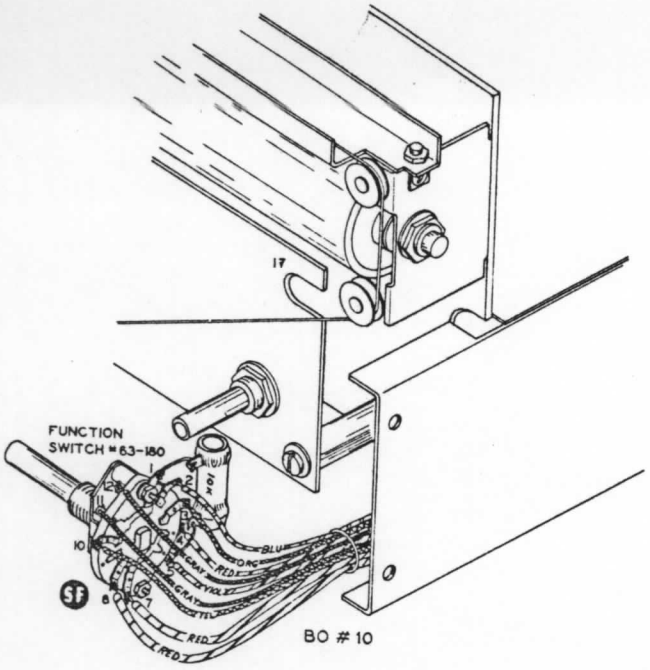


Figure 29

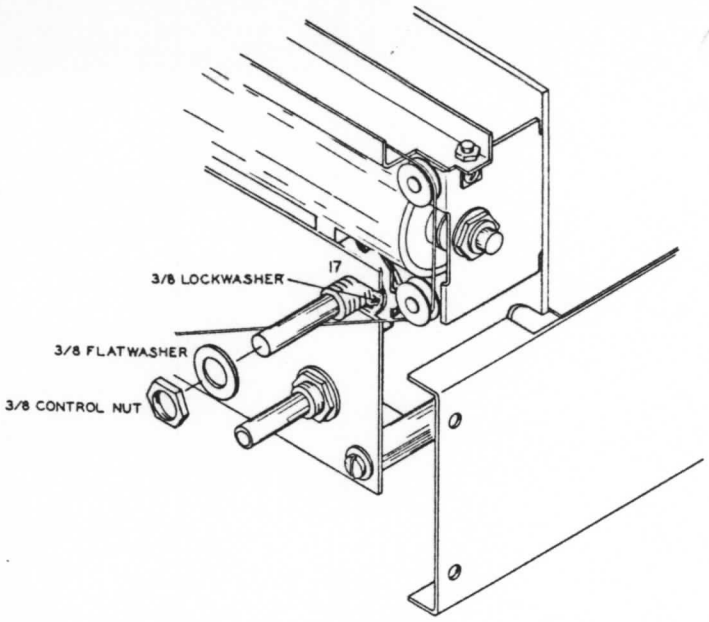


Figure 30

( ) Locate the function switch (#63-180), now designated as switch SF, and refer to Figure 29 to become familiar with the numbering sequence, making special note of the position of terminals and the rotor wafers. The switch is shown rotated fully counterclockwise.

( ) Connect a 10 KΩ 5 watt resistor between terminal SF1 (S-1) and terminal SF5 (NS). Position as shown.

Connect the wires at BO#10 as follows:

( ) Blue wire to terminal SF2 (S-1).

( ) Orange wire to terminal SF3 (S-1).

( ) Small red wire to terminal SF4 (S-1).

( ) Violet wire to terminal SF5 (S-2).

( ) Either heavy red wire to terminal SF7 (S-1).

( ) Remaining heavy red wire to terminal SF8 (S-1).

( ) Yellow wire to terminal SF10 (S-1).

( ) Either gray wire to terminal SF11 (S-1).

( ) The remaining gray wire to terminal SF12 (S-1).

( ) Now mount the function switch at location 17 on the front dial plate. Positioning is not critical here. Refer to Figure 30. Use a 3/8" lockwasher over the bushing and secure with a control nut and flat washer on the front side. Push the other wires to the rear but be sure no connections are shorted.

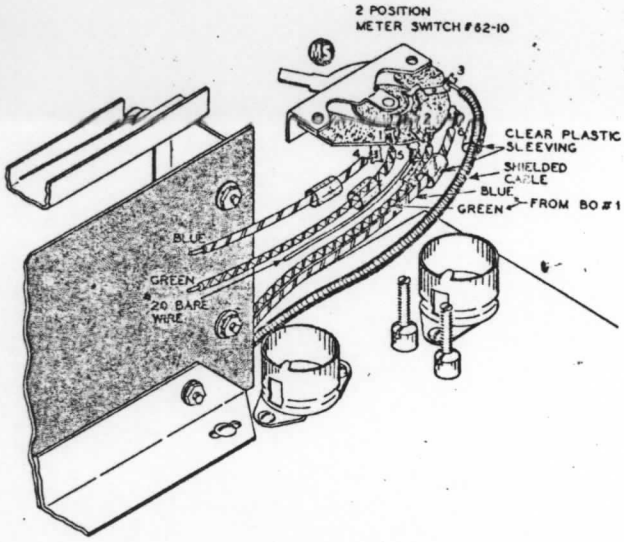


Figure 31

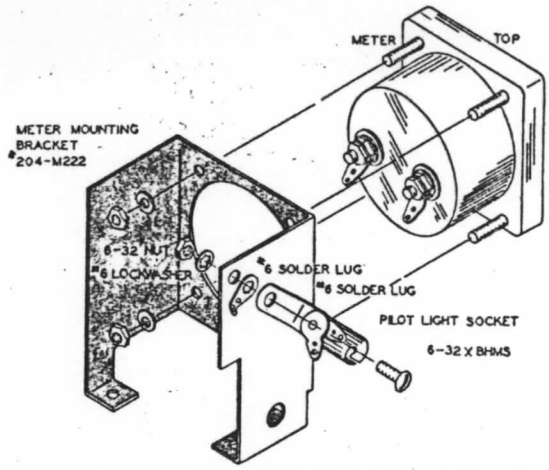


Figure 32

( ) Locate the lever action 2-position meter switch (#62-10), now designated as switch MS. Referring to Figure 31, note the detent spring is positioned toward the chassis bottom and this side shows terminals 4, 5 and 6 beginning with the colored terminal which is #4. The opposite side shows terminals 1, 2 and 3 beginning with the colored terminal, which is #1. Now connect the blue and green wires at BO#1 (after placing 1/2" of clear 3/16" plastic sleeving on each lead) as follows:

( ) The blue wire to terminal MS6 (S-1). Now slide the sleeving down over the terminal.
( ) The green wire to terminal MS2 (S-1). Now slide the sleeving over this terminal.
( ) Connect a 2 1/2" green hookup wire to terminal MS1 (S-1). Slide 1/2" of 3/16" clear plastic sleeving over this terminal and leave the other end of the wire free.
( ) Connect a 2" blue hookup wire to terminal MS4 (S-1). Slide 1/2" of 3/16" clear plastic sleeving over this terminal and leave the other end of the wire free.
( ) Connect a 4" length of #20 bare wire to MS5 (S-1). Leave the other end free.

( ) Place a 1/2" length of clear plastic sleeving over the cable coming from grommet F and connect the center lead to meter switch terminal MS3 (S-1). Now slide the sleeving over the terminal. Allow the switch to remain free temporarily.

( ) Locate the meter mounting bracket (#204-M222) and mount the milliammeter (#407-60) to the bracket using the hardware provided with the meter. Do not tighten the nuts excessively as it is possible to crack the meter case.

( ) Referring to Figure 32, mount a pilot light socket on the side of the bracket as shown, using a 6-32 x 1/4" BHMS, a large #6 solder lug under the mounting foot and securing with a #6 lockwasher and 6-32 nut. Now set the meter and bracket aside.

( ) On a 6-32 x 3/4" RHMS, assemble hardware in the following order: a large #6 flat washer, a 1/8" spacer, another large #6 flat washer, a 3/16" spacer and a #6 lockwasher. Now secure with a 6-32 nut. Refer to Figure 33. This assembly becomes a string guide pulley.

( ) Locate the string guide bracket (#204-M229) with the 3 holes and mount the string guide pulley on the side with the single hole, using a #6 lockwasher and a 6-32 nut. Face it away from the bracket as shown.

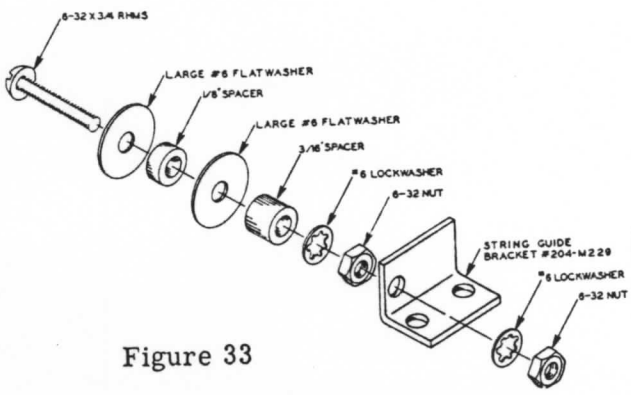


Figure 33

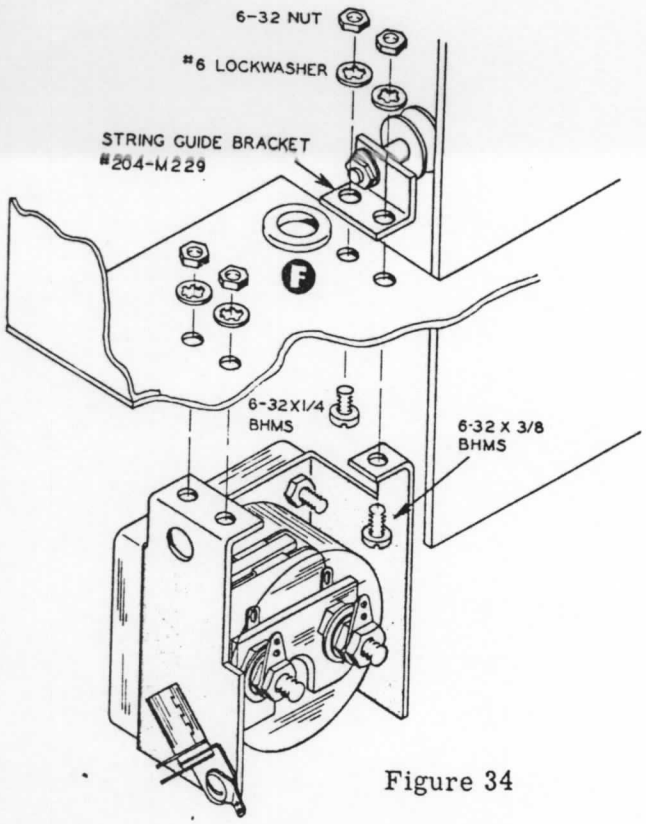


Figure 34

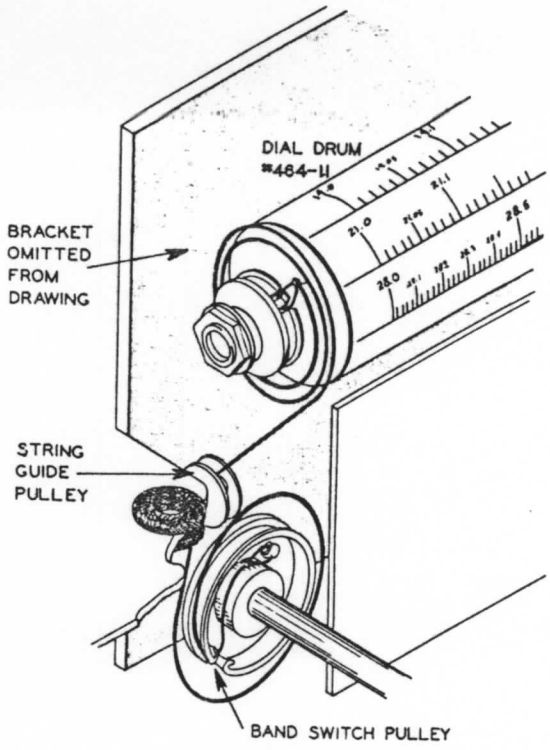


Figure 35

( ) Position this assembly on the underside of the main chassis top plate, as shown in Figure 34, and secure with a 6-32 x 1/4" BHMS through the front hole only, keeping the rear hole aligned, completing with a #6 lockwasher and a 6-32 nut from the chassis underside.

( ) Place a knob temporarily on the band switch shaft for the following steps, after which this knob may then be removed.

( ) Referring to Figure 35, secure a small loop in one end of the remaining length of dial cord. Prepare this loop as before. Slip the loop over the prong in the gap on the rim of the small dial drum pulley. Looking at the end of the drum, wrap two turns around this pulley in a clockwise direction, then allow the other end to hang free temporarily. The cord should be coming down off the front of the pulley as shown.

( ) Now make one turn in a counterclockwise direction around the band switch pulley with the free end of the cord, without pulling the string tight enough to rotate the dial drum, and form a small loop.

( ) Place the loop over the hook on the band switch pulley and route the cord through the gap in the pulley, as shown. Now dress the cord to the rear of the string guide pulley and rotate the band switch pulley in a counterclockwise direction on the band switch shaft until a slight tension exists. Tighten the pulley in this position.

( ) Now, rotate the dial drum on its shaft until the 10-meter calibration faces straight outward with the band switch in the 10-meter position. Tighten the setscrew.

( ) Now mount the meter mounting bracket, in which the meter has previously been installed, on the top side of the chassis and secure with two 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nuts. Use a 6-32 x 3/8" BHMS on the mounting screw which passes through and secures the string guide pulley bracket just installed. Refer to Figure 34.

( ) Carefully place the meter switch between the meter bracket mounting feet and slide to the rear. It may be necessary to bend the terminals slightly to pass this switch through the opening. Exercise care in doing so.

( ) Connect the green wire from meter switch terminal MS1 to lug 1 on the meter (NS), and the blue wire from terminal MS4 to lug 2 on the meter (NS). Refer to Figure 36.

( ) Connect a .005 mfd disc ceramic capacitor between lugs 1 and 2 on the meter and solder both connections.

( ) Connect the gray wire from BO#1, now passing through grommet F, to lug ML1 on the meter pilot light socket (NS). The black wire connects to lug ML2 (NS).

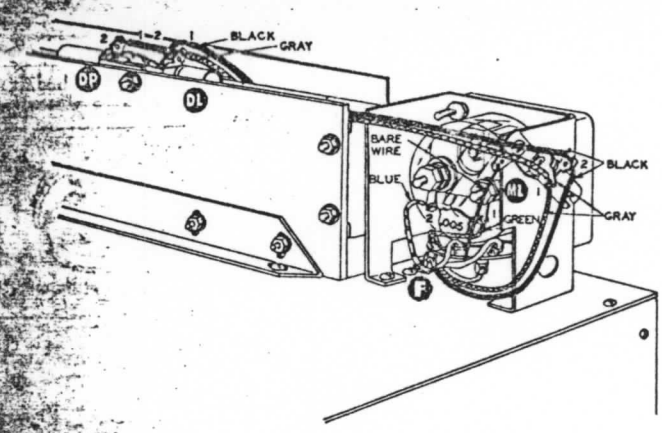


Figure 36

( ) Connect the 1/4" end of an 8 1/2" gray hookup wire, after stripping one end 1/4" and the other end 1", to lug ML1 on the meter pilot light socket (S-2). Run the other end through lug DL1 on the nearest pilot light socket and connect to lug DP2 on the other socket. Use 1/8" sleeving between socket terminals. Solder both connections

( ) Connect the 1/4" end of an 8 1/2" length of black hookup wire, after stripping one end 1/4" and the other end 1", to lug ML2 on the meter light socket (S-2). Run the other end through lug DL2 on the nearest pilot light socket and connect it to lug DP1 on the other socket. Solder both connections.

( ) Position the pilot light lugs so they will not short together or to the cabinet when later installed. Insulated sleeving may be used for protection.

( ) Connect the other end of the bare wire from meter switch terminal MS5 to the ground lug under pilot light bracket ML (S-1). Position this wire so it touches no other meter wiring.

Refer to Figure 36A for the following steps:

( ) Locate the dial pointer (#463-15) and place it on the pointer bracket above the dial drum.

( ) Rotate the VFO shaft fully counterclockwise and run the dial cord through the pointer pins on the rear of the pointer as shown in Figure 36A. The cord may be protected with Scotch tape if desired.

( ) Position the pointer so there are equal spaces between the pointer and band edge calibration marks at both ends of the dial drum when the VFO shaft is rotated against the stops when in the 80-meter position. Then bend the center pin on the rear of the pointer up to secure it firmly to the dial cord. Use care not to cut the cord if tape is not used.

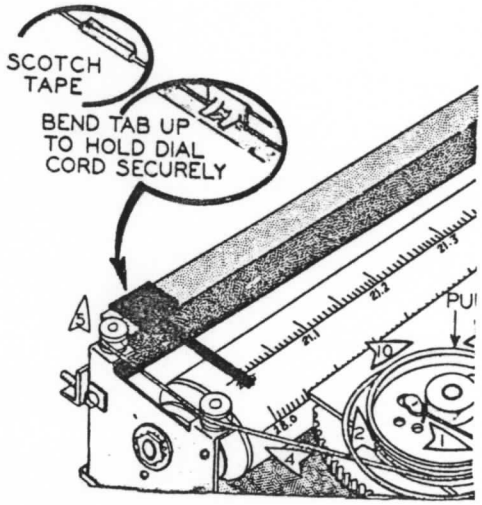


Figure 36 A

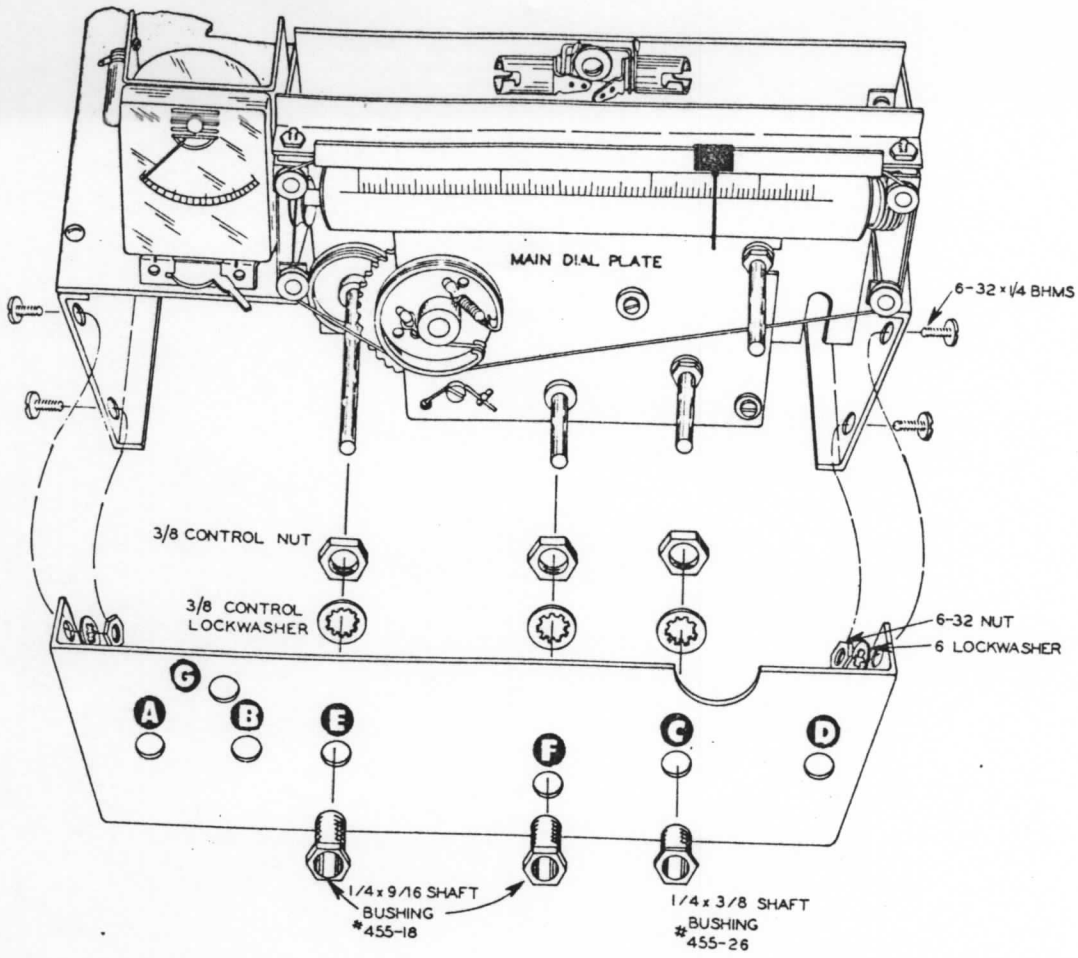


Figure 37

Refer to Figure 37 for the following steps:

NOTE: To insure perfect alignment of the shafts through the front panel it is necessary to temporarily mount the front panel mounting bracket (#204-M223) to the chassis base with 6-32 x 1/4" hardware. Before doing so, however, mount 1/4" x 9/16" bushings at locations E and F and a 1/4" x 3/8" bushing at location C from the front of the front panel mounting bracket, securing them with 3/8" nuts from the rear.

( ) Loosen the nuts on the spade lugs on the main dial plate which hold the center frame and VFO shield.

( ) Loosen the nuts on the top plate bracket.

( ) Now mount the front panel mounting bracket to the chassis base with the 6-32 x 1/4" hardware previously mentioned, sliding the bushings carefully over the shafts.

( ) Position the tuning assembly so all shafts are aligned and free turning. When it has been determined the shafts are aligned and turn free in the bushings, tighten all nuts previously loosened.

( ) Now remove the front panel mounting bracket and the bushings.

Refer to Figure 37A for the following steps:

( ) Locate the finished front panel (#203-168F248-252) and, using care not to mar the painted surface, fasten the front panel mounting bracket to it by inserting 1/4" x 9/16" bushings from the front at holes A, B, E and D as shown and a 1/4" x 3/8" bushing at C, securing all with 3/8" lockwashers and nuts from the rear.

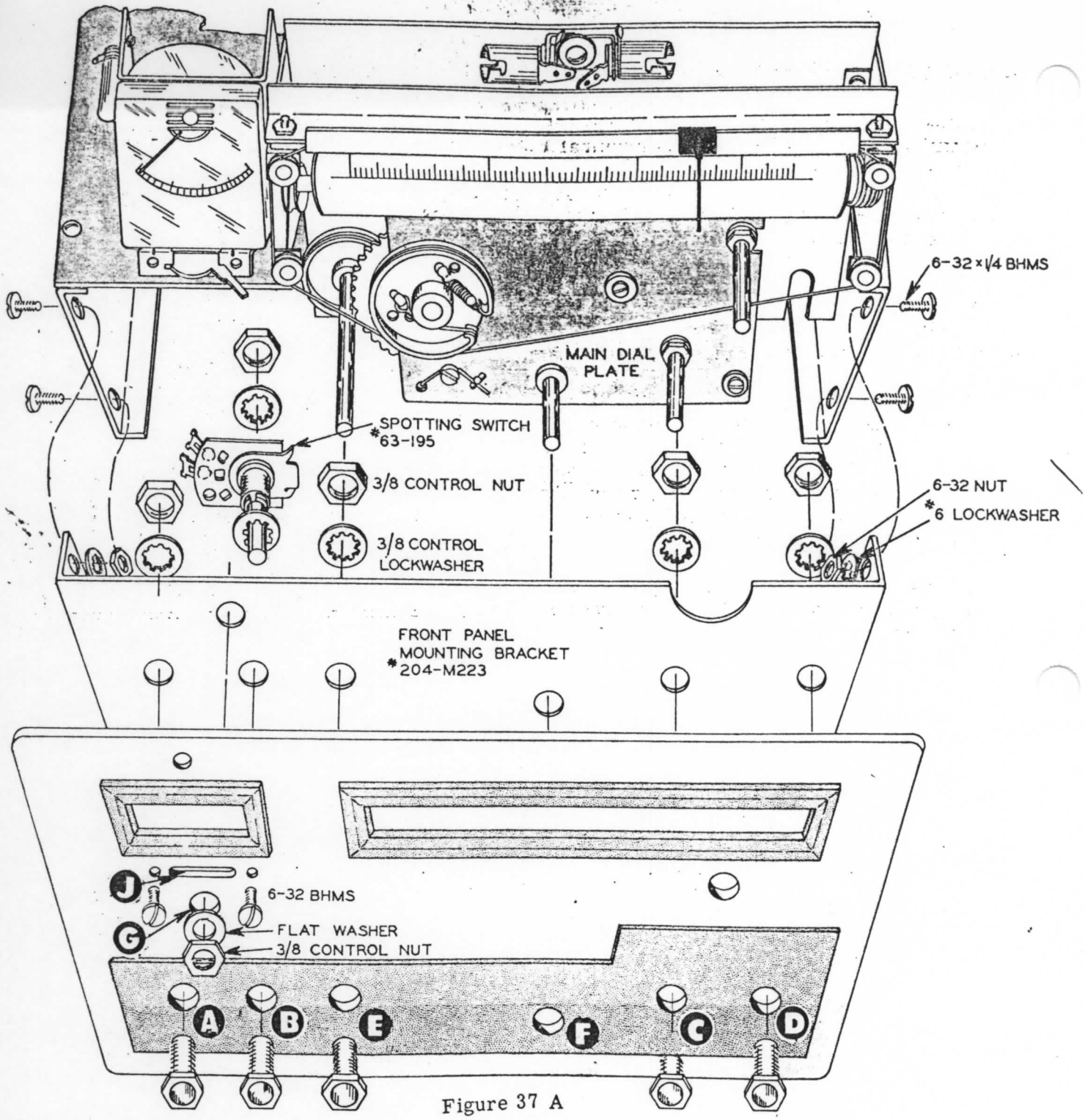


Figure 37 A

( ) Locate the SPST rotary spotting switch (#63-195) and, placing a 3/8" lockwasher on the bushing, mount this switch at hole G as shown. Secure with a 3/8" control flat washer and nut from the front panel and position the switch terminals as shown in Figure 38 on page 42.

( ) Now mount the front panel and mounting bracket assembly to the chassis base, after first sliding the shafts carefully through the bushings, and secure with four 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nuts. Be sure the lever of the meter switch passes through slot J in the front panel.

( ) Secure the meter switch to the front panel with 6-32 x 1/4" BHMS into the tapped switch mounting holes.

Refer to Figure 38 for the following steps:

(√) Connect a 15 KΩ 10 watt resistor between terminal strip lug FF2 (S-6) and terminal 1 on the spotting switch (S-2).

( ) Connect the orange wire from KK3 to terminal 1 on the spotting switch (S-2).

( ) Connect a 15 KΩ 2 watt resistor (brown-green-orange) between spotting switch terminal 2 (S-1) and FF4 (S-2).

Refer to Figures 39 and 40 for the following steps:

( ) Locate final tuning capacitor (#26-31) and remove the flat washers and nut supplied. Now mount this capacitor at location LL from the top of the chassis, using a 3/8" small control lockwasher on the top side of the chassis and a 3/8" flat control washer and control nut underneath.

( ) Locate the four right angle drive gears (#451-18) and insert 8-32 x 1/8" hex setscrews in all bushings.

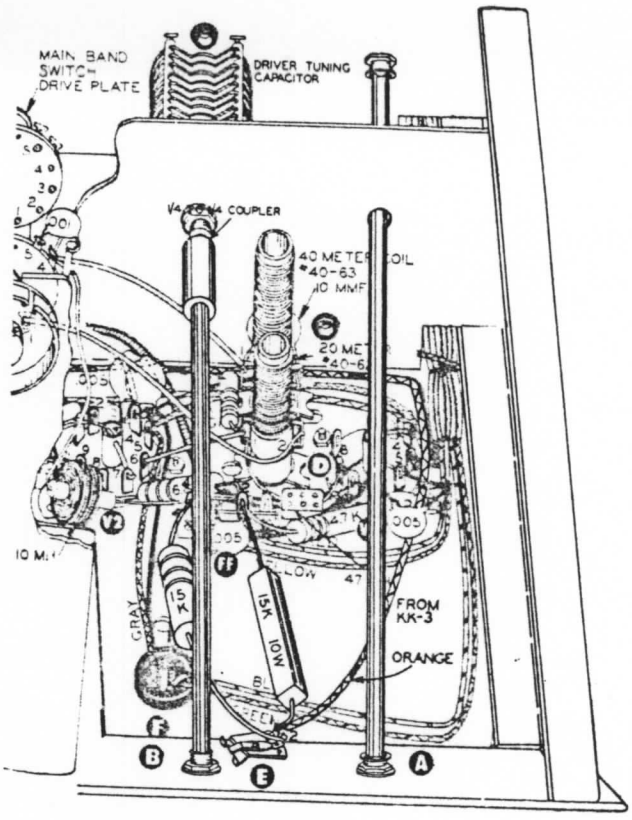


Figure 38

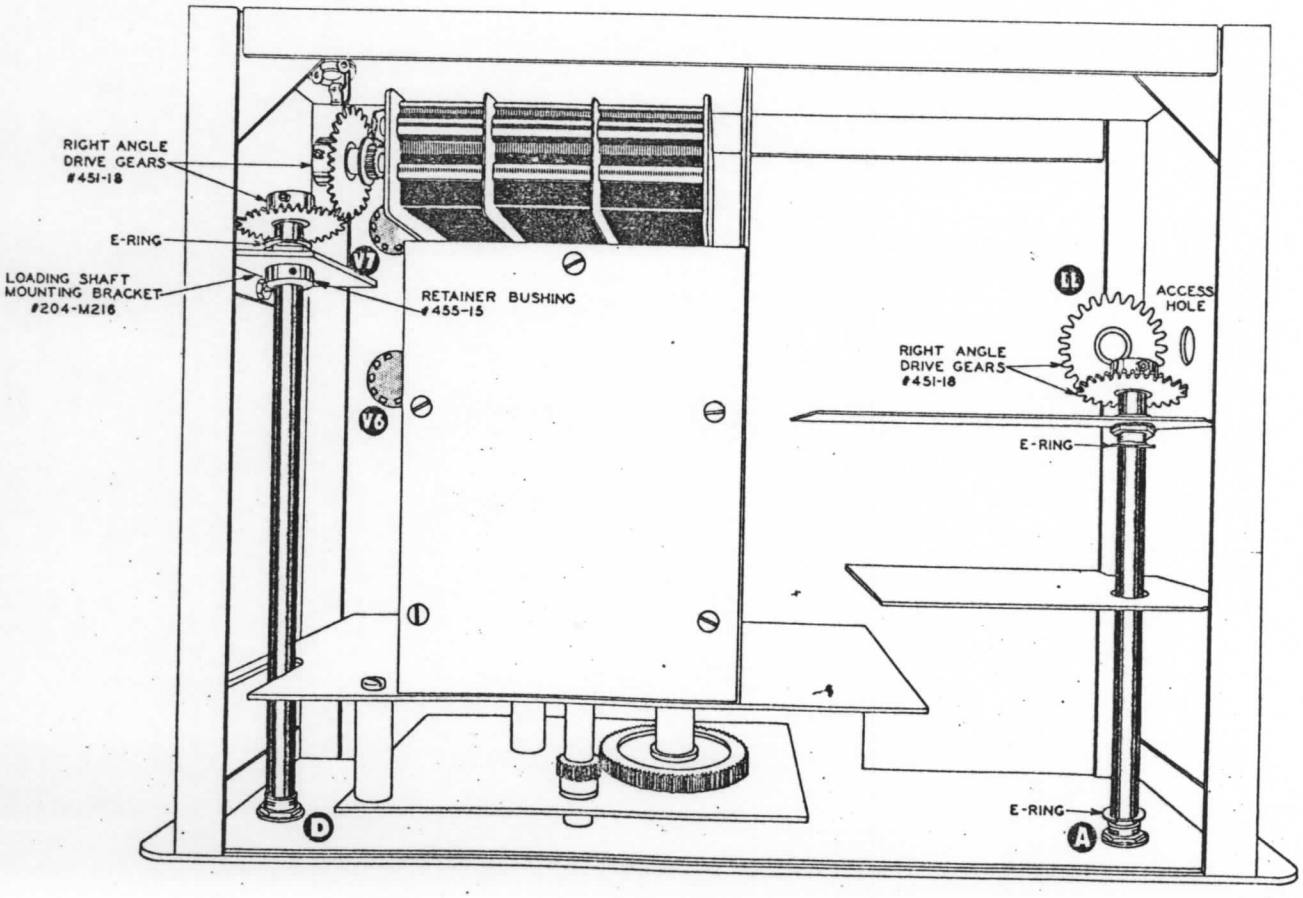


Figure 39

( ) Slide a right angle drive gear over the final tuning capacitor shaft, hub down, and fasten temporarily.

( ) Referring to Figure 39, slide the final tuning shaft (#453-72) through bushing A (the end with the E ring groove located 15/16" from the end first) then through the remaining bushing in the rear shield plate. Secure the shaft on the threaded side of bushing A by placing an E retainer ring in the groove. Insert another E ring on this shaft in front of the rear shield plate bushing.

( ) Place another right angle drive gear on the final tuning shaft just installed. Adjust the two gears until they mesh smoothly and secure with setscrews. Note that the setscrew in the gear on the capacitor shaft is best secured through the access hole in the side of the chassis base. Be sure this gear clears the adjacent RF choke.

( ) Again referring to Figure 38, locate the driver tuning shaft (#453-75) and insert it through hole B in the front panel. Placing the 6-32 x 1/8" slotted setscrews in the 1/4" to 1/4" shaft coupler, secure the tuning shaft to the driver capacitor shaft. Now secure the tuning shaft to the coupler.

( ) Locate the loading shaft mounting bracket (#204-M216) and mount a 1/4" ID x 1/4" long shaft bushing in the upper hole. Use a control lockwasher under the nut and secure on the side away from the flange, using a 3/8" control nut. Now mount this bracket on the left side of the chassis base as shown. The flange should be toward the front of the chassis. Secure with 6-32 x 1/4" BHMS, #6 lockwashers and 6-32 nuts, temporarily.

( ) Locate the loading capacitor shaft (#453-71 , longest shaft with E ring groove) and slide through the bushing at location D (E ring groove first). Place a shaft retainer bushing with setscrew on the shaft, then slide the shaft through the loading shaft mounting bracket just mounted.

( ) Place an E ring on the loading capacitor shaft in the groove behind the mounting bracket bushing. Take up the excess shaft movement by positioning the retainer bushing close to the mounting bracket bushing. Tighten the setscrew.

( ) Slide one right angle drive gear over the loading capacitor shaft, hub facing outward, and another over the shaft just installed at location D, in a similar manner. Adjust the gears until they mesh smoothly and secure with the setscrews. Now tighten the loading bracket mounting screws permanently.

Return the Transmitter to its normal position and focus your attention on the area around V4 on the top side of the chassis.

( ) Mount the .425 mh RF choke (#45-41) on the driver coil mounting screw just in front of the final tuning capacitor, as shown in Figure 40. Use a #6 fiber washer over the coil mounting screw and nut. Do not tighten excessively. Bend the #2 choke lug flat so this connection is no higher than absolutely necessary. Form the #1 choke lug as shown to facilitate tightening.

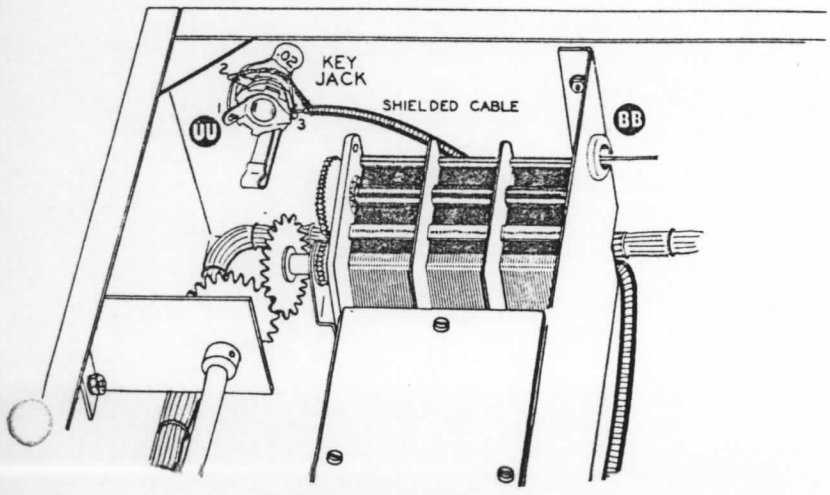


Figure 39 A

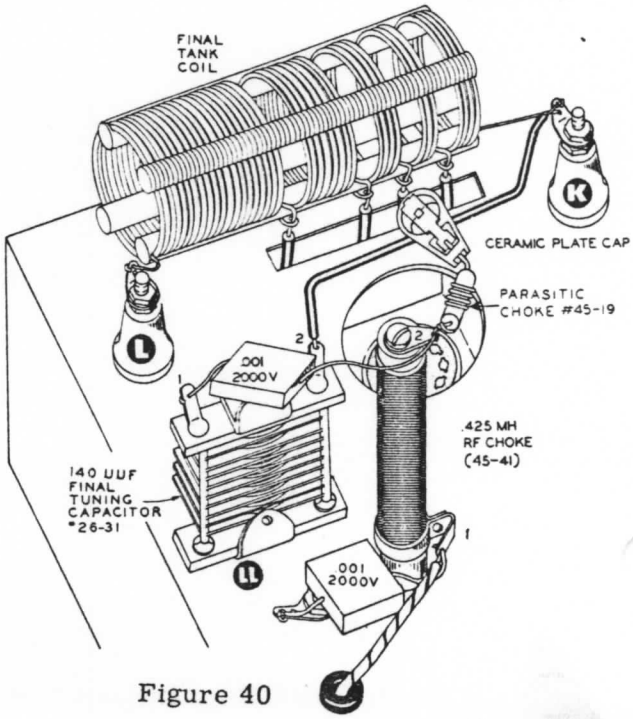


Figure 40

(√) Connect the heavy red wire from the 5/16" grommet to lug 1 on the RF choke (NS).

(√) Connect a .001 mfd 2000 volt mica capacitor between lug 1 of the RF choke (S-2) and the ground lug nearby (S-1).

(√) Connect another .001 mfd 2000 volt mica capacitor between lug 2 of the RF choke (NS) and lug 1 on the final tuning capacitor (S-1).

(√) Carefully place the 6146 tube in its socket to the front of the final tank coil.

(√) Connect a #16 bare wire between lug 2 of the capacitor (S-1) and the solder lug at K (S-2). Use 1/8" sleeving and form this wire to pass around the 6146 final amplifier tube and away from the final amplifier rotor plates when in full open position.

(√) Connect the parasitic choke (#45-19, 4 turns of wire wound on a 47 Ω 1/2 watt resistor) (yellow-violet-black) to lug 2 on the RF choke (S-2). Connect the ceramic plate cap (#260-10) to the other end of the parasitic choke (S-1), after placing the cap on the tube to determine the correct length of the choke lead.

( ) Place the plate cap on the 6146 tube after soldering the cap to the choke.

Refer to Figure 40A for the following steps:

( ) Install the 9/16" fluted knobs on the function switch, audio gain control and spotting switch. Secure each with an 8-32 x 1/8" Allen head setscrew.

(√) Install the large 1 3/4" knob on the VFO tuning shaft, using two 8-32 x 1/4" Allen head setscrews.

( ) Slip the slotted push-on plastic knob (#462-80) on the meter switch shaft.

(√) Install 1 1/4" knobs on the remaining four shafts, indexing each so that they agree with the printing on the panel, and securing each with an 8-32 x 1/4" Allen head setscrew.

(√) Both the final tuning and loading capacitors should be in full mesh at zero front panel reading.

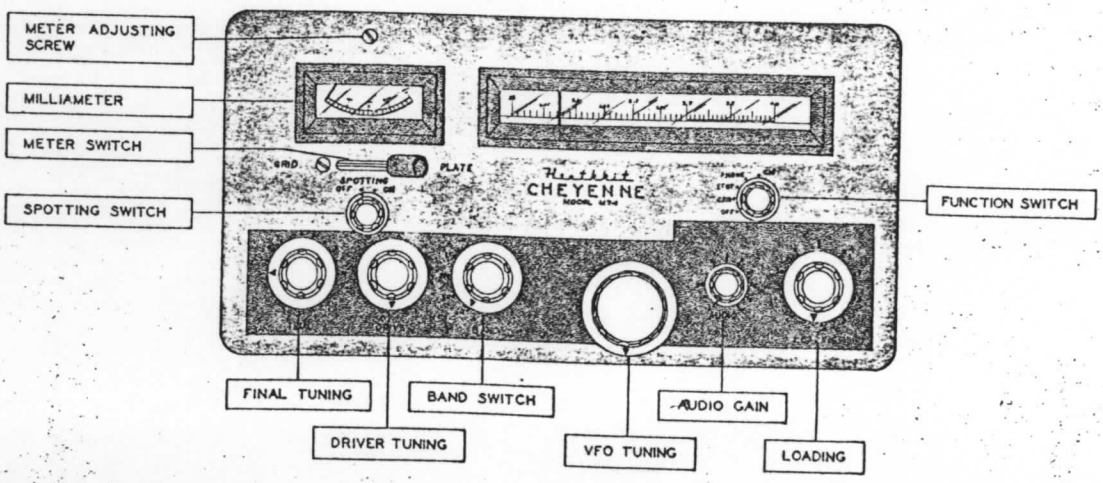


Figure 40 A

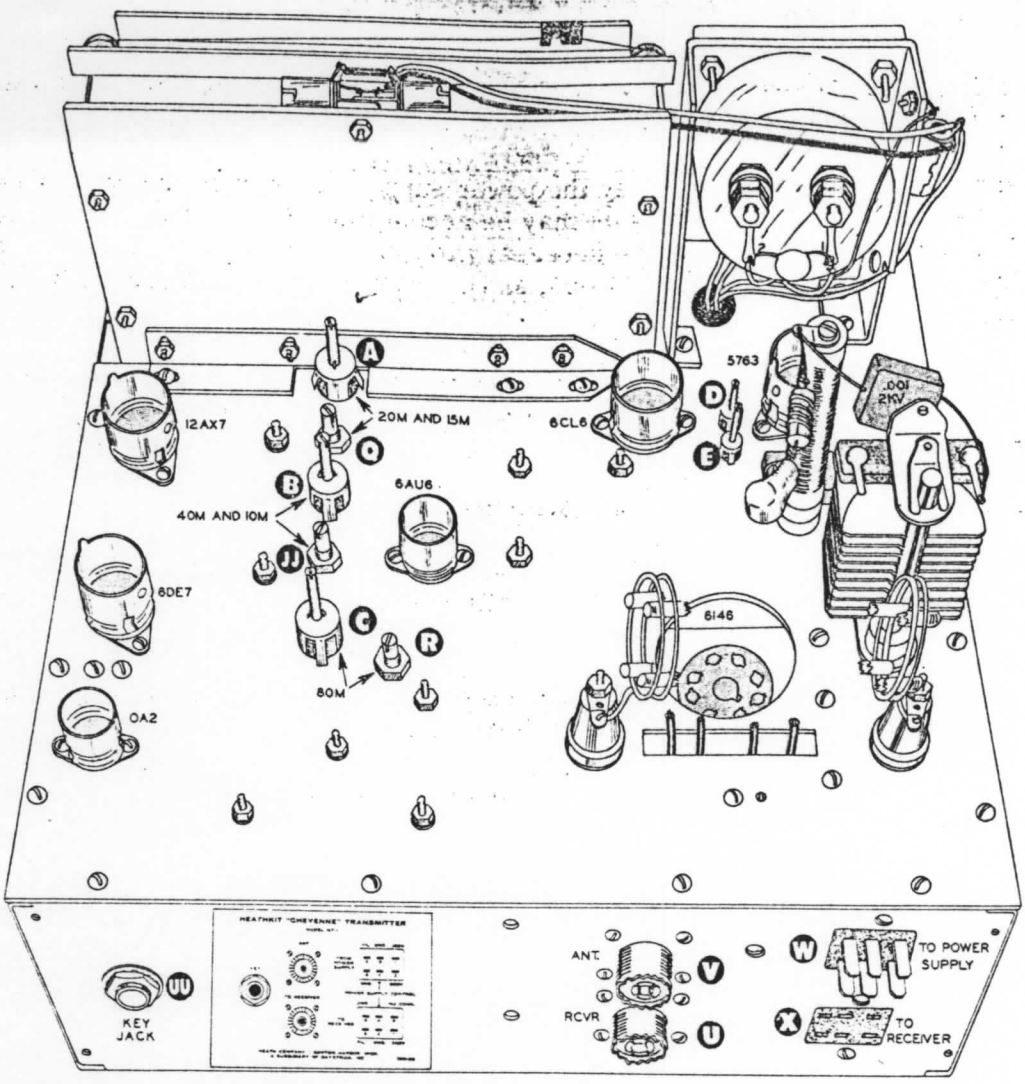


Figure 41

( ) Refer to Figure 41 and install all remaining tubes, the fuse and the pilot lights in their proper sockets. Use tube shields on all tubes except the 6146 final amplifier tube.

( ) Install pilot light shrouds (#206-86) over the meter pilot light and both dial drum pilot lights. These may be positioned to the rear to reduce light glare under night driving conditions.

( ) Install the label on the rear apron, as shown.

This completes assembly and wiring of your MT-1 "Cheyenne" Mobile Transmitter. Refer to Figure 42 before continuing with the preliminary checking.

Preliminary Checking

NOTE: The MT-1 "Cheyenne" was designed to be used with the Heathkit MP-1 Power Supply and the MR-1 "Comanche" Receiver. In this service the power supply is initially turned on by the receiver and remains on during operation. The low voltage

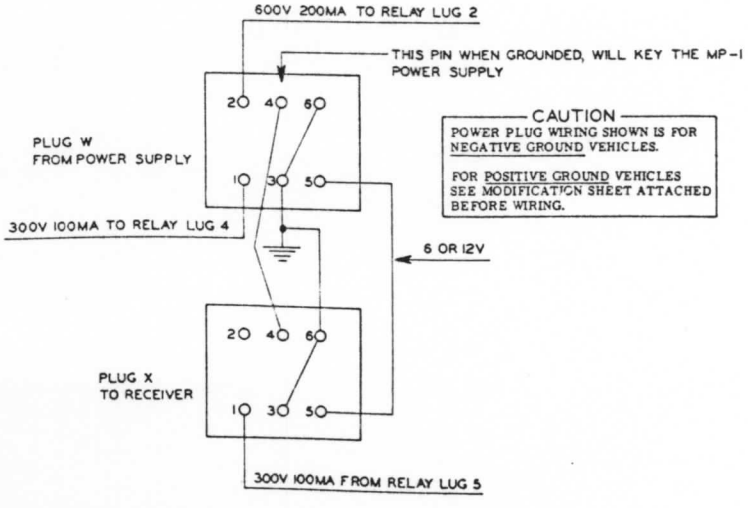


Figure 42

is removed from the receiver to allow full DC power to be applied to the Transmitter when the microphone button is depressed.

If it is desired that the Transmitter key the power supply, as may be the case when a receiver other than the "Comanche" is used, this may be accomplished by connecting a lead from lug 4 to lug 6 of the power socket. It may be necessary to connect this lead for the tests which follow, provided the receiver is not yet in operation, and the power supply used for testing is not running continuously.

( ) An 8-conductor cable is supplied with the MT-1 for later connection to the receiver. Prepare this cable by removing 3/4" of the outer cover insulation, stripping each of the separate wires 5/16" and lightly tinning.

( ) Place a 1 1/2" length of 1/4" plastic sleeving over the cable.

( ) Remove the pin from the side of the male Jones plug (#432-26) and slide the shell over the cable. The retaining pin may be more easily removed by pushing it out from the plain end than by pulling it out by the head.

( ) Refer to Figure 43 and connect the wires as indicated. Be sure none are shorting, then slide the shell back over the plug and reinsert the locking pin.

( ) Now slide the 1/4" sleeving as far down in the plug shell as it will go, then tighten the screws on the cable clamp.

NOTE: One female Jones plug (#432-21) is supplied and is intended to be used on the end of the 8-conductor cable supplied with the MP-1 Power Supply. The female Jones plug (#432-21) leading to the MR-1 Receiver is supplied with the Receiver kit. This plug is intended for use on the other end of the cable just prepared. If this cable is used between the MR-1 Receiver and MT-1 Transmitter in the combination AK-6 Mount, this cable length should be approximately one foot.

NOTE: No changes in cable connections are necessary for either negative or positive ground vehicle operation.

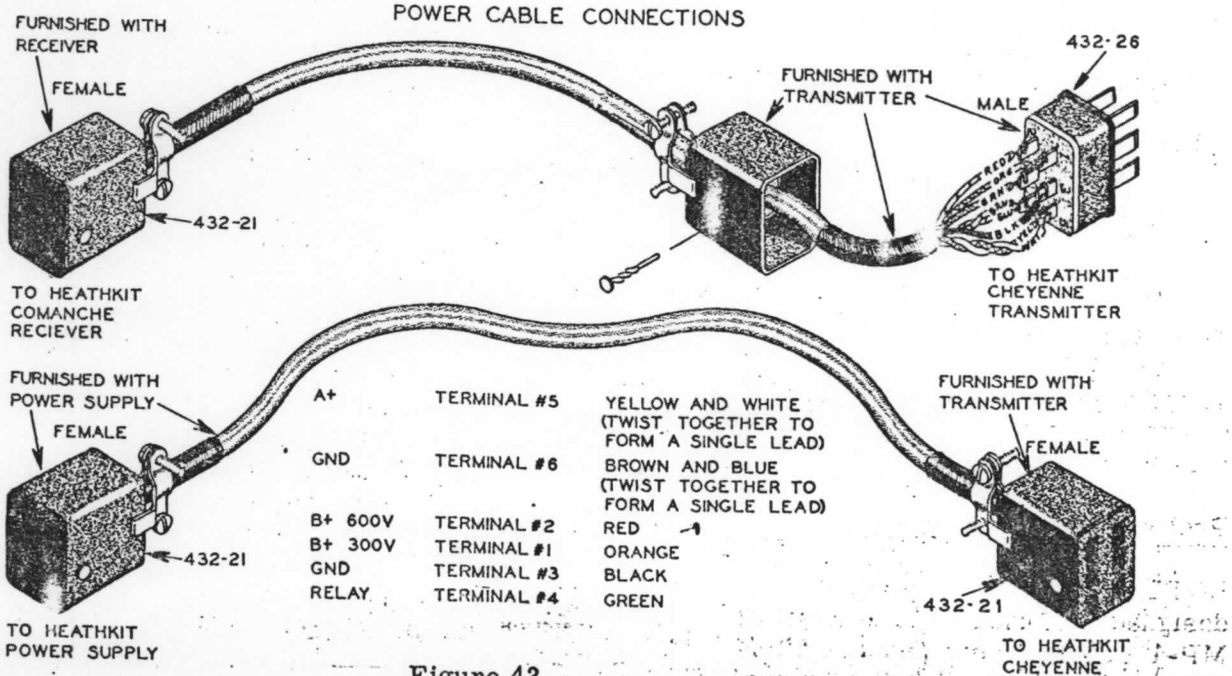


Figure 43

( ) Prepare the male microphone connector (#432-24) by removing the small screw from the shell of the connector. See Figure 44. Slide the shell over the microphone cable, spring end first. Strip 1 1/2" of outer insulation from the cable and unbraid the shield. Now twist the shield to form a single pigtail. Strip all inner conductors 3/4" and tin.

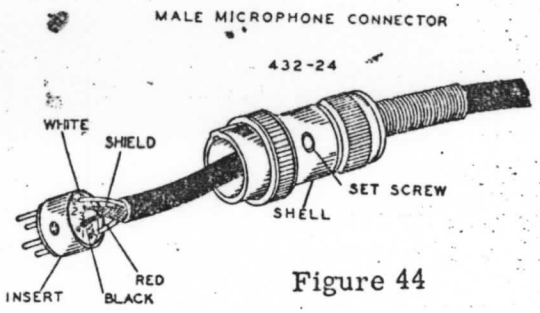


Figure 44

( ) Connect the microphone cable to the plug by inserting the tinned leads into their respective hollow plug terminals as follows, and solder all connections. Clip excessive lead lengths after soldering.

( ) Connect the white wire to terminal 2. Insert the wire into the hole and solder in such a manner that the solder flows down into the hole and not around it. This is accomplished by holding the soldering iron on the side of the lug and feeding the solder from the end.

( ) Connect the red wire to terminal 4.
( ) Connect the shield wire to terminal 3.
( ) Connect the black wire to terminal 1.
( ) Replace the insert into the shell and secure with the small setscrew.

NOTE: IT SHOULD BE NOTED THAT AN AMATEUR RADIO OPERATOR AND STATION LICENSE IS REQUIRED TO PLACE THIS TRANSMITTER ON THE AIR. Information regarding licensing and amateur frequency allocations may be had from publications of the Federal Communications Commission or the American Radio Relay League.

( ) Supply the connection between W-4 and W-6 on the power socket as explained in the note. This connection is needed only when the power supply is not running continuously. If the power supply is controlled by its own switch, then turn the B+ voltage on and ignore the previously mentioned connection.

CAUTION: Remember potentially lethal voltages are present during the following steps.
( ) Plug the microphone into its receptacle at this time.
( ) Turn the function switch to the STANDBY position and apply the B+ voltage to power plug W on the rear apron of the chassis. NOTE: This voltage will not be applied any further than the power plug until the microphone button is depressed. The pilot lights and all tubes should be lit. If nothing unusual is noted, then proceed with the following steps.

( ) Turn the function switch and the meter switch to the GRID position. Depress the microphone button and adjust the driver tuning control until a reading of 3 ma is obtained. Note that there is a red line on the meter at the 3 ma point. Do not exceed this point. Repeat this operation on all bands, 80 through 10 meters. The 10 and 15 meter drive may be slightly low until the buffer plate coils are peaked in a later operation.

( ) Connect a dummy load, such as a 60 watt light bulb, to the coaxial output jack at V. The band switch should be in the 80-meter position for this check and the VFO set to some frequency known to be in the phone portion of the band. Since the VFO has not yet been calibrated, it will be necessary to check the signal on a receiver to determine that it is within the phone portion of the band. Check for and obtain the 3 ma grid drive as described above by depressing the microphone button and adjusting the driver tuning, with the function switch and the meter switch in the GRID position. Now, with the meter switch in the PLATE position, set the loading control fully counterclockwise and the function switch to the PHONE position. Depress the microphone button and tune the final tuning control for a dip. The dip is first obtained in this position since less current will be drawn here than in the CW position. Now that the resonant point has been determined, move the function switch to the CW position. Advance the loading control until a reading of 150 ma is obtained on the meter in the PLATE position. Redip the final tuning control. Adjust the final tuning and the loading control until the Transmitter is loaded to its MAXIMUM OUTPUT, even though this point

may exceed the red line on the meter. Try to reach this point in a minimum amount of time, since the plate of the 6146 will be drawing excessive current during the loading procedure. Now move the function switch back to the PHONE position. Advance the audio gain control until peaks of 150 ma can be read on the meter when speaking into the microphone. Do not exceed this point. A red line is provided on the meter for quick observation of peaks.

In actual operation, you will find some output indicating device such as the Heathkit Mobile Tuning Meter an invaluable aid. If such a unit is available to you, then the Transmitter may best be adjusted for maximum output in the PHONE position by sustaining a tone and adjusting the final tuning, drive, and the loading control. The point of maximum output may differ slightly in this method than in the CW position and is considered as the best method of tuning, since the Transmitter output power is being observed rather than the input power.

( ) Remove the microphone from its receptacle for the following VFO calibration, since only the oscillator is involved in this operation.

VFO CALIBRATION

If the kit builder has access to a commercial frequency standard, an electronic counter of good quality, a surplus frequency standard of the LM or BC series, or a high quality communications receiver with a built-in crystal calibrator, such as the Heathkit "Mohawk", these are excellent for calibration. If a frequency meter is used, the frequency meter and the VFO signals can be beat against each other in the receiver. It will be necessary to calibrate only the 80, 20 and 10-meter bands. Since the 20 and 15-meter bands of the "Cheyenne" both use a common VFO switch position, as do the 40 and 10-meter bands, when the 20 and 10-meter bands are calibrated, the 40 and 15-meter bands are also calibrated automatically. Before beginning calibration, allow the Transmitter, frequency meter and the receiver to warm up for one half hour or more. During the calibration procedure, the drive control should be set at maximum grid current reading with the function and meter switch in GRID position. The spotting switch should be set to its ON position. If a frequency meter is used for calibration, the frequency meter signal and the VFO signal should be zero beat against each other in a receiver, with the BFO off. Under these conditions, the VFO is at the same frequency as the frequency meter. Aside from slight differences in measurement technique, the following procedure may be used for either method of calibration. Refer to Figure 41 on page 45 for location and identification of the various calibrating adjustments. If you should be unable to hear the VFO signal in the receiver, a piece of hookup wire may be run near the oscillator tube over to the receiver input terminal for better signal pickup.

NOTE: It should be noted that the trimmer capacitors R, Q and JJ are used to determine the frequency spread covered on the dial, while the coil slugs A, B and C in Figure 41 are used to set a definite frequency point in the dial.

The coil slugs are set to the calibration frequency at the low end of the dial; the trimmers are adjusted so that the calibration frequency at the high end of the band coincides with the dial reading. These two adjustments interact with each other and, therefore, will have to be adjusted alternately until optimum overall calibration is obtained. All the trimmer capacitors should be set to HALF MESH, before starting calibration. Make sure the steps regarding the setting of the main tuning capacitor and dial pointer, in relation to the dial mechanism, were not overlooked or done improperly.

For 80-meter calibration, set the MT-1 dial at 3500 kc, and set the frequency meter without modulation, to the same frequency. Make sure the band switch is in the 80-meter position. Adjust slug C for zero beat in the receiver. Note that zero beat will result when the VFO frequency is the same as the 3500 kc output of the frequency meter. Now, retune the VFO to the high end of the band and move the frequency meter up to a frequency of 4000 kc. Reset the receiver as in the previous step. Tune the VFO to zero beat at the high end of the band and note the reading. Starting with the trimmer R plates at HALF MESH, adjust trimmer R until the VFO is zero beat on 4000 kc. Readjust slug C for zero beat once again at the lower calibration frequency of 3500 kc. Move the VFO up and check the high end, and it should be found that the dial

reading is closer to the actual frequency than before. Adjust trimmer R again and repeat this process until calibration is achieved at both ends of the band. Repeat the procedure outlined above for the 20 and 10-meter bands, moving the band switch to the appropriate band for each calibration procedure. The receiver and frequency meter, or signal sources, must operate between 14000 and 14350 kc for the 20-meter calibration, and between 28000 and 29700 kc for the 10-meter calibration. Use trimmer Q and slug A for the 20-meter calibration and trimmer JJ and slug B for the 10-meter calibration. This will complete VFO calibration. Be sure to remove any wire serving to couple the oscillator to the receiver before proceeding. 14850 14850

( ) Now again insert the microphone plug into its receptacle, setting the function switch to its PHONE position.

After VFO calibration is complete, the adjustment of the buffer coils may be accomplished. Set the band switch to the 10-meter position and the VFO dial to the middle of the band, approximately 28.8 mc. Depress the microphone button, tuning the final to resonance and adjusting the loading to maximum plate current. Advance the drive control until a small amount of grid current reading can be obtained. Adjust slug D, as shown in Figure 41, for a maximum grid current reading. Once again, do not exceed 3 ma for more than an instant. Now switch the band switch to the 15-meter position and set the VFO dial to the middle of the band or approximately 21.3 mc. Peak the drive once again at a low reading and adjust slug E, Figure 41, for a maximum reading on the meter. This completes testing, adjustment and calibration of your MT-1 Mobile Transmitter.

( ) If CW operation is contemplated it is suggested a two wire cable be brought out to an external SPST transmit-standby switch. The internal connections of this cable are as follows: One wire to pin 4 on female microphone socket Z, the other wire to pin 1. The function switch should, of course, be in CW position for CW operation.

( ) Insert a phone plug into the key jack on the rear apron. B+ is turned ON by throwing the transmit-standby switch to ON. The oscillator and buffer will run continuously with the driver and final stages keyed in their respective cathode leads. CAUTION: Approximately 90 volts will be present at the key terminals under "key-up" conditions. A low voltage keying relay could be used for greater safety if desired.

Note that the four holes in the top and bottom of the cabinet, normally used for mounting the rubber feet, match the same relative holes in the MR-1 "Comanche" Receiver cabinet. This is for bolting the two units together, should you so desire. There are also holes in the sides of both cabinets for the same purpose. If the four holes in the bottom of this cabinet are to be used in this manner, then disregard the mounting of the rubber feet.

( ) Mount the four rubber feet in the bottom of the cabinet using 6-32 x 3/8" BHMS, #6 lockwashers and nuts. Use a #8 small flat washer under the screw head. Refer to Figure 45.

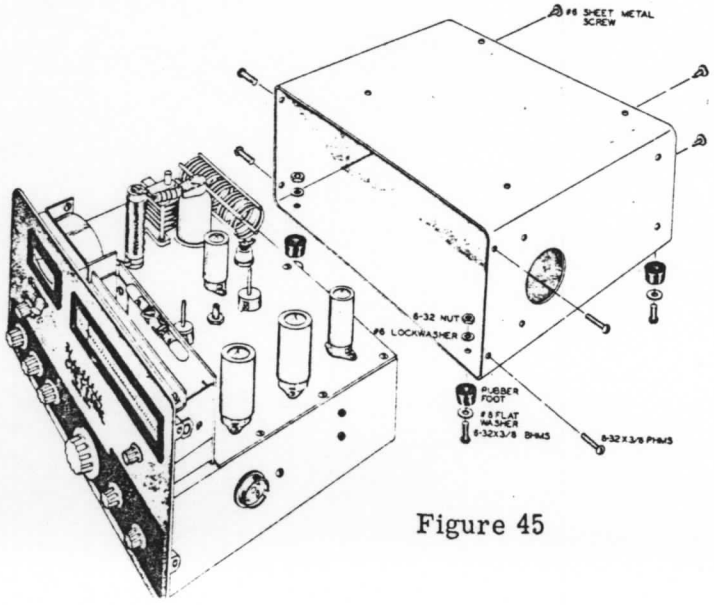


Figure 45

( ) Slide the Transmitter into the cabinet and secure through the sides of the cabinet with 8-32 PHMS. Secure at the rear with #6 sheet metal screws.

IN CASE OF DIFFICULTY

Mistakes in soldering and wiring are the most common causes of difficulty; consequently, the first step is to recheck all wiring against the Pictorials, Schematic Diagrams and Step-By-Step. Often having a friend check the wiring will locate an error consistently overlooked.

With miniature sockets there is a possibility of shorts between adjacent socket terminals, due to close spacing. This should be checked and if any doubt exists, terminals should be pried apart until an obvious gap can be seen between them. Sometimes apparently good solder connections will have an insulating coating of rosin between the wire, the terminal, and the solder. This is often the case when insufficient heat was applied in soldering. An ohmmeter check of any questionable connections will test for this condition. Naturally, all voltages should be off for such tests.

The filament string is protected with a type 3AG 8 ampere fuse. Should it be found that this fuse consistently blows when the equipment is turned on, then check for a short in this string. Be sure to reread the circuit descriptions in the beginning of this manual so that the cause and effect reasoning may be employed as the search for trouble progresses. If some difficulty still persists after the above steps have been completed, attempt to localize the trouble to a particular stage in the circuit. Use the tuning procedure and voltage-resistance information provided on the schematic as a basis for localization.

RF Circuits

If a grid reading cannot be obtained on the meter, a receiver may be used to check the VFO operation. Connect a short piece of insulated wire to the receiver antenna terminal and bring the wire near the VFO tube. Turn the receiver BFO on. Now vary the VFO frequency to determine if the signal is being generated by the VFO. If the signal is heard, then proceed to the next stage which is the 6CL6 buffer stage. Re-inspect the wiring around this socket and if it appears to be wired correctly, its output may be measured by checking the grid of the following stage, which is the 5763 stage. This may be checked with an RF probe or a neon bulb. If it is found that the 6CL6 stage is operating properly and that the band switch in the plate of this stage is wired correctly, and the switch is functioning properly, then the next step is to check the output of the 5763 stage. This may be checked in the same manner, by measuring the RF voltage at the grid of the 6146 final amplifier stage. If drive is present at the grid of the 6146, as indicated by a small amount of voltage, then there is a possibility that the buffer coils may be detuned. If the problem still exists, then the voltages should be measured against the voltage charts for all RF stages. Other possible solutions may be to check for defective tubes or lack of coupling between stages. If grid drive is obtained to the final stage, and there is an inability to tune through resonance, then the error could be in the final tank circuit. This could be in the form of an incorrectly wired band switch, loading capacitor, a shorted loading capacitor (plates touching), or any other short to ground in the final pi network circuit.

AUDIO CIRCUITS

Problems in the audio circuit of the MT-1 may be checked similarly to the above, checking resistance first, then voltages, including coupling between stages. Inability to obtain modulation could be caused by a short between the center conductor and the shield of the cables coming from the volume control to the 12AX7 speech amplifier. Be sure to eliminate the possibility of a defective microphone first.

INSTALLATION AND OPERATION

The MT-1 is designed to be used as a companion unit with the MR-1 "Comanche" Receiver and the MP-1 Transistor Power Supply. The Transmitter requires that the source of power be contin-

as well as switching the antenna. The power supply is turned on initially by the receiver. The relay may be modified to fit numerous other installation requirements, provided the power switch is not used.

The Transmitter-Receiver combination will average approximately 8 amperes at 12.6 volts from the car battery, and the Transmitter will draw approximately 15 amperes at 12.6 volts on modulation peaks using the MP-1 Supply. The modulation system, being carrier controlled, has a great advantage in mobile operation in that the overall battery drain is much less than other methods of modulation. This makes it possible to run much higher power on peaks. The MT-1, when used with the MP-1 Transistor Power Supply, will run at an input power of 90 watts on instantaneous peaks. The MP-1 Transistor Power Supply delivers a dual voltage; a high voltage of 600 volts at 150 milliamperes and a low voltage of 300 volts at 100 milliamperes. The Transmitter has been designed around these two voltages and will be most efficient when they are used. However, good results can be obtained at slightly lower voltages.

You will note that the "Cheyenne" and the "Comanche" cabinets are designed so that they may be bolted together and mounted under the dash and over the center hump of most automobiles. See Figure 46. This makes a very neat and compact installation and is offered as a suggestion. It is realized that the mounting requirements may vary considerably. For example, the two units could be mounted side by side in some automobiles. This phase of installation is best left to the individual operator. In any case, installation may be accomplished through the use of simple brackets and average home tools, or by using the convenient AK-6 Mobile Mount shown below and available from the Heath Company.

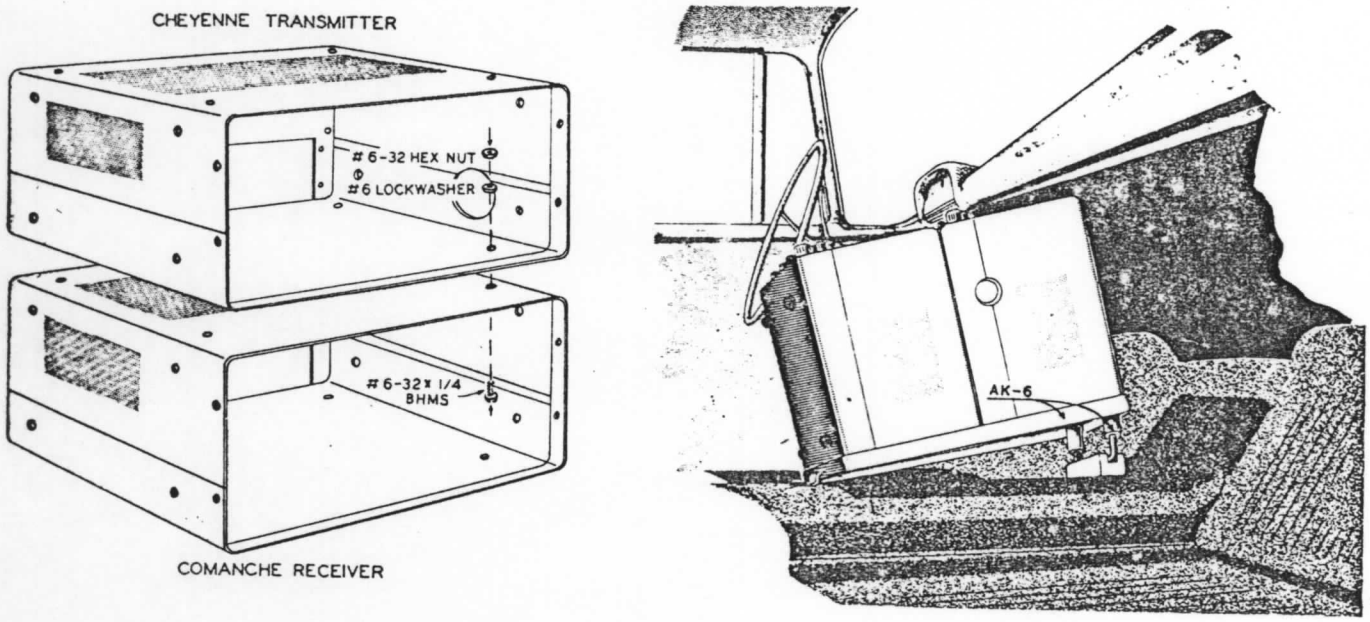


Figure 46

One of the more important things to remember is that the leads running from the battery to the power supply should be at least #12 wire, and the two filament leads from the power supply to the Transmitter should be at least #18 wire. Voltage drops in either one of these two circuits can cause a considerable loss in output power. The remainder of the power leads may be as small as #22 wire, without any appreciable loss in voltage. The appropriate cable is included with the MP-1 Transistor Power Supply, as well as the Jones type plugs for interconnecting the two.

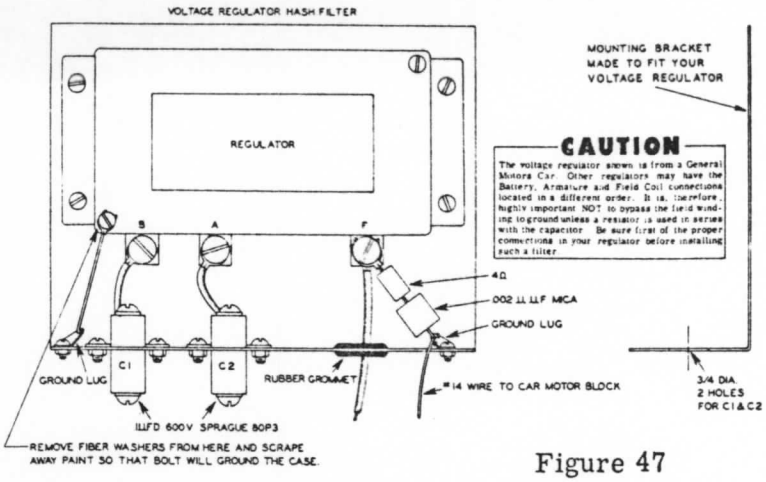


Figure 47

The most serious problem encountered in mobile installation is that of noise. The noise is generated by several sources. The two main sources of noise are the ignition system and the generator regulator system. One method of treating the voltage regulator is shown in Figure 47. Other noise may be generated by primary and secondary electrical circuits of the car, or may be generated by static electricity caused by the movement of the car. Complete elimination of ignition noise cannot be accomplished, since radio frequencies must be generated by the ignition system or no ignition will result. This noise can be greatly reduced, however, through the use of resistor spark plugs or suppressors, which are commercially available. This problem also will manifest itself to a greater or lesser degree, depending upon the particular automobile, and it is suggested that the new mobile operator consult one of several mobile handbooks which are readily available.

It may be pointed out, also, that the MT-1 "Cheyenne" Transmitter will serve very nicely as a fixed station unit as well, as will the MR-1 "Comanche" Receiver. Standard dual voltage DC power supplies may be used in the fixed station operation. The pi network output circuit of the MT-1 will match pure resistive loads of 50 to 72 Ω. For best results it is strongly recommended that the antenna and transmission line system selected present an unbalanced 50 to 72 Ω resistive load to the output of the Transmitter. In mobile operation, an unbalanced 50 Ω system is required. Most commercial or fixed station antennas, including beams, verticals and trap antennas in use today, are designed to be fed with 50 or 72 Ω coax. If an antenna with a balanced feed line is desired, it is recommended that a set of Heath Balun coils, or an antenna coupler be obtained. Much has been published on the subject of antennas and excellent articles can be found in the "ARRL Handbook", the "Radio Handbook", and in most issues of "CQ" and "QST".

ACCESSORY EQUIPMENT

Although not primarily designed for mobile operation there are several pieces of Heathkit equipment which have proven to be very valuable accessories.

MARINE BATTERY CHARGE INDICATOR: This unit, which is made for use on either 6 or 12 volt systems, continuously monitors the condition of battery charge. By always being aware of battery condition, the mobileer is less likely to walk home; also, when an external charging source is used to permit parked operation, the required amount of external power is instantly apparent on the charge indicator meter.

MARINE CONVERTER KIT: This is a heavy duty charging source operated by 115 VAC, and providing up to 20 amperes at 6 volts, and 10 amperes at 12 volts. As such, it may be used to keep the battery charged while operating the mobile station in the car when parked, without running the motor. Such conditions normally prevail while making antenna adjustments, or while using the mobile as a temporary fixed station.

MOBILE TUNING METER: This kit measures relative RF field strength. It may be mounted on the car dash and will indicate correct transmitter tuning by maximum antenna radiation. This unit was designed for mobile application and requires no external power source.

REFLECTED POWER METER: This kit measures forward and reflected power on the transmission line to the antenna (SWR). It is invaluable in the initial antenna tune-up procedure, and may be left in the line (forward power position) to indicate proper transmitter tuning.

REPLACEMENTS

Material supplied with Heathkits has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper Transmitter operation can be traced to a faulty tube or component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information:

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.

B. Identify the type and model number of kit in which it is used.

C. Mention the order number and date of purchase.

D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. Please do not return the original component until specifically requested to do so. Do not dismantle the component in question as this will void the guarantee. If tubes are to be returned, pack them carefully to prevent breakage in shipment as broken tubes are not eligible for replacement. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SERVICE

If, after applying the information contained in this manual and your best efforts on the unit, you are still unable to obtain proper performance from the Transmitter, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for the purpose of providing Heath Customers with a personalized technical consultation service; this service is available to you without charge. The technical consultants are thoroughly familiar with all details of the Transmitter and can usually localize the trouble from a suitable description of the difficulty encountered. It is, of course, necessary that you provide full and complete information concerning your problem when writing to the Technical Consultation Department for assistance. For instance, clearly identify the kit involved, giving the purchase date and, if possible, the invoice number; describe in detail the difficulty that you have encountered; state what you have attempted to do to rectify the trouble, what results have been achieved, and include any information or clues that you feel could possibly be of value to the consultant who handles your problem. Failure to provide complete descriptive details may lead to incorrect assumptions on the part of the consultant and needless delay in the solution to your problem. Quite frequently, when the information given the consultant is complete, concise and reliable, a diagnosis of the difficulty can be made with confidence and specific instructions given for its correction. If replacement of a component is involved in the correction, the component will be shipped to you, subject to the terms and conditions of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed Transmitter to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a fixed fee of $15.00, plus the price of any additional parts or material required. However, if the Transmitter is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase and give invoice number, if possible.

Local Service by Authorized Heathkit Dealers is available and often will be your fastest, most efficient method of obtaining service for your Heathkits. Although you may find charges for local service somewhat higher than those listed in Heathkit manuals (for factory service), the amount of increase is usually offset by the transportation charges you will pay if you elect to return your kit to the Heath Company.

Heathkit dealers will honor the regular 90 day Heathkit Parts Warranty on all kits, whether purchased through a dealer or directly from Heath Company. It will be necessary that you verify the purchase date of your kit by presenting your copy of the Heath Company invoice to the authorized dealer involved.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if your local dealer assists you in locating a defective part (or parts) in your Heathkit, or installs a replacement part for you, he may charge you for this service.

Heathkits purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized Heathkit dealer in order to be eligible for parts replacement under the terms of the Warranty.

THESE SERVICE POLICIES APPLY ONLY TO COMPLETED INSTRUMENTS CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Instruments that are not entirely completed or instruments that are modified in design will not be accepted for repair. Instruments showing evidence of acid core solder or paste fluxes will be returned NOT repaired.

For information regarding modification of Heathkits for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic outlet stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for specific purposes. Therefore, such modifications must be made at the discretion of the kit builder according to information which will be much more readily available from some local source.

SHIPPING INSTRUCTIONS

In the event that your Transmitter must be returned for service, these instructions should be carefully followed.

ATTACH A TAG TO THE TRANSMITTER BEARING YOUR NAME, COMPLETE ADDRESS, INVOICE NUMBER ON WHICH THE TRANSMITTER WAS PURCHASED, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Wrap the Transmitter in heavy paper, exercising care to prevent damage. Place the wrapped Transmitter in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the Transmitter and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Clearly print the address on the carton as follows:

To: HEATH COMPANY
Benton Harbor, Michigan

Include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit, if in HIS OPINION, the article is inadequately packed for shipment. Your Transmitter will be returned by express collect.

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

WARRANTY

Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY

PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
Resistors		
1-13	1	2.7 KΩ 1/2 watt (red-violet-red)
1-16	1	4.7 KΩ 1/2 watt (yellow-violet-red)
1-22	1	22 KΩ 1/2 watt (red-red-orange)
1-25	1	47 KΩ 1/2 watt (yellow-violet-orange)
1-26	2	100 KΩ 1/2 watt (brown-black-yellow)
1-33	3	470 KΩ 1/2 watt (yellow-violet-yellow)
1-35	2	1 meg 1/2 watt (brown-black-green)
1-37	1	2.2 meg 1/2 watt (red-red-green)
1-40	1	10 meg 1/2 watt (brown-black-blue)
1A-24	1	4.7 KΩ 1 watt (yellow-violet-red)
1A-25	1	6.8 KΩ 1 watt (blue-gray-red)
1A-44	1	18 KΩ 1 watt (brown-gray-orange)
1A-46	2	27 KΩ 1 watt (red-violet-orange)
1B-4	1	15 KΩ 2 watt (brown-green-orange)
2-22	1	31.62 Ω 1% precision
2-60	1	.483 Ω 1% precision
3E-2	2	10 KΩ 5 watt
3E-7	1	11 Ω 5 watt
3J-8	1	15 KΩ 10 watt

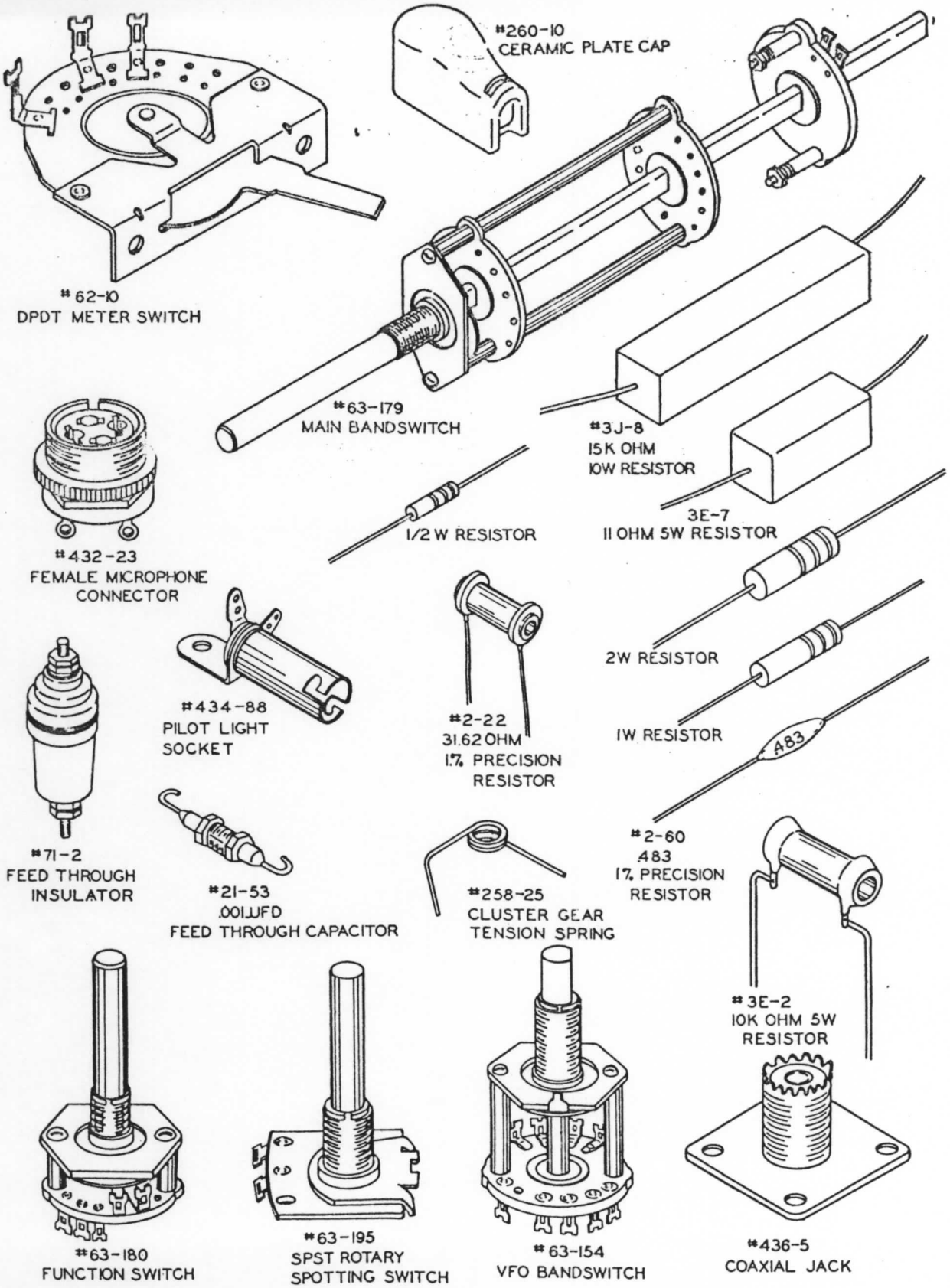
PART No.	PARTS Per Kit	DESCRIPTION
Capacitors		
20-1	2	47 mmf SM 600 V (yellow-violet-black)
20-42	4	510 mmf SM 500 V
20-48	2	.001 2 kv mica
20-77	1	24 mmf SM 5%
20-109	1	62 mmf SM 5%
20-110	1	75 mmf SM 5%
21-3	1	10 mmf disc ceramic
21-9	3	100 mmf disc ceramic
21-14	3	.001 mfd disc ceramic
21-27	16	.005 mfd disc ceramic
21-28	1	10 mmf N750
21-29	2	4.7 mmf N750
21-31	5	.02 mfd disc ceramic
21-49	2	68 mmf 4 kv
21-53	2	.001 mfd 600 V feed-through
21-54	1	75 mmf N750
23-11	1	.1 mfd 600 V molded tubular
23-63	1	.25 mfd 400 V paper
26-31	1	140 mmf variable
26-43	1	7-14 mmf dual section variable
26-44	3	15 mmf midget variable
26-45	1	450 mmf/section 3-gang variable
26-50	1	77 mmf variable midget
Coils		
40-86	1	Amplifier plate coil
140-1	1	Coil set
Consisting of:		
40-62	1	20-meter slug tuned coil
40-63	1	40-meter slug tuned coil
40-172	1	80-40-20 driver coil
40-173	1	10-15 meter driver coil
45-4	3	1.1 mh RF choke
45-14	1	2.5 mh RF choke
45-16	1	10 mh RF choke
45-19	1	Parasitic choke
45-41	1	.425 mh RF choke
45-42	1	8.5 μh RF choke
140-2	1	Coil set
Consisting of:		
40-115	1	160-meter VFO coil
40-116	2	40-meter VFO coil
Socket-Terminal Strips-Knobs		
431-5	1	4-lug, no ground, terminal strip
431-10	2	3-lug, #2 ground, terminal strip
431-12	1	4-lug, #2 ground, terminal strip

PART No.	PARTS Per Kit	DESCRIPTION
Sockets-Terminal Strips-Knobs (Cont'd.)		
431-40	1	4-lug, #3 ground, terminal strip
431-45	1	6-lug, #4 ground, terminal strip
432-21	1	6-prong Jones plug, female (cable type)
432-22	1	6-prong Jones plug, male (chassis mtg. type)
432-23	1	Microphone connector, female
432-24	1	Microphone connector, male
432-25	1	6-prong Jones plug, female (chassis mtg. type)
432-26	1	6-prong Jones plug, male (cable type)
434-35	2	7-pin ceramic tube socket (shielded)
434-36	2	9-pin ceramic tube socket (shielded)
434-39	1	Octal socket
434-43	2	9-pin Bakelite tube socket (shielded)
434-88	3	Pilot light socket
436-4	1	Closed circuit key jack
436-5	2	Coax jack
462-59	1	Fluted knob, 1 3/4" diameter
462-60	4	Fluted knob, 1 1/4" diameter
462-61	3	Fluted knob, 9/16" diameter
462-80	1	Plastic knob
463-15	1	Dial pointer
Control-Switches-Relay		
10-92	1	1 megohm audio taper potentiometer
62-10	1	DPDT lever switch
63-154	1	VFO band switch
63-179	1	Main band switch (3 section)
63-180	1	Function switch
63-195	1	SPST rotary spotting switch
69-8	1	3PDT 6.3 VAC relay
Meter-Tubes		
407-60	1	Milliammeter
411-11	1	6AU6 tube
411-26	1	12AX7 tube
411-59	1	OA2 VR tube
411-63	1	6CL6 tube
411-75	1	6146 tube
411-77	1	5763 tube

PART No.	PARTS Per Kit	DESCRIPTION
Meter-Tubes (Cont'd.)		
411-109	1	6DE7 tube
412-1	3	#47 pilot light
421-4	1	3AG 8 amp fuse
422-1	1	Fuse block
Hardware		
71-2	2	Feed-through insulator
73-1	1	3/8" rubber grommet
73-4	4	5/16" rubber grommet
204-9	2	Right angle bracket
250-6	3	6-32 x 1" threaded stud
250-8	9	#6 sheet metal screw
250-29	1	6-32 x 3/4" RHMS
250-33	2	6-32 x 1/8" slotted setscrew
250-49	20	3-48 x 1/4" PHMS
250-56	66	6-32 x 1/4" BHMS
250-89	17	6-32 x 3/8" BHMS
250-93	11	8-32 x 1/4" Allen head setscrew
250-105	9	8-32 x 1/8" Allen head setscrew
250-124	1	6-32 x 3/16" fillister head machine screw
250-135	1	5-40 shouldered hex screw
250-137	4	8-32 x 3/8" PHMS
251-1	11	6-32 spade lug
252-1	20	3-48 nut
252-3	92	6-32 nut
252-7	19	3/8" x 32 control nut
252-40	1	5-40 nut
253-1	2	Fiber washer
253-9	6	#8 small flat washer
253-10	5	3/8" control flat washer
253-11	4	E retaining ring
253-21	6	#6 large flat washer
253-36	2	Spring washer
254-1	102	#6 lockwasher
254-4	15	3/8" lockwasher (large)
254-5	1	3/8" lockwasher (small)
254-7	28	#3 lockwasher
254-13	2	#12 lockwasher
255-1	1	#6 x 1/8" spacer
255-2	1	#6 x 3/16" spacer
255-3	3	#6 x 3/8" spacer
255-16	2	Dial drive spacer
258-1	1	Dial cord spring
258-10	1	Spiral drum spring
258-25	1	Cluster gear tension spring
259-1	10	#6 solder lug
259-6	7	#6 small solder lug
259-10	3	Control solder lug

PART No.	PARTS Per Kit	DESCRIPTION
Sheet Metal Parts		
100-M19	1	Drum drive pulley assembly
100-M125	1	Plug button-bushing assembly
100-M126	1	VFO switch drive plate assembly
100-M127	1	Band switch drive plate assembly
100-M132	2	Dial drum support bracket assembly
100-M165	1	Pointer drive pulley assembly
100-M196	1	Chassis base assembly
100-M200	1	Dial drum shaft assembly
100-M212	1	Main dial plate assembly
100-M213	1	Front dial plate assembly
200-M203	1	Chassis base center section
203-168-F248-252	1	Finished panel
204-M213	1	Top plate bracket
204-M215	1	Dial pointer bracket
204-M216	1	Loading shaft bracket
204-M217	1	Tube submounting bracket
204-M222	1	Meter mounting bracket
204-M223	1	Front panel mounting bracket
204-M229	1	String guide bracket
205-M136	1	VFO shield cover plate
205-M137	1	Top plate, chassis
206-M94	1	Rear shield plate
206-M95	1	Center shield plate
206-M97	1	VFO shield
485-M7	1	Drum plug button
Miscellaneous		
90-95	1	Cabinet
100-201	1	Pinion gear shaft assembly
100-202	1	Pointer drive gear shaft assembly
134-4	1	Cable assembly
206-3	1	2" tube shield
206-25	1	1 3/4" tube shield, 7/8" diameter
206-44	1	2 1/4" tube shield, 7/8" diameter
206-54	3	2 3/8" tube shield, 1" diameter
206-86	3	Pilot light shroud
260-10	1	Ceramic plate cap
261-9	4	Rubber feet
340-2	1	Length #20 bare wire
340-3	1	Length #16 bare wire

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (Cont'd.)		
343-4	1	Length shielded wire
344-1	7	Lengths hookup wire (1 each of green, gray, black, blue, red, orange and white)
344-4	1	Length heavy gray stranded wire
344-6	1	Length #18 red wire
346-1	3	Length 1/8" diameter sleeving
346-5	1	Length 1/4" plastic sleeving
346-7	1	Length 3/16" clear plastic sleeving
347-1	1	Length 8-conductor cable
349-3	1	Length glass core dial cord
390-60	1	Adhesive label
451-12	1	Nylon cluster gear
451-15	1	Tuning drive gear
451-16	1	Antibacklash gear
451-18	4	Right angle drive gear
453-71	1	Loading shaft
453-72	1	Final tuning shaft
453-75	1	Driver tuning shaft
453-78	1	Cluster gear pivot shaft
455-6	5	1/4" x 1/4" ID shaft bushing
455-15	1	Retainer bushing
455-18	4	9/16" x 1/4" ID shaft bushing
455-26	1	1/4" x 3/8" shaft bushing
456-7	1	1/4" to 1/4" shaft coupler
464-11	1	Dial drum 5 scale printed
480-7	1	Ceramic microphone
490-6	1	5/64" Allen wrench
490-19	1	1/4" wrench
595-240	1	Instruction manual


#260-10
CERAMIC PLATE CAP
#62-10
DPDT METER SWITCH
#63-179
MAIN BANDSWITCH
#3J-8
15K OHM
10W RESISTOR
1/2 W RESISTOR
3E-7
11 OHM 5W RESISTOR
#432-23
FEMALE MICROPHONE
CONNECTOR
#434-88
PILOT LIGHT
SOCKET
#2-22
31.62 OHM
1% PRECISION
RESISTOR
2W RESISTOR
1W RESISTOR
.483
#71-2
FEED THROUGH
INSULATOR
#21-53
.001 MFD
FEED THROUGH CAPACITOR
#258-25
CLUSTER GEAR
TENSION SPRING
#2-60
.483
1% PRECISION
RESISTOR
#3E-2
10K OHM 5W
RESISTOR
#63-180
FUNCTION SWITCH
#63-195
SPST ROTARY
SPOTTING SWITCH
#63-154
VFO BANDSWITCH
#436-5
COAXIAL JACK

#250-33
6-32 X 1/8
SET SCREW

#250-105
8-32 X 1/8
ALLEN HEAD SET SCREW

#250-93
8-32 X 1/4
ALLEN HEAD SET SCREW

#250-135
5-40
SHOULDERED HEX. SCREW

#250-49
3-48 X 1/4
PHMS

#250-124
6-32 X 3/16
FILLESTER HEAD M.S.

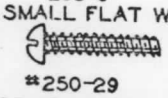
#250-8
#6 SHEET METAL SCREW

#254-13
#12 LOCKWASHER

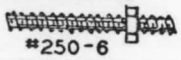
#250-56
6-32 X 1/4 BHMS

#250-89
6-32 X 3/8 BHMS

#253-9
#8 SMALL FLAT WASHER



#250-29
6-32 X 3/4 RHMS



#250-6
6-32 X 1 THREADED STUD

#255-1
#6 X 1/8
SPACER

#255-2
#6 X 3/16
SPACER

#255-3
#6 X 3/8
SPACER

#254-7
#3 LOCKWASHER

#254-1
#6 LOCKWASHER

#254-4
3/8 LOCKWASHER

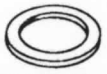
#252-1
3-48 NUT

#252-3
6-32 NUT

#252-7
3/8 CONTROL NUT

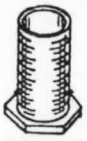
#253-1
FIBER WASHER

#253-36
SPRING WASHER

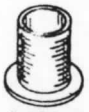


#253-10
3/8 FLAT WASHER

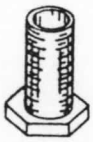
#253-21
#6 LARGE FLAT WASHER



#455-26
1/4 X 3/8
SHAFT BUSHING



#455-6
1/4 X 1/4
SHAFT BUSHING



#455-18
1/4 X 9/16
SHAFT BUSHING

#251-1
SPADE BOLT

#258-1
DIAL CORD SPRING

#259-6
#6 SMALL SOLDER LUG

#259-1
SOLDER LUG

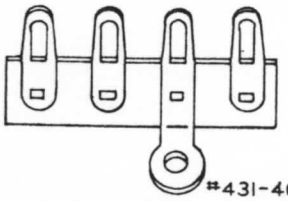
#204-9
RIGHT ANGLE
BRACKET

#261-9
RUBBER FOOT

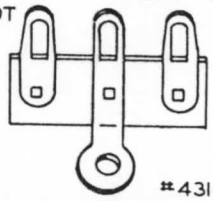
#253-11
E RETAINING RING

#455-15
RETAINER BUSHING

#259-10
CONTROL SOLDER LUG



#431-40
4 LUG # 3 GROUND TERMINAL STRIP

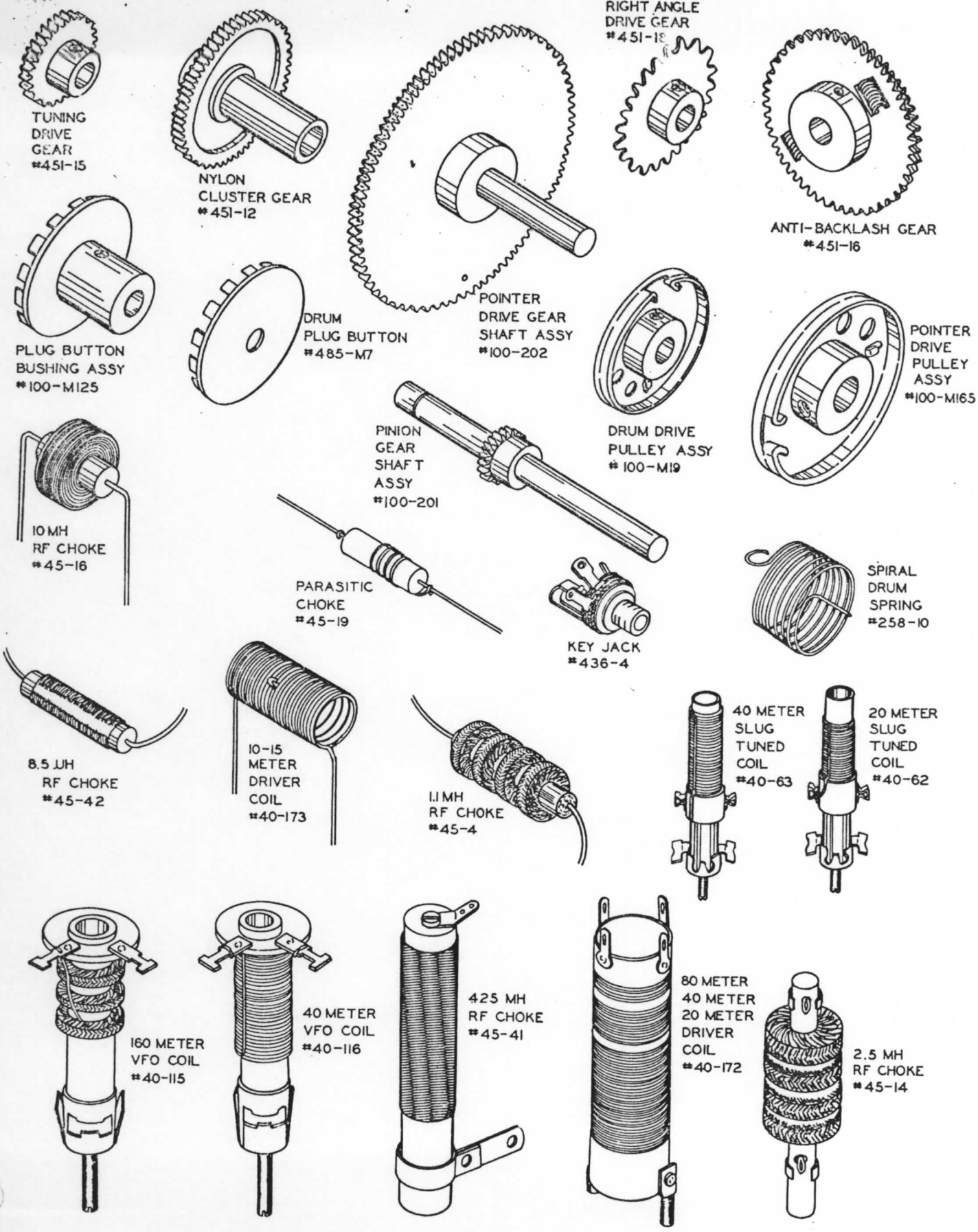


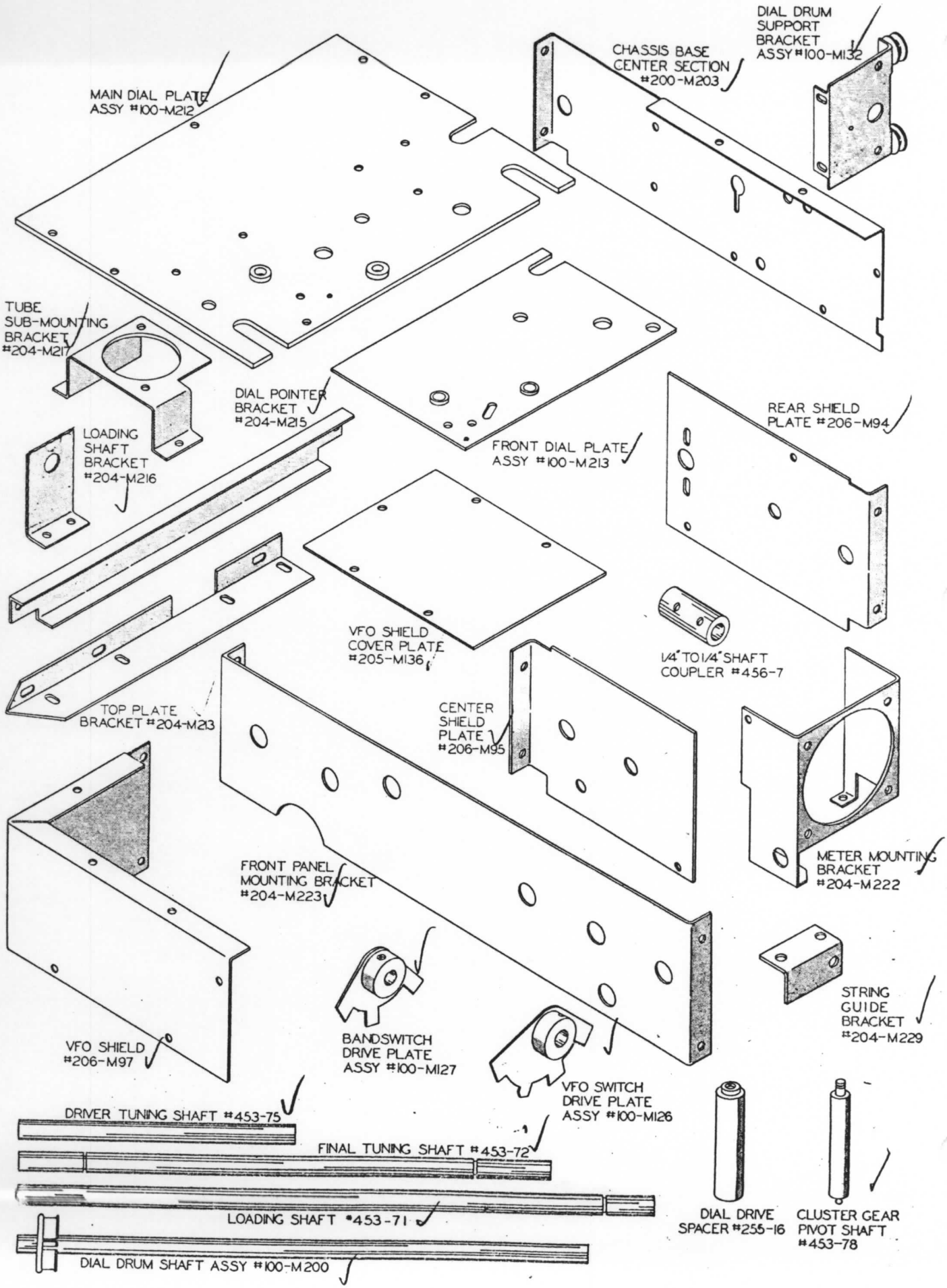
#431-10
3 LUG #2 GROUND TERMINAL STRIP

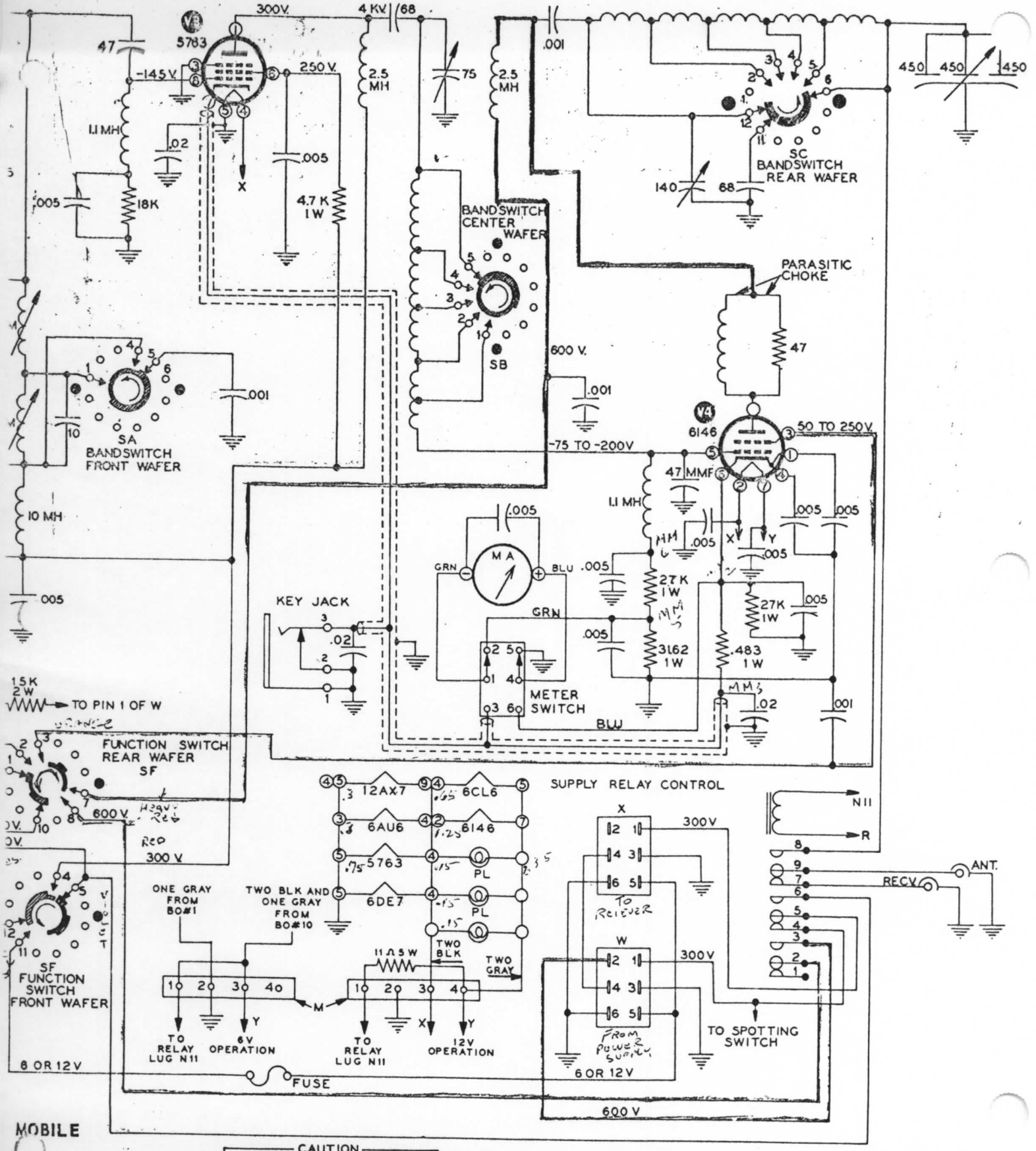
#431-45
6 LUG #4 GROUND TERMINAL STRIP

#431-12
4 LUG #2 GROUND TERMINAL STRIP

#431-5
4 LUG NO GROUND TERMINAL STRIP


TUNING DRIVE GEAR #451-15
NYLON CLUSTER GEAR #451-12
RIGHT ANGLE DRIVE GEAR #451-18
ANTI-BACKLASH GEAR #451-16
PLUG BUTTON BUSHING ASSY #100-M125
DRUM PLUG BUTTON #485-M7
POINTER DRIVE GEAR SHAFT ASSY #100-202
DRUM DRIVE PULLEY ASSY #100-M19
POINTER DRIVE PULLEY ASSY #100-M165
PINION GEAR SHAFT ASSY #100-201
10 MH RF CHOKE #45-16
PARASITIC CHOKE #45-19
KEY JACK #436-4
SPIRAL DRUM SPRING #258-10
8.5 UH RF CHOKE #45-42
10-15 METER DRIVER COIL #40-173
1.1 MH RF CHOKE #45-4
40 METER SLUG TUNED COIL #40-63
20 METER SLUG TUNED COIL #40-62
160 METER VFO COIL #40-115
40 METER VFO COIL #40-116
425 MH RF CHOKE #45-41
80 METER 40 METER 20 METER DRIVER COIL #40-172
2.5 MH RF CHOKE #45-14


DIAL DRUM SUPPORT BRACKET ASSY #100-M132
CHASSIS BASE CENTER SECTION #200-M203
MAIN DIAL PLATE ASSY #100-M212
TUBE SUB-MOUNTING BRACKET #204-M217
DIAL POINTER BRACKET #204-M215
LOADING SHAFT BRACKET #204-M216
FRONT DIAL PLATE ASSY #100-M213
REAR SHIELD PLATE #206-M94
VFO SHIELD COVER PLATE #205-M136
1/4" TO 1/4" SHAFT COUPLER #456-7
TOP PLATE BRACKET #204-M213
CENTER SHIELD PLATE #206-M95
METER MOUNTING BRACKET #204-M222
FRONT PANEL MOUNTING BRACKET #204-M223
STRING GUIDE BRACKET #204-M229
BANDSWITCH DRIVE PLATE ASSY #100-M127
VFO SHIELD #206-M97
VFO SWITCH DRIVE PLATE ASSY #100-M126
DRIVER TUNING SHAFT #453-75
FINAL TUNING SHAFT #453-72
LOADING SHAFT #453-71
DIAL DRUM SHAFT ASSY #100-M200
DIAL DRIVE SPACER #255-16
CLUSTER GEAR PIVOT SHAFT #453-78



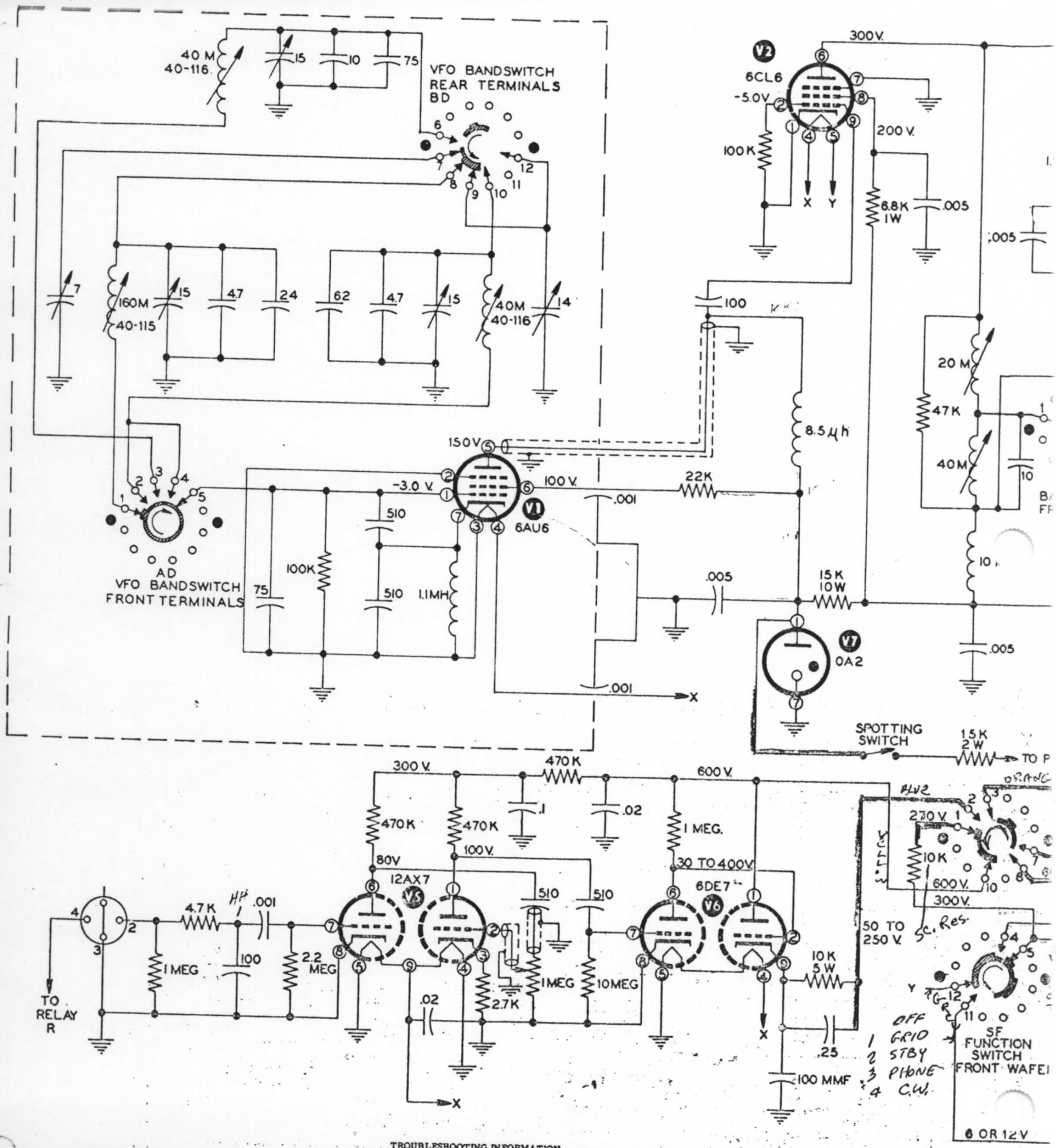
CAUTION

CONNECTIONS TO POWER PLUGS X AND W ARE FOR NEGATIVE GROUNDED VEHICLES.

FOR POSITIVE GROUNDED VEHICLES SEE MODIFICATION SHEET ENCLOSED BEFORE WIRING THESE PLUGS.

- FILS ON
- 300 V. ON EXIT.
ON -

7-8 PA-to Good.



GENERAL INFORMATION

THE BANDSWITCH S-3 IS SHOWN IN THE 80 METER POSITION.

THE FUNCTION SWITCH S-2 IS SHOWN IN THE "OFF" POSITION.

THE METER SWITCH IS SHOWN IN THE "PLATE" POSITION.

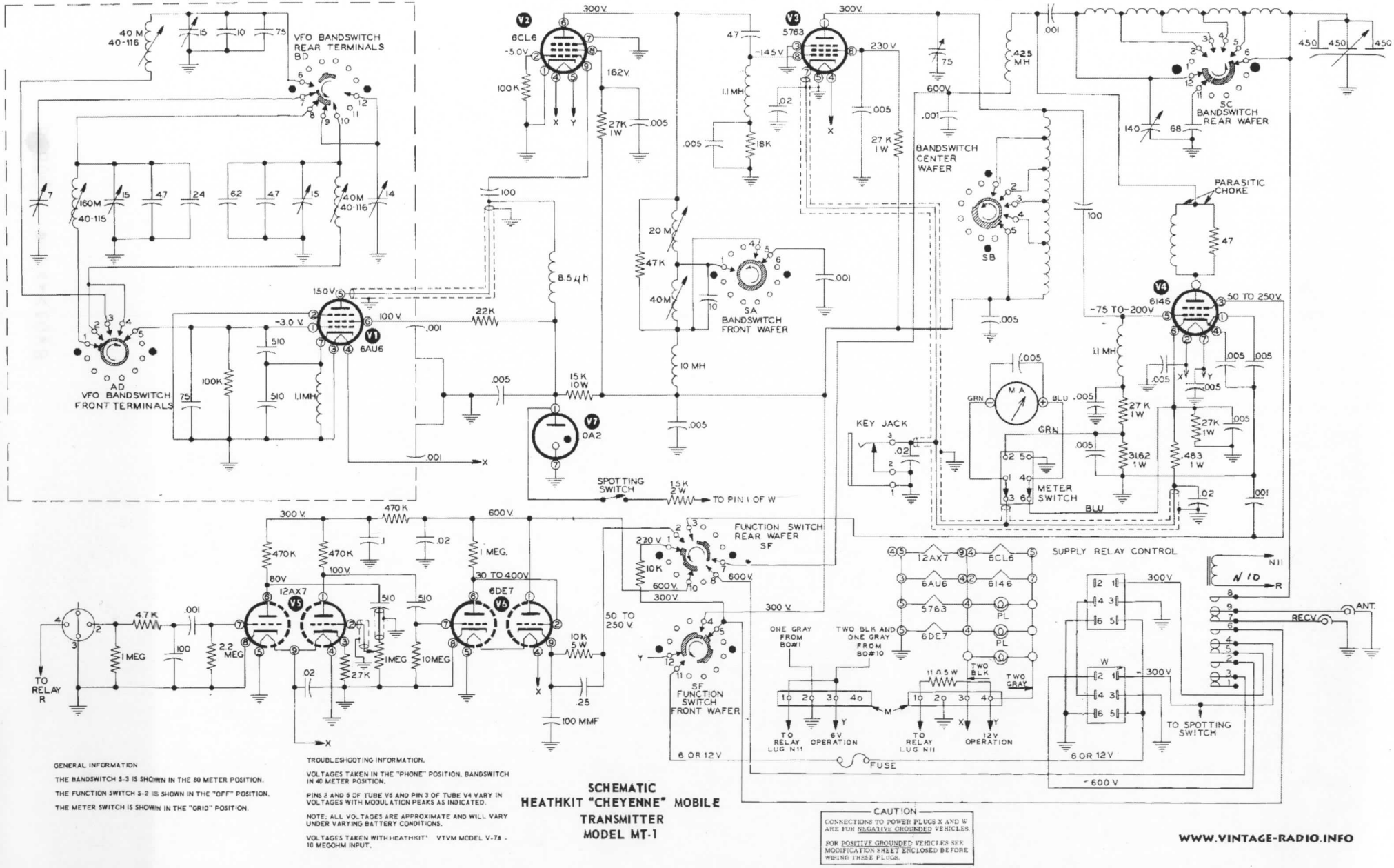
TROUBLESHOOTING INFORMATION.

VOLTAGES TAKEN IN THE "PHONE" POSITION. BANDSWITCH IN 40 METER POSITION.

PINS 3 AND 8 OF TUBE V6 AND PIN 3 OF TUBE V4 VARY IN VOLTAGE WITH MODULATION PEAKS AS INDICATED.

NOTE: ALL VOLTAGES ARE APPROXIMATE AND WILL VARY UNDER VARYING BATTERY CONDITIONS.

SCHEMATIC
HEATHKIT "CHEYENNE" MOBILE TRANSMITTER
MODEL MT-1



GENERAL INFORMATION

THE BANDSWITCH S-3 IS SHOWN IN THE 80 METER POSITION.

THE FUNCTION SWITCH S-2 IS SHOWN IN THE "OFF" POSITION.

THE METER SWITCH IS SHOWN IN THE "GRID" POSITION.

TROUBLESHOOTING INFORMATION.

VOLTAGES TAKEN IN THE "PHONE" POSITION. BANDSWITCH IN 40 METER POSITION.

PINS 2 AND 6 OF TUBE V6 AND PIN 3 OF TUBE V4 VARY IN VOLTAGES WITH MODULATION PEAKS AS INDICATED.

NOTE: ALL VOLTAGES ARE APPROXIMATE AND WILL VARY UNDER VARYING BATTERY CONDITIONS.

VOLTAGES TAKEN WITH HEATHKIT® VTVM MODEL V-7A - 10 MEGOHM INPUT.

SCHEMATIC
HEATHKIT "CHEYENNE" MOBILE TRANSMITTER
MODEL MT-1

CAUTION

CONNECTIONS TO POWER PLUGS X AND W ARE FOR NEGATIVE GROUNDED VEHICLES.

FOR POSITIVE GROUNDED VEHICLES SEE MODIFICATION SHEET ENCLOSED BEFORE WIRING THESE PLUGS.

HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual through thoroughly to familiarize yourself with the general procedure. Note the relative location of pictorials and pictorial inserts in respect to the progress of the assembly procedure outlined.

This information is offered primarily for the convenience of novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronics enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialized equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 100 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of rosin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that tube sockets are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer color coded wires will be available at the proper chassis opening.

Make it a standard practice to use lock washers under all 6-32 and 8-32 nuts. The only exception being in the use of solder lugs—the necessary locking feature is already incorporated in the design of the solder lugs. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.

When installing binding posts that require the use of fiber insulating washers, it is good practice to slip the shoulder washer over the binding post mounting stud before installing the mounting stud in the panel hole provided. Next, install a flat fiber washer and a solder lug under the mounting nut. Be sure that the shoulder washer is properly centered in the panel to prevent possible shorting of the binding post.

WIRING

When following wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.

When removing insulation from the end of hookup wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect to nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.

In mounting parts such as resistors or condensers, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use spaghetti or insulated sleeving over exposed wires that might short to nearby wiring.

It is urgently recommended that the wiring dress and parts layout as shown in the construction manual be faithfully followed. In every instance, the desirability of this arrangement was carefully determined through the construction of a series of laboratory models.

SOLDERING

Much of the performance of the kit instrument, particularly in respect to accuracy and stability, depends upon the degree of workmanship used in making soldered connections. Proper soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat to thoroughly flow the solder smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and tube sockets. This is particularly important in instruments such as the VTVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality rosin core radio type solder.