

# ASSEMBLY AND OPERATION OF THE HEATHKIT "MOHAWK" RECEIVER MODEL RX-1



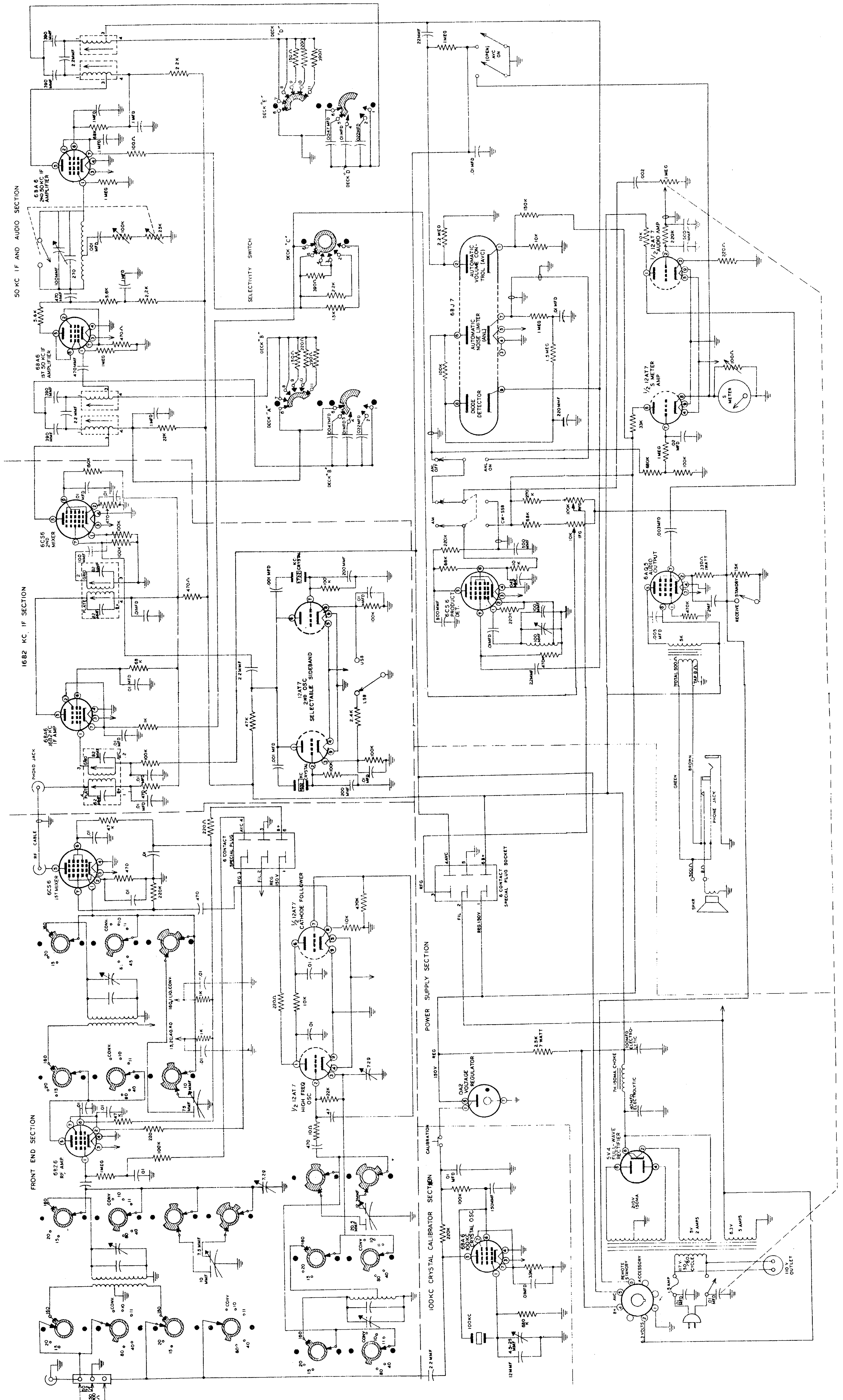
## SPECIFICATIONS

15 Tube Double Conversion Superhetrodyne Receiver  
With Selectable Sideband

First IF frequency 1682 KC

Second IF frequency 50 KC

Frequency Coverage.....	Band	Frequency
	160 .....	1.8 - 2.0 mc
	80 .....	3.5 - 4.0 mc
	40 .....	7.0 - 7.3 mc
	20 .....	14.0 - 14.35 mc
	15 .....	21.0 - 21.45 mc
	11 .....	26.96 - 27.23 mc
	10 .....	28.0 - 29.7 mc
	6 .....	50 - 54 mc (with converter)
	2 .....	144 - 148 mc (with converter)



Selectivity Range..... 5 KC, 3 KC, 2 KC, 1 KC, .5 KC.

Bridged T Notch Filter..... 50 DB Rejection Notch

Panel Controls.....	RF gain	Tuning
	I F gain	Antenna Trimmer
	AF gain-	
	W/on-off switch	Calibrate Set
	T Notch tuning	Calibrate On
	T Notch depth	CW-SSB-AM
	ANL	Receive Standby
	AVC	Upper-Lower Sideband
	BFO	Selectivity
	BAND	Phones

Tube Complement.....	6BZ6 .....	RF amplifier
	6CS6 .....	1st mixer
	12AT7 .....	Oscillator-cathode follower
	6BA6 .....	1682 KC IF amplifier
	6CS6 .....	2nd mixer
	12AT7 .....	1632-1732 KC crystal oscillator
	6BA6 .....	50 KC IF amplifier
	6BA6 .....	50 KC IF amplifier
	6BJ7 .....	DET-AVC-ANL
	6CS6 .....	Product detector
	12AT7 .....	1st Audio-S meter amp.
	6AQ5 .....	Audio output
	6BA6 .....	100 KC oscillator
	OA2 .....	Voltage regulator
	5V4 .....	Rectifier

Signal to Noise Ratio..... 10 DB at less than 1 microvolt

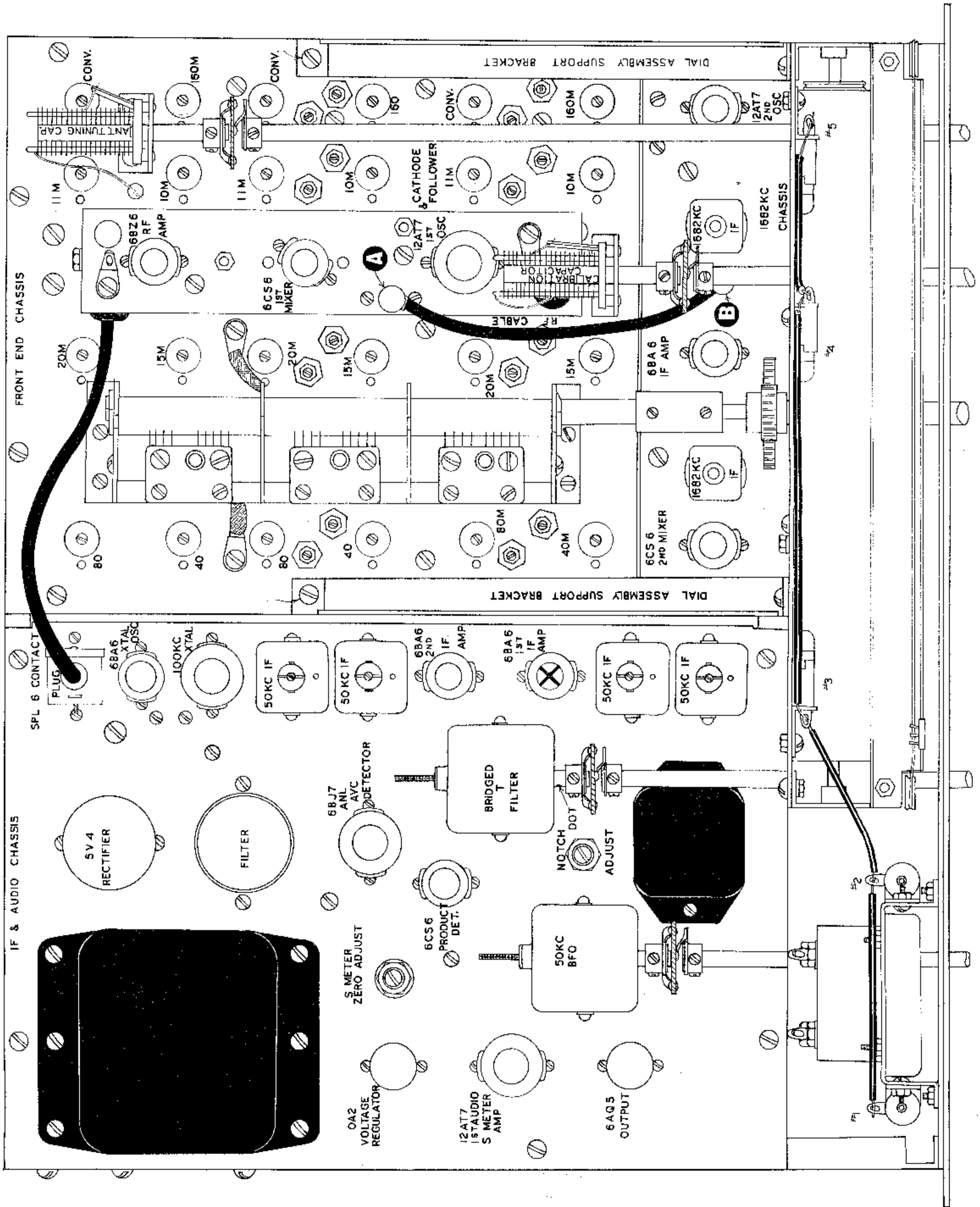
Output..... 8 or 500 ohms - 2 watts

Power Required..... 117 VAC 50/60 cycle 75 watts

Weight..... 52 lbs.

Shipping Weight..... 65 lbs.

Size..... 19 1/2" wide x 11 5/8" high x 16" deep



FRONT END CHASSIS

IF & AUDIO CHASSIS

DIAL ASSEMBLY SUPPORT BRACKET

DIAL ASSEMBLY SUPPORT BRACKET

1682 KC CHASSIS

TOP PLATE DRAWING

## INTRODUCTION

Amateur Radio operation today requires a highly specialized receiver, capable of receiving several different types of transmissions, under a wide variety of conditions. Although no receiver can be considered perfect in all respects, the Heathkit Mohawk, Model RX-1, represents a serious attempt to combine all of the necessary functions required in a high class communications receiver.

The high frequency oscillator is voltage regulated and cathode follower isolated to achieve stability. A high-gain RF amplifier stage is used to minimize the effect of mixer noise. The mixer tube itself is the result of numerous tests to obtain a very quiet tube type. All of the "front end" coils are of ceramic form construction to achieve stability and high Q. The tube sockets and the band switch are also ceramic, and all of the "signal circuit" tie points are made at highly insulated terminations.

A bridged T notch filter is incorporated for heterodyne rejection, and a built-in 100 KC crystal oscillator is used for dial calibration. The receiver also has a special calibrated band for use with 6 and 2 meter converters.

Panel controls include main tuning; band switch; selectivity; RF, IF, audio gain controls; upper-lower side band; notch tuning and notch depth; antenna trimmers; BFO; calibrate controls; ANL (Auto-Noise-Limiter); AVC (Auto-Volume-Control); CW-SSB, AM; and phone jack.

The RF chassis of this receiver is furnished completely wired and aligned, thus eliminating the most difficult part of receiver adjustment.

The receiver also incorporates the means for complete and accurate alignment of all IF stages without expensive test equipment.

## CIRCUIT DESCRIPTION

### RF CHASSIS

#### RF AMPLIFIER

A 6BZ6 tube is used as the radio frequency amplifier stage. The stage has delayed AVC applied and has a separate gain control operating in the cathode circuit. By being able to control the gain of this stage independently, it is possible to reduce cross modulation from extremely strong signals, and yet maintain good overall receiver sensitivity.

Eight high-Q ceramic form coils and four sections of the band switch are enclosed in the RF compartment. The antenna windings of the coils have grounded center taps, with the two ends switched for band changing. The entire antenna winding is used with balanced antennas of 100-150 ohm impedance, and because of the centertap construction, noise pick up in the feeders is canceled. Half of the antenna winding is used for coaxial feed lines of 50 to 75 ohms impedance. A front panel antenna trimmer control peaks the circuit for various antennas.

#### 1st Mixer

A 6CS6 tube which has dual grid control and sharp cut off characteristics is used as the 1st mixer. This tube, although not primarily designed for mixer service, has proved to have equal conversion transconductance, and considerably less mixer noise than many others tested. Its basic configuration is similar to the 6BE6, but is a higher gain tube with less noise.

Here again, the coils and the necessary sections of the band switch are isolated in a separate compartment. One section of the band switch, in each compartment, switches the main tuning

capacitor sections to place either the larger or smaller sections, or both, in parallel with the circuit, to provide the proper band spread for each band.

The output of the mixer is carried through a coaxial cable to the 1682 KC IF chassis.

### 1st Conversion Oscillator

A 12AT7 twin triode tube combines the functions of a Hartley oscillator and a cathode follower. By using half the tube as a cathode follower to couple the oscillator to the mixer stage, oscillator "pulling" is eliminated.

A 20 mmf variable capacitor is connected to the oscillator coil cathode tap, and is used to calibrate the dial to the 100 KC crystal oscillator incorporated in the receiver.

The oscillator coils and band switch sections are isolated in the front section of the RF chassis.

The complete RF chassis, including the RF amplifier, mixer and oscillator, is furnished completely wired and aligned. This unit is connected to the rest of the receiver by appropriate plugs and cables, and to the panel controls through mechanical linkage.

## 1682 KC IF AMPLIFIER CHASSIS

A 6BA6 tube is used as a transformer coupled amplifier at 1682 KC. This stage has AVC control of its grid. The cathode bias is regulated by the IF gain control. The choice of IF frequency places images over three megacycles away from the frequency to which the receiver is tuned and thus virtually eliminates an image response.

### 2nd Mixer

Again, a 6CS6 tube is used in mixer service for the reasons stated in the first mixer description. This stage converts the 1682 KC signal to 50 KC and thus allows the sharp selectivity characteristics of a 50 KC IF frequency to be utilized. Note that the plate of this tube and the plates or grids of following tubes are tapped down on the 50 KC transformers. By doing this, the transformers are very lightly loaded and as a consequence are able to maintain the high Q necessary for good selectivity.

### 2nd Conversion Oscillator

A 12AT7 twin triode tube is operated as two crystal controlled oscillator stages, one at 1632 KC and the other at 1732 KC. By switching one or the other of the oscillators into operation, which are 50 KC above or below the 1682 KC IF frequency, either the lower or upper sideband of an incoming signal is placed in the 50 KC IF band pass. Thus the upper or lower sideband of an SSB signal is chosen by merely turning a panel control. In the case of AM signals, this feature allows the choice of the sideband having the least interference.

## POWER, AUDIO AND 50 KC IF CHASSIS

### 50 KC IF AMPLIFIER

Following the second mixer is a two stage 50 KC IF amplifier using 6BA6 tubes. Although gain is realized in these stages, their primary purpose is to provide selectivity. Instead of the usual IF transformers, four separate high Q coils are used. The coupling between these coils is controlled by capacity and the loading by resistance. As the capacitive coupling and resistance loading are simultaneously reduced in steps, the band pass of the amplifier becomes narrower, and the selectivity is increased. The capacitive coupling circuit is so arranged that the coupling capacitor is effectively a part of the tuning capacity of each of the inter-stage coils. As the value

of the coupling capacitor is decreased (increasing the pass-band), the mid-frequency of the pass-band is also increased, leaving the low frequency skirts of the pass-band at approximately the same frequency regardless of the selectivity switch position. This feature, combined with the selectable second conversion crystal controlled oscillator frequency, makes accurate tuning of either upper or lower single-sideband signals a perfectly straight forward procedure.

As a large amount of gain is not necessary at this point, the first 6BA6 tube is triode connected and operated at a low gain level.

### Bridged T Filter

Coupled between the first and second 50 KC IF tube is a bridged T filter for rejection of heterodynes and unwanted signals. The bridged T filter is an unbalanced form of lattice filter, utilized where one side of the circuit must be grounded. By using LC components of reasonably high Q, proper impedance matching of input and output, and adjusting the resistance leg to the proper match, a rejection notch of 50 to 60 DB can be realized.

### Detector Circuits

The output of the 50 KC IF amplifiers is fed to a 6CS6 tube operating as a product detector, and a 6BJ7 tube which combines the functions of diode detection, automatic volume control, and the automatic noise limiting.

The product detector is basically a mixer circuit with two control inputs (grids) and a common output (plate). One grid is part of a Hartley oscillator circuit with variable frequency control by means of a tuning capacitor. This is a panel control and represents the BFO. The incoming 50 KC IF signal is injected at the other controlling grid. These two signals (BFO and received signal) are mixed in the tube and the product appears at the plate. If the two signals are at nominal zero beat with each other, the oscillator section of the tube replaces the missing carrier in a SSB signal; if separated by 1000 cycles, the result is an audible beatnote for CW reception.

The 50 KC IF signal is also fed to two diode sections of the 6BJ7 triple diode tube. One of these sections acts as a shunt rectifier to produce a negative AVC voltage. The cathode of this section has a fixed positive voltage applied, which allows the incoming signal to reach a predetermined level before the tube conducts and produces AVC output. This is known as delayed AVC and allows a better signal to noise ratio by permitting maximum gain on weak signals.

The second diode section acts as a series rectifier to demodulate the incoming signal for AM reception. This demodulated signal is either fed directly to the audio amplifier, or through the third diode section acting as a series noise limiter. The noise limiter section derives an automatic bias from the incoming signal and applies to it an RC network in the cathode circuit. By this means the clipping level of the noise limiter is controlled by the average carrier level.

The direct output of the diode detector is also fed to 1/2 of a 12AT7 twin triode through an RC network. This section has regulated plate voltage and a meter in the cathode circuit. The varying carrier level applied to the tube grid causes a varying tube current which is read on the meter as "S" units. On 10 meters a hundred microvolt signal at the receiver antenna input produces an S9 reading at the meter.

The switch selected output from either the diode or product detector is applied to the other half of the 12AT7 for audio amplification. The output of the 12AT7 is further amplified by a 6AQ5 for speaker output at 8 ohms or earphone output at 500 ohms. Both of these amplifiers have their RC constants chosen for maximum amplification in the speech range.

## NOTES ON ASSEMBLY AND WIRING

A good communications receiver is an instrument that will be used for many years in the "ham shack". Consequently, it will repay the builder to spend a sufficient number of hours to guarantee

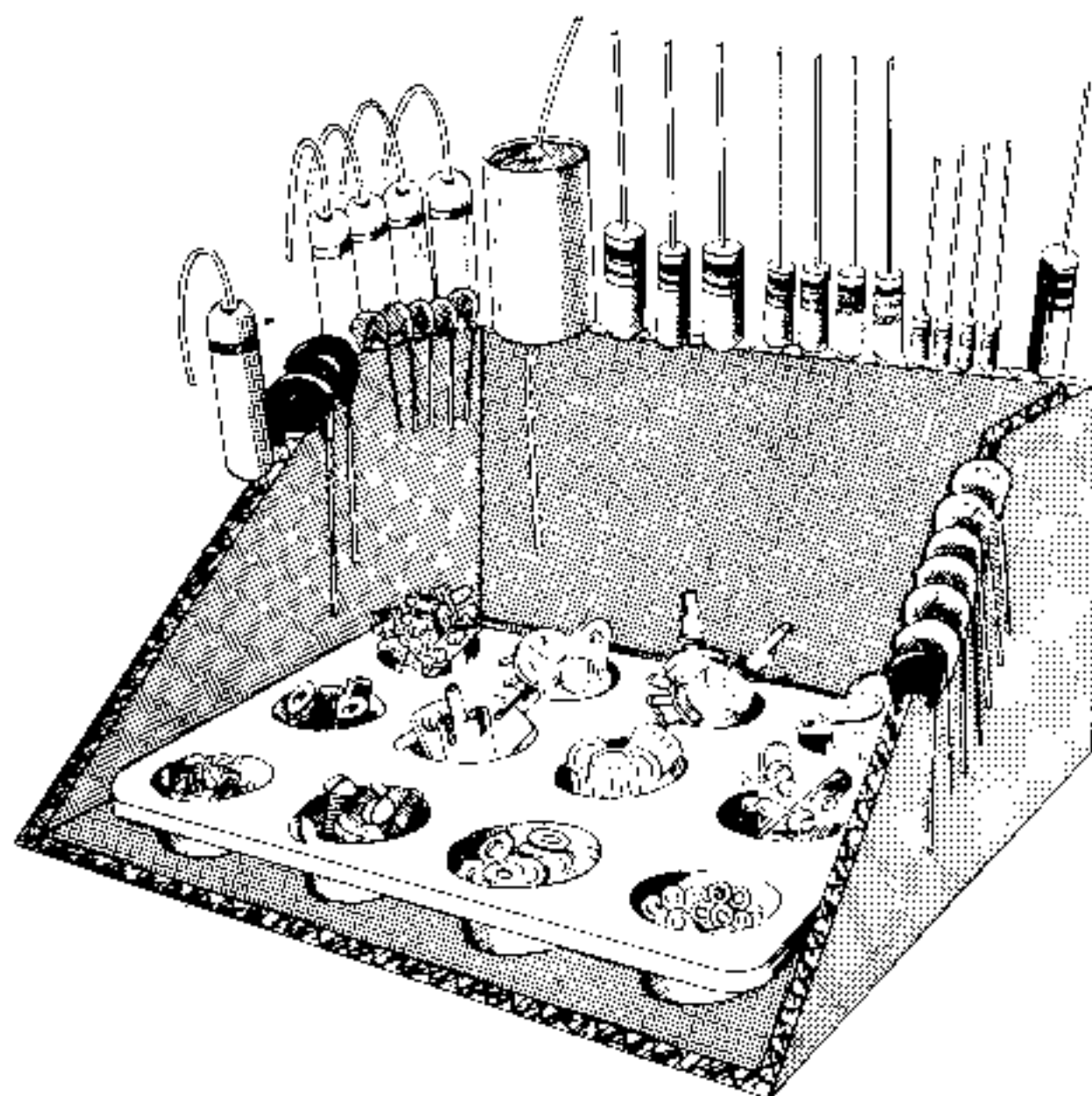
the best possible workmanship in assembly. The following are suggestions that may make assembly easier.

If possible the work should be started on a table or bench that will not have to be cleared until the project is finished. It is much easier to resume construction if everything remains in place until the kit is completed. Several layers of newspaper should be placed over the work table to protect both the table and the kit.

Basic tools needed are a soldering iron or soldering gun, long nose pliers used to form leads or hold parts for soldering, cutting pliers, preferably separate but may be in combination with the long nose pliers, a small knife or regular wire stripping tool, a 1/4" and 1/8" blade screwdriver, scale or ruler and rosin core solder.

UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with each part. Refer to the charts and other information shown on the inside cover of the manual to help you identify any parts about which there may be a question. 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.

Most kit builders find it helpful to separate the parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed in the edge of a piece of corrugated cardboard. The illustration shows one method that may be used.



This manual is supplied to assist you in every way to complete the Mohawk with the least possible chance for error. Read each step through completely before starting it, and compare the written instructions with the pictorials. This will help form a mental picture of the exact location and connection of the part being used. The layout and wiring as specified in this manual are the results of considerable research and experimentation; for best results the step by step should be followed carefully. Attempting to wire directly from the schematic or pictorials have proven disastrous for some builders. The large fold-in pictorials are handy to attach to the wall above your work space; this will eliminate turning back pages in the manual to find the proper picture. We suggest that you retain the manual in your file after the kit is finished.

Capacitors, resistors, transformer, etc., have leads longer than necessary for wiring. In most cases the length of lead necessary will be specified in the manual. Where the lead length is not specified, the parts are mounted with the minimum length of lead needed to connect the part directly from one terminal to the other and about 1/4" of lead between the terminal and the component body for heat insulation. Soldering should be performed quickly with a hot iron to flow the solder rapidly but not overheat the component.

In many cases, the specified wire lengths may seem long. These lengths were chosen so the wire could be run close to the chassis and formed for the best appearance. Marking the letters of the tube sockets and terminal strips on the chassis as they are installed will be a great help during the wiring procedure.

The actual tube markings may differ from the type specified in the parts list by an additional suffix (A, B, GT, etc.). This denotes a minor variation which will not affect the operation of the completed instrument.



In order to expedite delivery to you, we are occasionally forced to make minor substitutions of parts. Such substitutions are carefully checked before they are approved and the parts supplied will work satisfactorily. By checking the parts list for resistors, for example, you may find that a 2 K ohm resistor has been supplied in place of a 2.2 K ohm as shown in the parts list. These changes are self-evident and are mentioned here only to prevent confusion in checking the contents of your kit. Resistors and condensers generally have a tolerance rating of  $\pm 10\%$  unless otherwise stated in the parts list. Therefore, a 100 K ohm resistor may test anywhere from 90 K ohm to 110 K ohm. The letter K is commonly used to designate a multiplier of 1000.

### PROPER SOLDERING PROCEDURE

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

Correct soldering technique is extremely important. Good solder joints are essential if the performance engineered into the kit is to be fully realized. If you are a beginner with no experience in soldering, a half-hour's practice with odd lengths of wire and a tube socket will be a worthwhile investment.

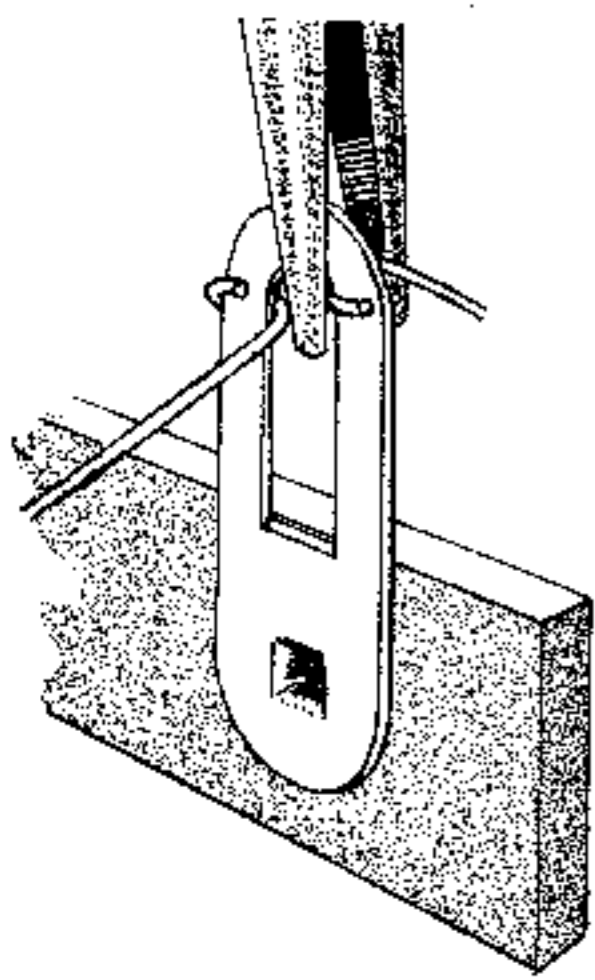
High quality solder of the proper grade is most important. There are several different brands of solder on the market, each clearly marked "Rosin Core Radio Solder." Such solders consist of an alloy of tin and lead, usually in the proportion of 50:50. Minor variations exist in the mixture such as 40:60, 45:55, etc. with the first figure indicating the tin content. Radio solders are formed with one or more tubular holes through the center. These holes are filled with a rosin compound which acts as a flux or cleaning agent during the soldering operation.

NO SEPARATE FLUX OR PASTE OF ANY KIND SHOULD BE USED. We specifically caution against the use of so-called "non-corrosive" pastes. Such compounds, although not corrosive at room temperatures, will form residues when heated. The residue is deposited on surrounding surfaces and attracts moisture. The resulting compound is not only corrosive but actually destroys the insulation value of non-conductors. Dust and dirt will tend to accumulate on these "bridges" and eventually will create erratic or degraded performance of the instrument.

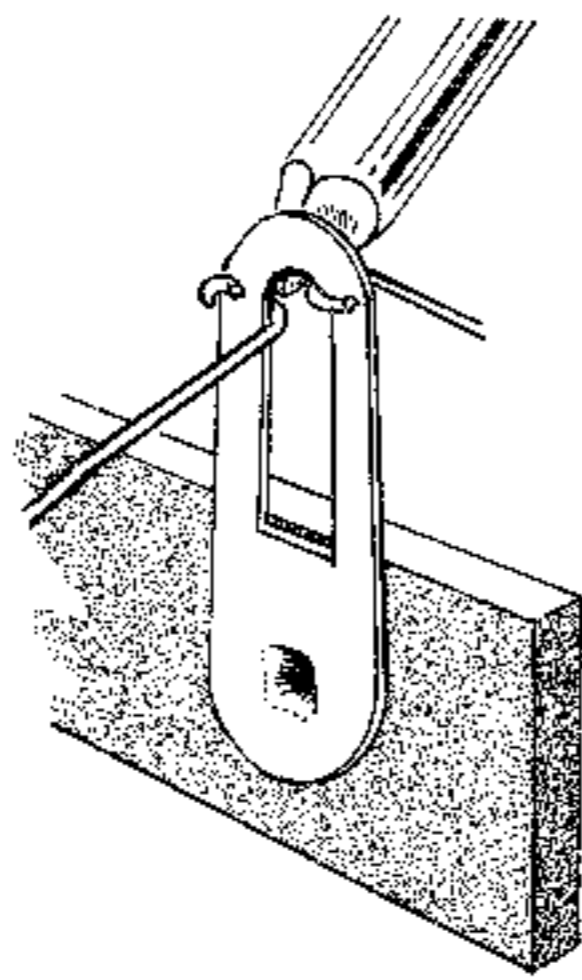
**NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.**

If terminals are bright and clean and wires free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Crimp or otherwise secure the wire (or wires) to the terminal, so a good joint is made without relying on solder for physical strength. To make a good solder joint, the clean tip of the soldering iron should be placed against the joint to be soldered so that the terminal is heated sufficiently to melt solder. The solder is then placed against both the terminal and the tip of the iron and will immediately flow out over the joint. Refer to the sketch below. Use only enough solder to cover wires at the junction; it is not necessary to fill the entire hole in the terminal with solder. Excess solder may flow into tube socket contacts, ruining the socket, or it may creep into switch contacts and destroy their spring action. Position the work so that gravity tends to keep the solder where you want it.

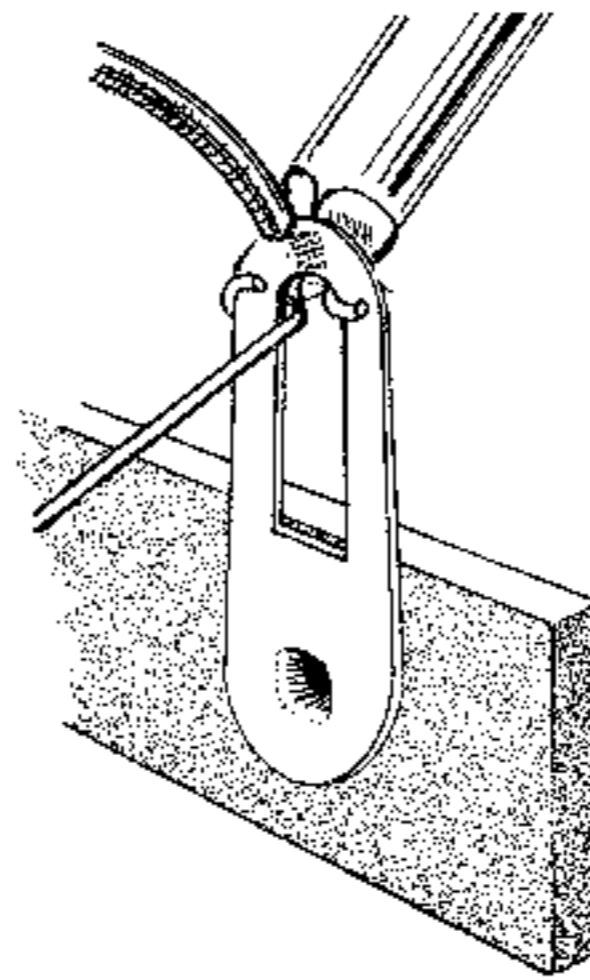
A poor solder joint will usually be indicated by its appearance. The solder will stand up in a blob on top of the connection, with no evidence of flowing out caused by actual "wetting" of the contact. A crystalline or grainy texture on the solder surface, caused by movement of the joint before it is solidified is another evidence of a "cold" connection. In either event, reheat the joint until the solder flows smoothly over the entire junction, cooling to a smooth, bright appearance. Illustrations on page 10 clearly indicate these two characteristics.



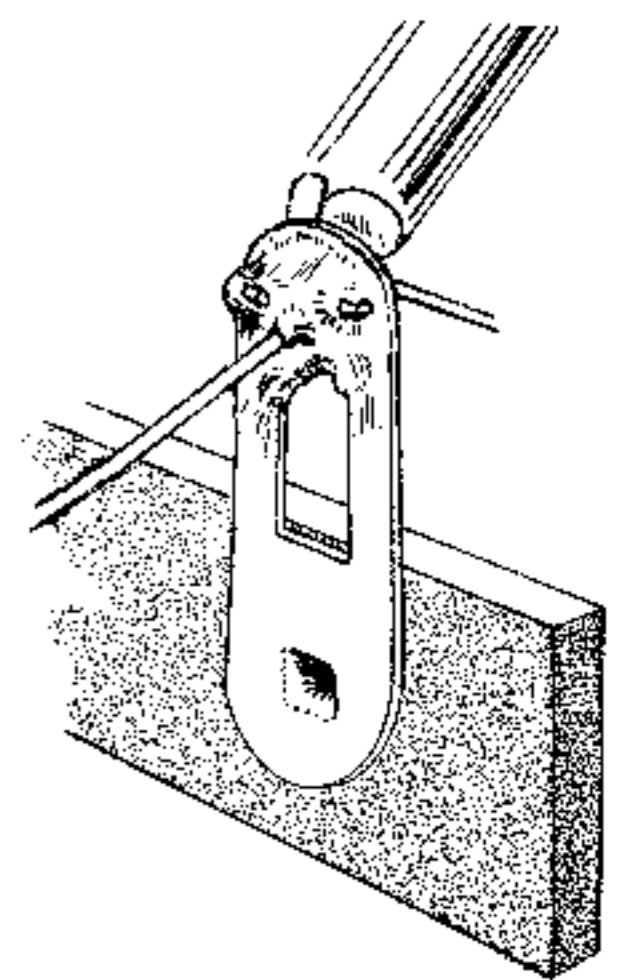
CRIMP WIRES



HEAT CONNECTION

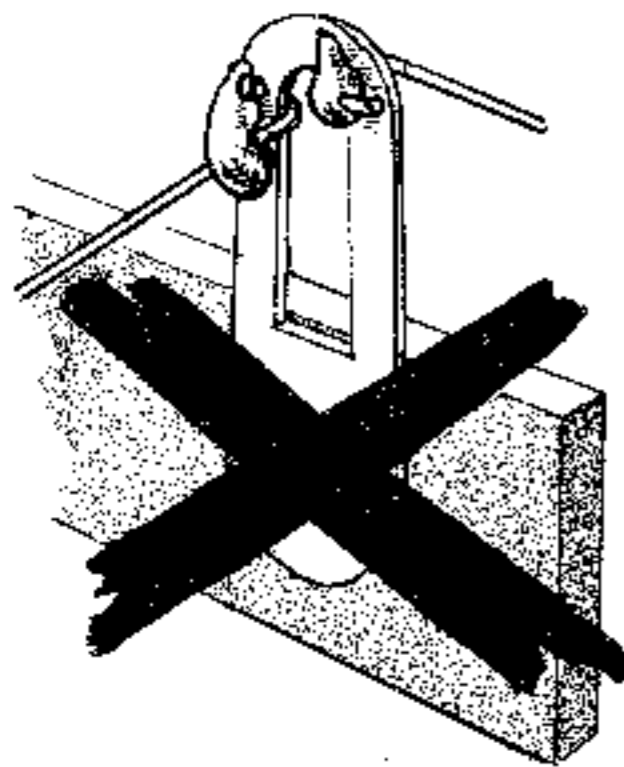


APPLY SOLDER

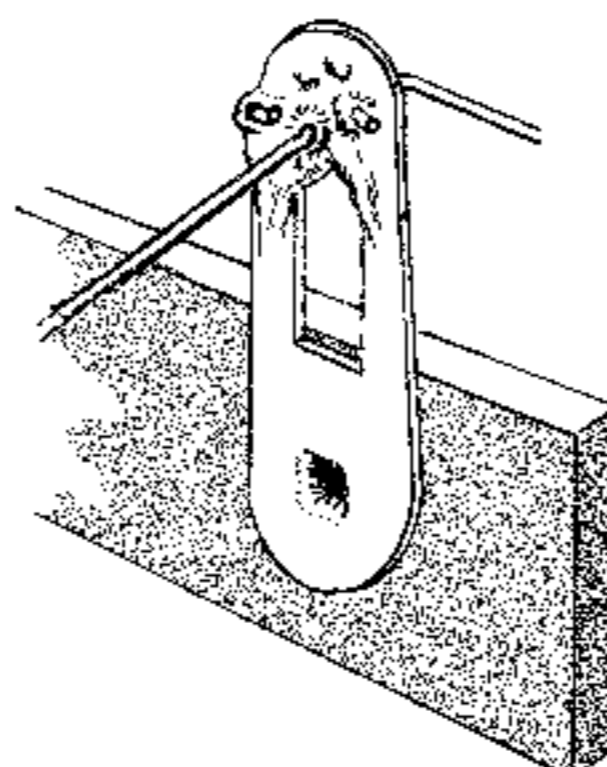


ALLOW SOLDER TO FLOW

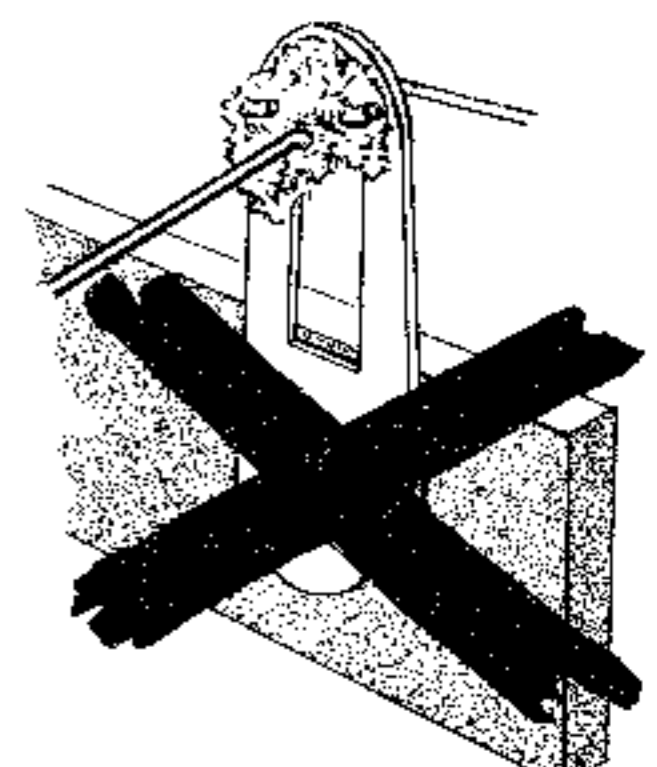
A good, clean, well-tinned soldering iron is also important to obtain consistently perfect connections. For most wiring, a 60 or 100 watt iron, or the equivalent in a soldering gun, is very satisfactory. Smaller irons generally will not heat the connections enough to flow the solder smoothly over the joint and are recommended only for light work, such as on etched circuit boards, etc. Keep the iron tip clean and bright. A pad of steel wool may be used to wipe the tip occasionally during use.



COLD SOLDER JOINT CONNECTION INSUFFICIENTLY HEATED



PROPER SOLDER CONNECTION



COLD SOLDER JOINT CONNECTION MOVED WHILE COOLING

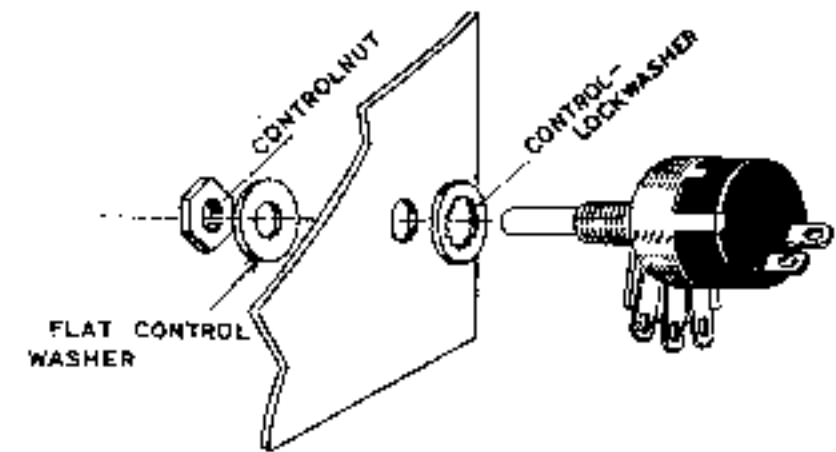
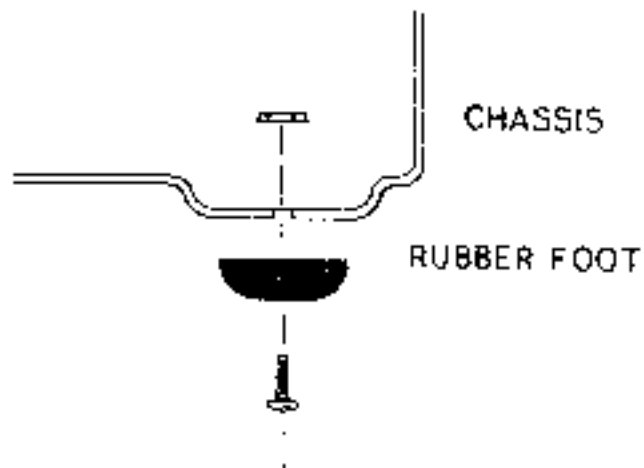
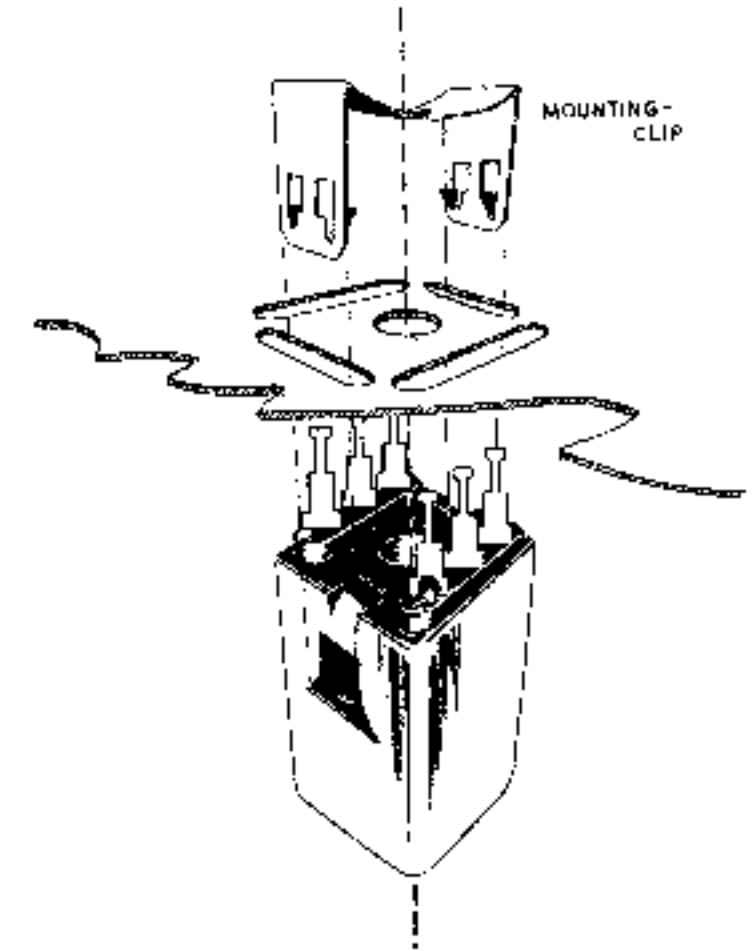
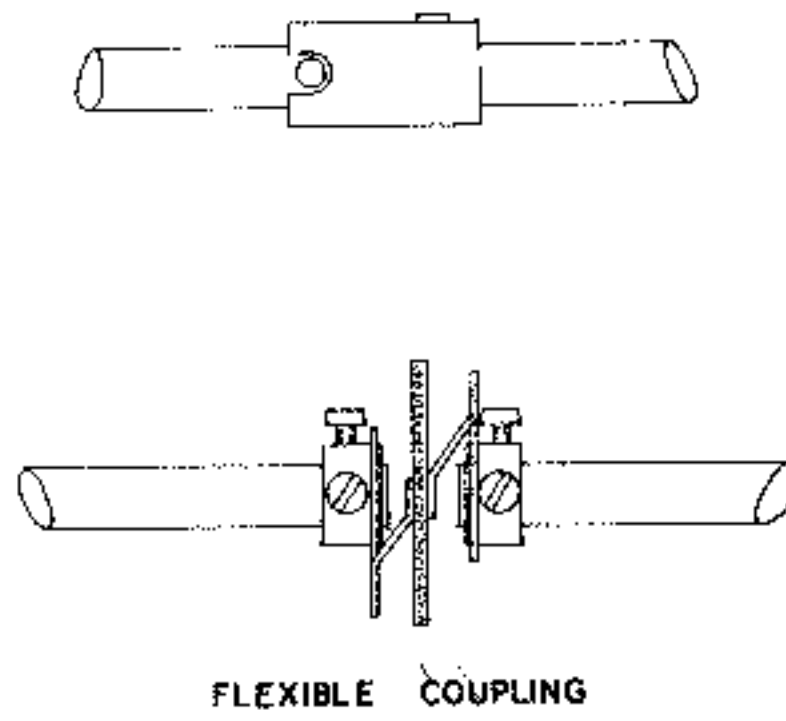
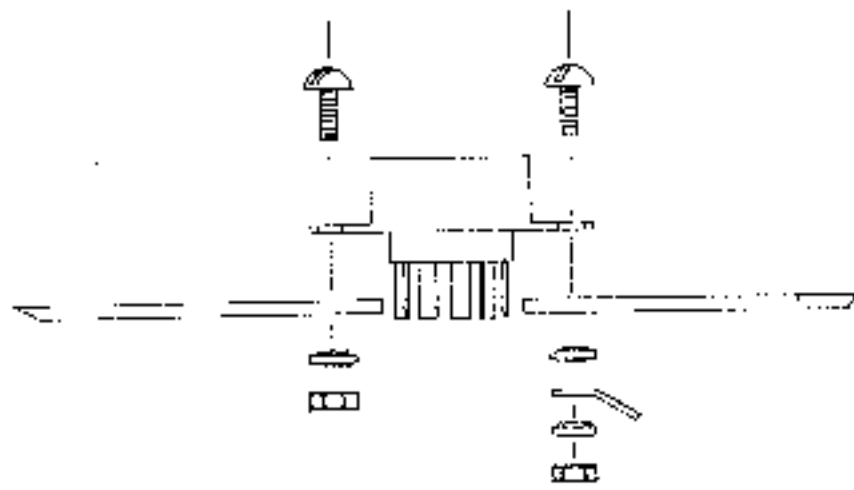
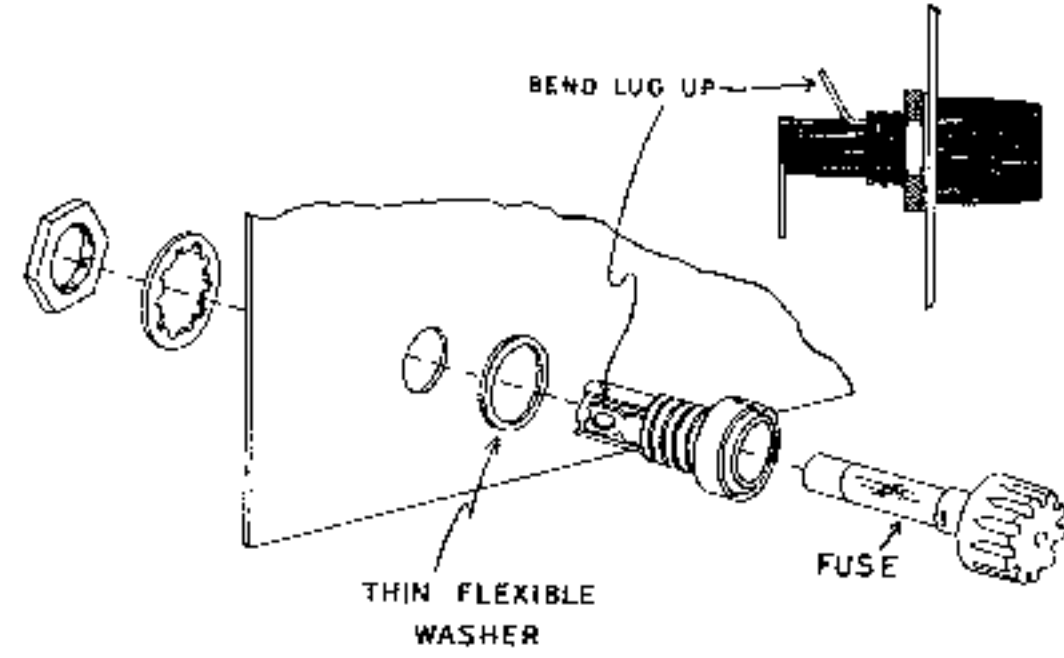
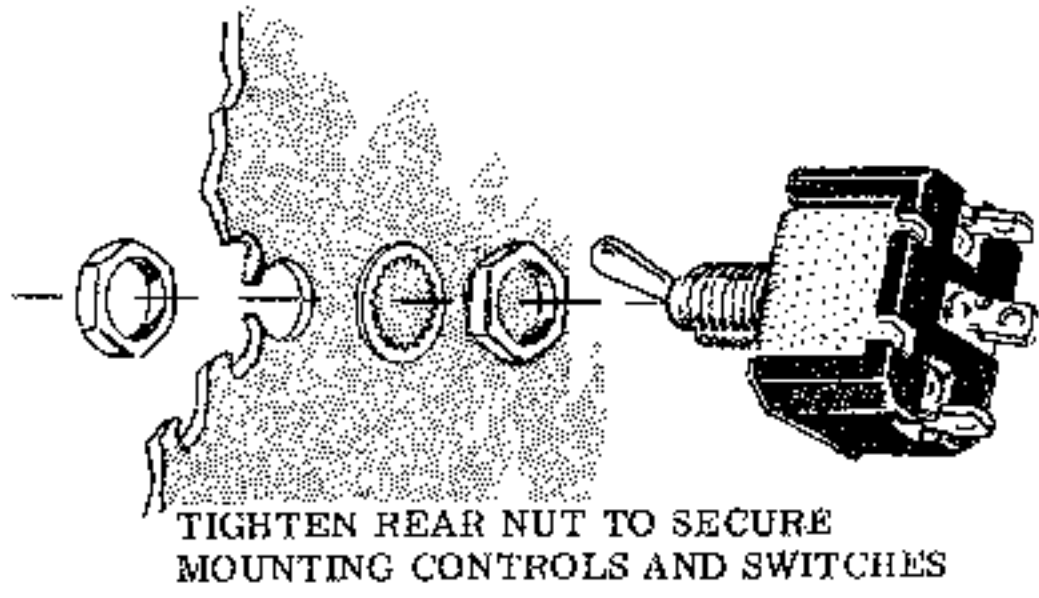
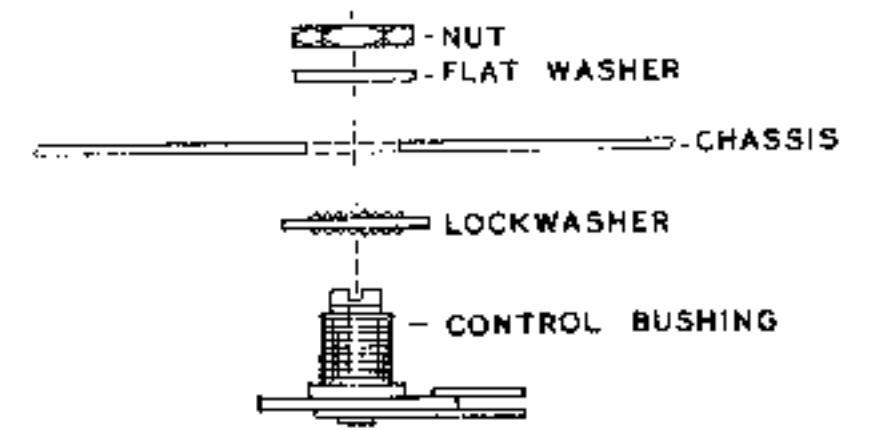
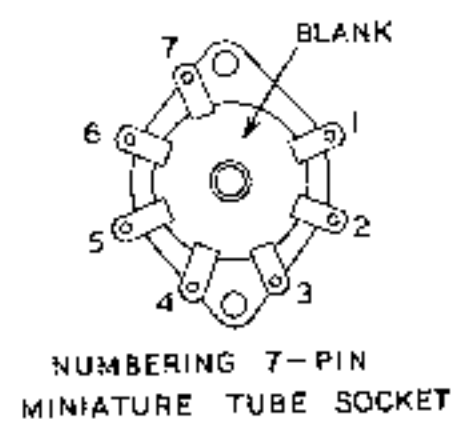
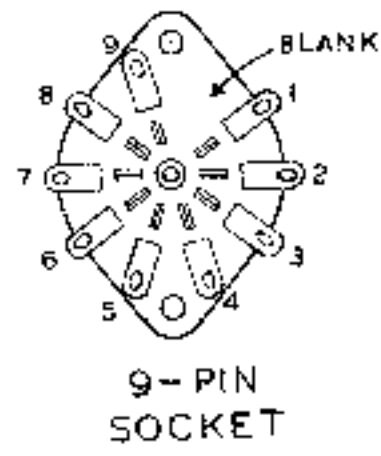
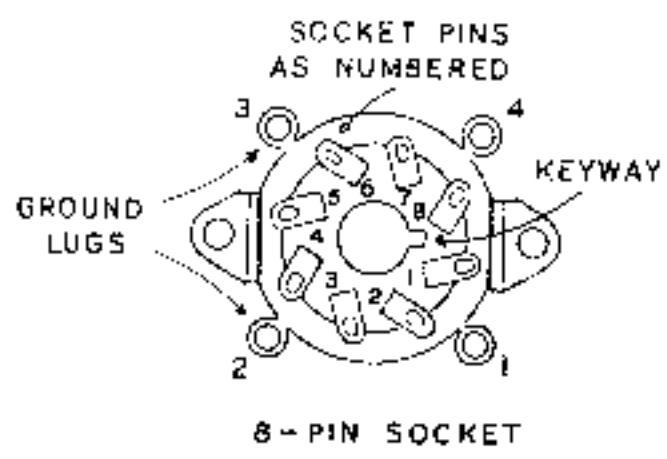
Take these precautions and use reasonable care during assembly of the kit. This will insure the wonderful satisfaction of having the instrument operate perfectly the first time it is turned on.

The abbreviation "NS" indicates that the connection should not be soldered as yet, for 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 appears after each solder (S) instruction. This number indicates the number of leads connected to the terminal in question. For example, if the instructions read, "Connect a 47 K $\Omega$  resistor from socket E1 (S-2) to E6 (NS)," it will be understood that there will be two leads connected to the terminal at the time it is soldered. This additional check will help avoid errors.

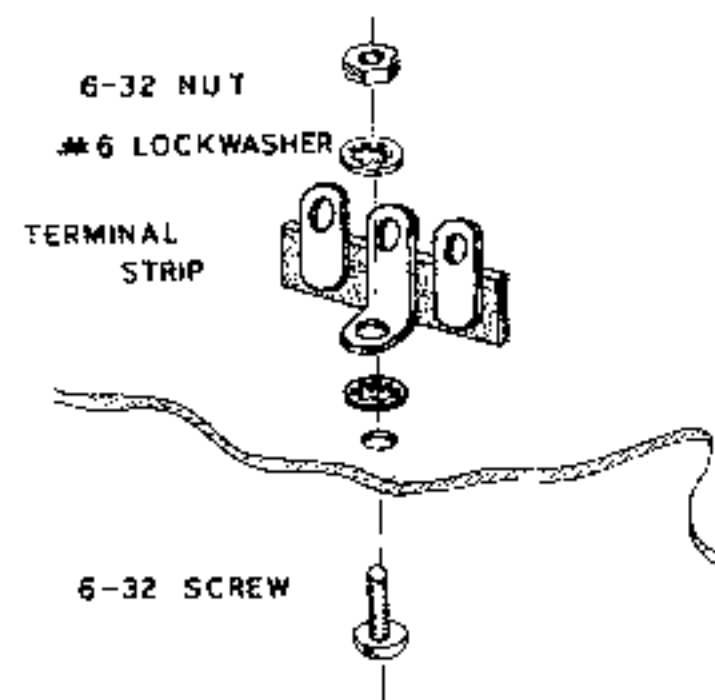
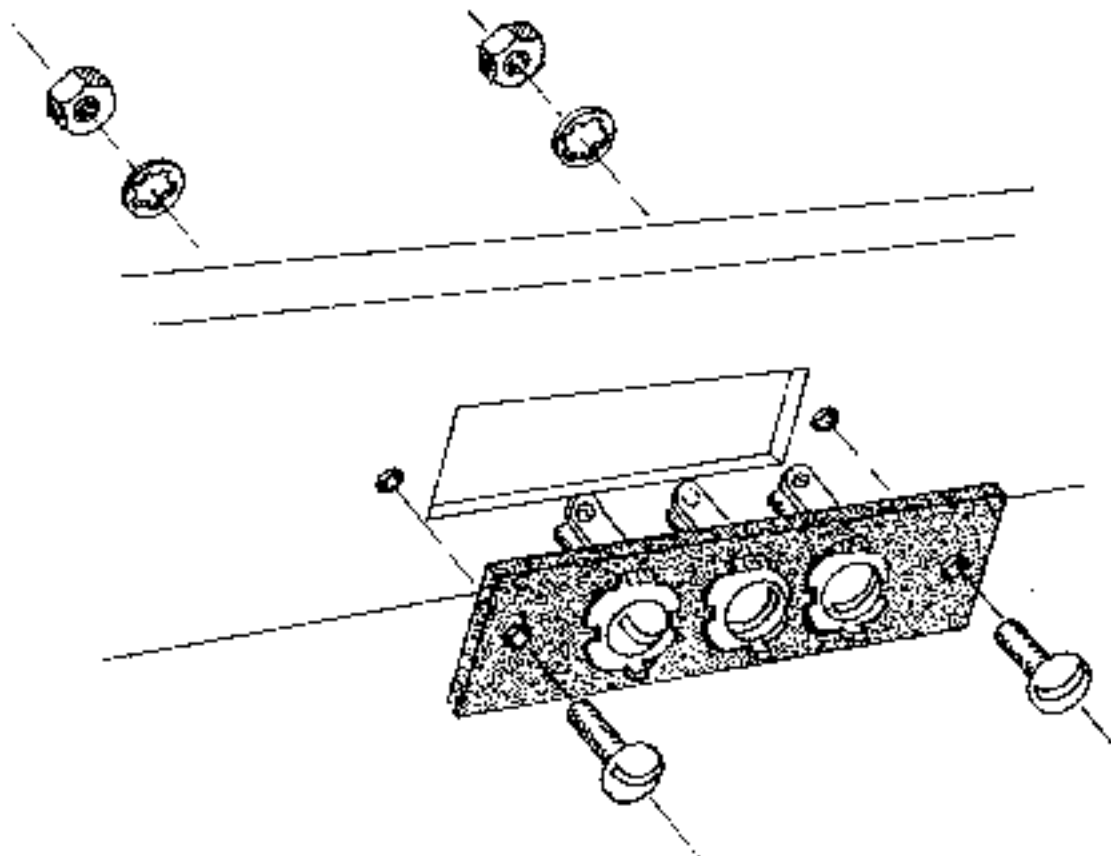
The following instructions are presented in a simple, logical, step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before you start to do it. When the step is completed, check it off in the space provided.

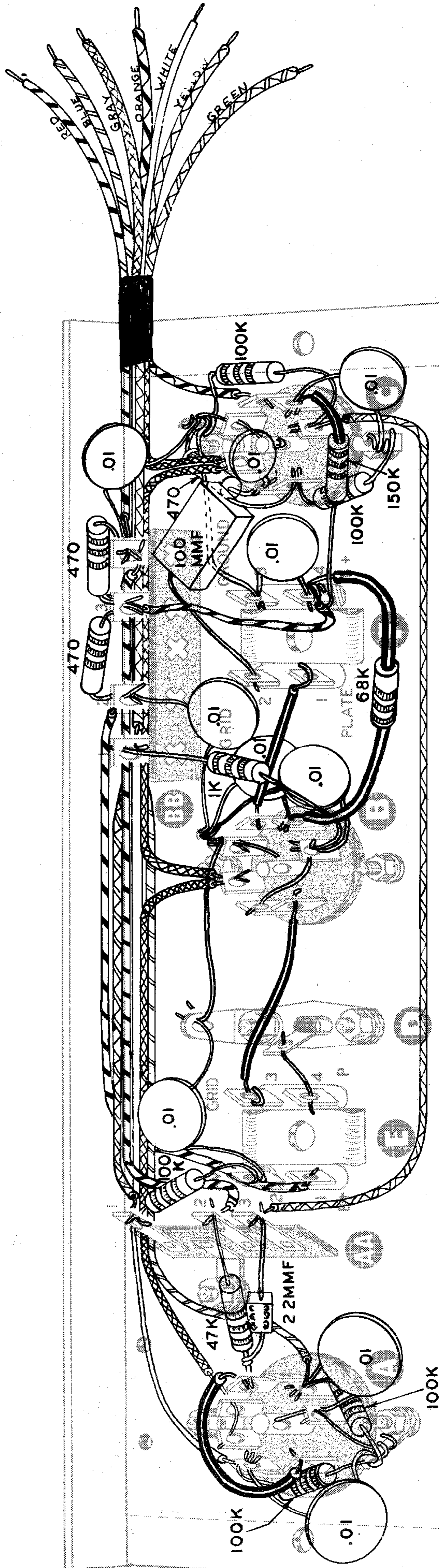
#### STEP-BY-STEP ASSEMBLY

NOTE: A plastic nut starter is included in the kit, the small end fits 3-48 nuts and the large end fits 6-32 nuts. The drawings on the following page illustrate mounting procedures for various components.



TERMINAL STRIP MOUNTING





1682 KC CHASSIS BOTTOM VIEW

## 1682 KC CHASSIS WIRING

- ( ) Select the 1682 KC chassis by comparison with Figure 1 and temporarily mount it with #6 sheet metal screws on the main chassis frame at the position shown on top plate drawing on Page 4. Now from the underside draw pencil lines around the edges of the main chassis. The lines on the 1682 KC chassis will now denote the clearance that must be maintained. In other words, no wires or components can lay over these lines or they will be pinched when the chassis is remounted. In the wiring instructions, some capacitors will overlap the lines; these will be bent out of the way later.
- ( ) Remove the 1682 KC chassis from the main chassis. NOTE: Refer to Figure 1 while completing the following steps.

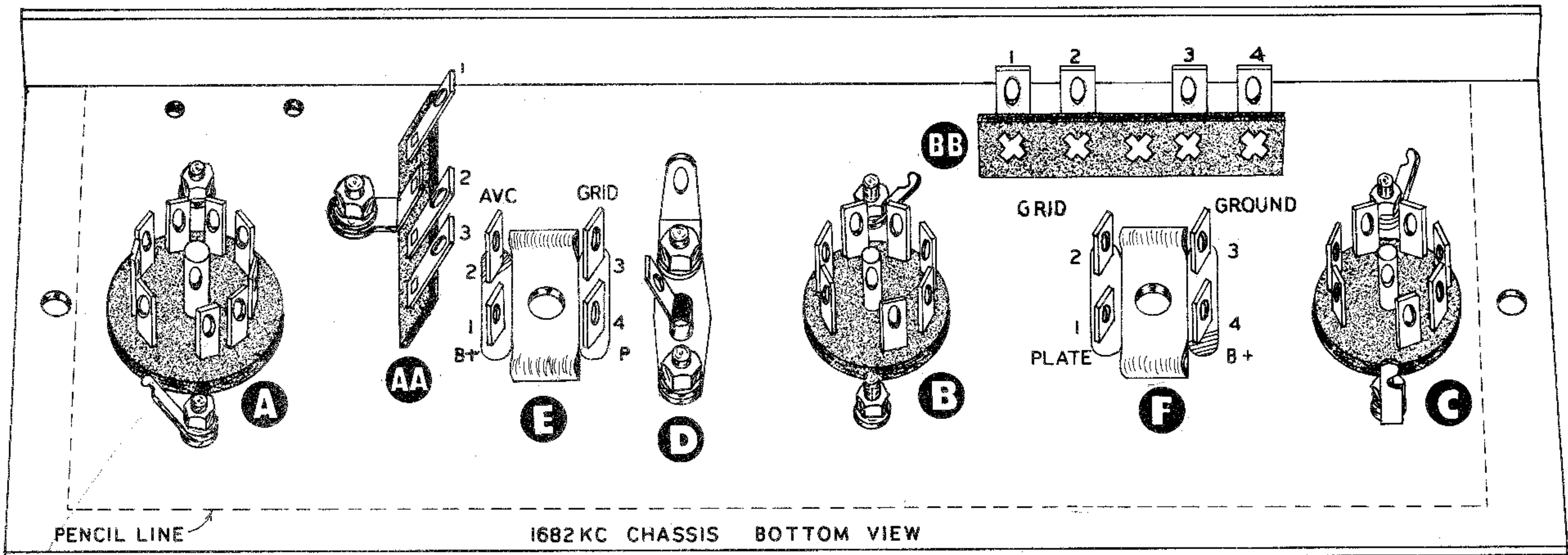


Figure 1

- ( ) Using 3-48 screws, nuts, and #3 lockwashers, mount a 9 pin ceramic shielded socket at hole A. Include a small solder lug on the front mounting screw with a lockwasher on both sides of the lug. Note the blank space between the tube socket pins; place the socket and bend the solder lug as shown.
- ( ) Mount a 7 pin miniature ceramic shielded socket at hole B, using 3-48 hardware. Include a small solder lug on the rear mounting screw, with lockwashers on each side; face the tube pins and small solder lug as shown.
- ( ) As in the above step, mount a 7 pin miniature ceramic shielded socket at hole C. Include small solder lugs under both screws; face tube pins and lugs as shown.
- ( ) Clip off the ground terminal and 1/8" of the center terminal of a phono connector, (see Figure 1) and mount it at hole D using 6-32 x 1/4" screws, nuts and one #6 lockwasher. Include a large #6 solder lug on the rear screw; no lockwasher is necessary with this type of solder lug.
- ( ) Bend the center terminal toward the 9 pin socket (A).
- ( ) Mount a 3 lug terminal strip AA (see Figure 1 for type and position) adjacent to the 9 pin socket, using 6-32 x 1/4" screw, through the chassis from the top, through a #6 lockwasher and the terminal strip mounting foot, through another #6 lockwasher and nut. NOTE: This system of mounting will apply to all terminal strips hereafter.
- ( ) Mount a 4 lug terminal strip BB between the two 7 pin sockets and behind hole F. See Figure 1 for type of terminal strip and mounting position. NOTE: There are two small IF transformers stamped 52-16 and 52-17. Transformer 52-16 is mounted at hole E and 52-17 at hole F. It is important that these not be interchanged or it will be impossible to align the IF strip.

- ( ) Mount IF transformer 52-16 from the top of the chassis at hole E with the white dot away from phono jack D. Hold IF transformer in place and press mounting clip over it from bottom of chassis as shown on Page 11. Clip should engage cutouts on opposite sides of transformer.
- ( ) In a similar manner mount transformer 52-17 at hole F with the red dot nearest socket C.

See Pictorial 1 for following wiring.

- ( ) Insert a 1 1/8" length of tinned bare wire through pin A9 to the center shield; connect the other end to the solder lug adjacent to A9. Solder the center shield only.

NOTE: There will be several connections made to the solder lugs mounted with tube sockets, so push the connections toward the chassis to make room for ones that follow.

- ( ) Insert a piece of tinned bare wire through B4 to the center shield; connect the other end to the adjacent solder lug; solder the center shield only.

- ( ) Connect a 2" length of bare wire from B4(S) to the solder lug at D (NS); run wire flat against chassis.

- ( ) Insert a 2 1/2" length of bare wire through C4 to the center shield and solder C4. On the other end, loop the wire once around the adjacent solder lug (NS) and run it over to F3 (NS). Make sure this lead does not touch other terminals of F or the nearby terminal strip BB.

- ( ) Cut both leads of a 470 ohm resistor (yellow-violet-brown) to a 1/2" length. Connect one lead to C2 (NS); connect the other lead to the ground lug adjacent to C4 (NS).

- ( ) Cut both leads of a .01 disc ceramic capacitor to a 1/2" length. Connect one lead to C2 (S2); connect the other lead to the center post of tube socket C (S2).

- ( ) Cut a piece of gray wire 5" long, strip one end 7/16" and the other end 1/4".

- ( ) Insert the 7/16" end through A5, A4 and solder both terminals.

- ( ) Run the wire diagonally over to, and around the rear of terminal strip AA and along the back of the chassis to the location of socket B, then bring the wire over to B3 (NS). See Pictorial 1. The wires coming from socket A must remain clear of the holes behind socket A.

- ( ) Cut a piece of gray wire 5" long and strip both ends 1/4".

- ( ) Connect one end to B3 (S2); run the wire along the rear of the chassis and connect the other end to C3 (NS).

- ( ) Cut a piece of gray wire 5 1/4" long; strip each end 1/4".

- ( ) Connect one end to C3 (S2); run the other end to rear of chassis and leave it free for now.

NOTE: There will be seven free wires that go to another compartment when the chassis is installed. As they are added to the wiring, insert them through the small mounting hole next to socket C to keep them out of the way until needed.

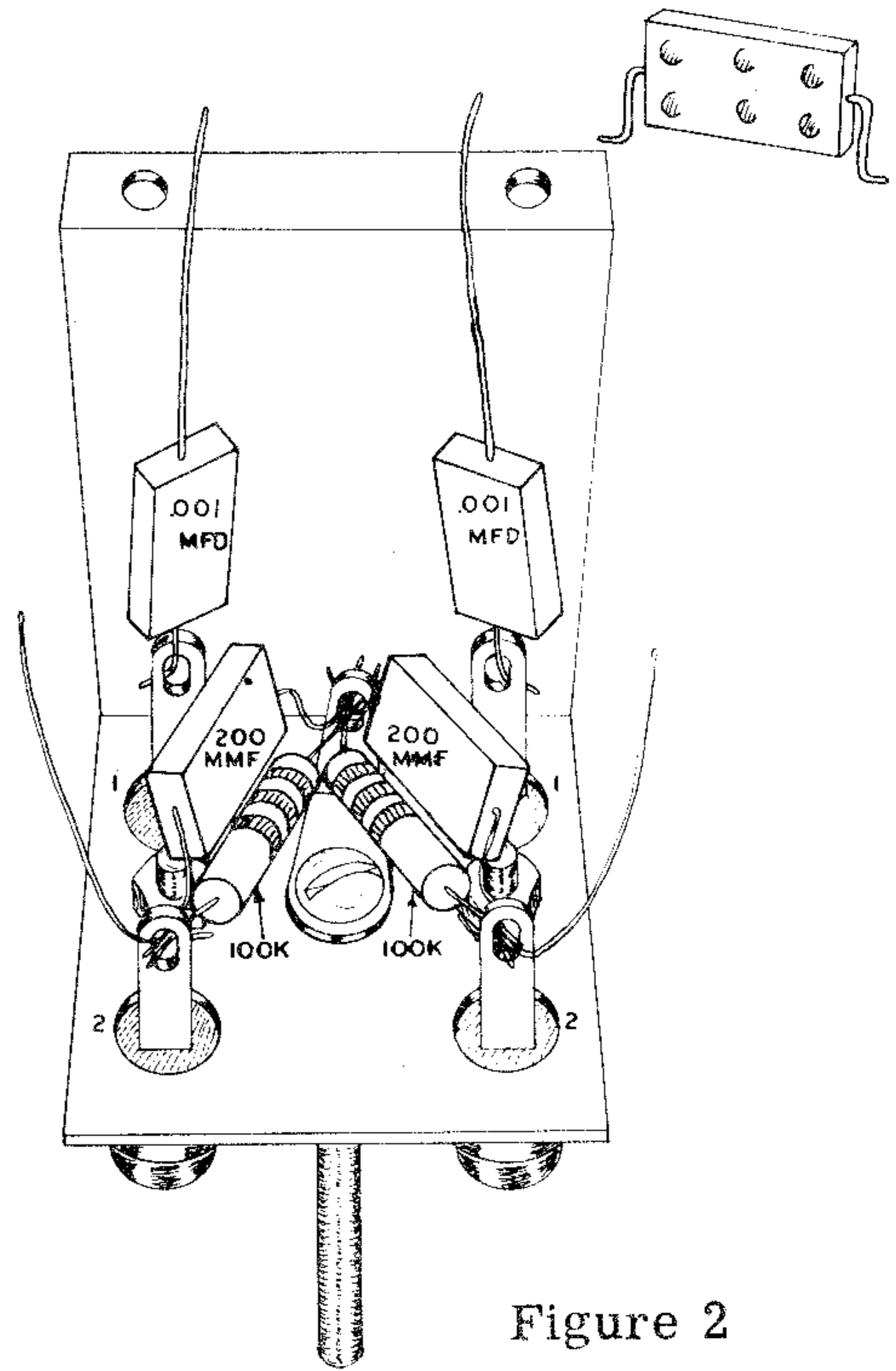
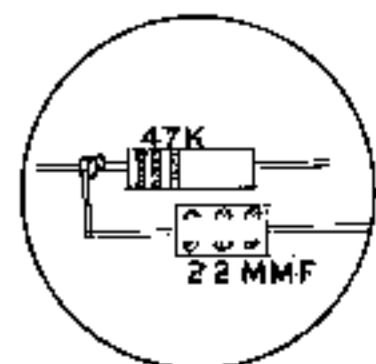


Figure 2

- ( / ) Cut a piece of blue wire 12" long and strip both ends 1/4". Connect one end to A8 (NS). Run the wire around terminal strip AA and along the back edge of the chassis. Insert the free end through the small hole near socket C.
- ( / ) Cut a piece of white wire 12 1/4" and strip both ends 1/4".
- ( / ) Connect one end to A3 (NS); run this wire along with the blue wire and through the same hole until needed.
- ( / ) Cut a piece of green wire 10 3/4" long and strip both ends 1/4". Connect one end to AA1 (NS); run wire along rear edge of chassis along with the white and blue wires until needed.
- ( / ) Cut a piece of yellow wire 7 1/4" long and strip both ends 1/4".
- ( / ) Connect one end to BB1 (NS); run the free end along with the white and blue wire until needed.
- ( ) Cut a piece of red wire 6" long and strip both ends 1/4".
- ( / ) Connect one end to BB4 (NS); run free end with the other free wires.
- ( / ) Cut a piece of orange wire 4 3/4" long and strip ends; connect one end to C5 (S1). The small hole will not accommodate any more wires, but as there are now enough wires to be self supporting remove the gray, blue, white wires etc., from the holes; add the orange wire to the group and tape or tie the seven wires together about 3 1/2" from the end. See Pictorial 1.
- ( / ) Cut a piece of red wire 2" long and strip both ends 1/4". Connect one end to BB3 (NS). Run wire close to chassis and connect other end to F4 (NS).
- ( / ) Cut a piece of red wire 6 3/4" long and strip both ends 1/4". Connect one end to BB4 (NS); run wire along rear edge of chassis and connect other end to AA2 (NS).
- ( ) Cut a piece of red wire 5 1/4" long and strip both ends 1/4". Connect one end to BB2 (NS); run wire along rear of chassis and connect other end to E1 (S).
- ( ) Cut a piece of green wire 6 3/4" long and strip both ends 1/4". Connect one end to AA3 (NS). Run flat along front of chassis, but within the pencil lines to C7 (NS). See Pictorial 1.
- ( / ) Cut both leads of a 100 K ohm resistor (brown-black-yellow) to 1/2". Connect one end to A3 (NS). Connect the other end to the solder lug adjacent to pin 9 (NS). Keep resistor close to socket so that it will clear main chassis flange later.
- ( / ) Cut both leads of a 100 K ohm resistor (brown-black-yellow) to 3/8". Connect one end to A8 (NS) and the other end to solder lug adjacent to pin 9 (NS).
- ( / ) Cut both leads of a .01 mfd disc ceramic capacitor to 1/2". Connect one lead to A3 (S3) and the other lead to the solder lug (S4). Leave the capacitor lay flat against the chassis for the time being, it will be bent up later to clear the main chassis flange.
- ( / ) Cut both leads of a .01 mfd disc ceramic capacitor to 1/2". Connect one lead to A9 (S2), and the other lead to A8 (S3), leave capacitor lay flat for the time being.
- ( / ) Cut a piece of bare wire 1 7/8" long and cover with a piece of insulated sleeving 1 3/8" long. Connect one end to A1 (S); run wire as shown and connect other end to A6 (NS).
- ( / ) Connect a 22 mmf silvered mica capacitor (red-red-black) to a 47 K ohm resistor (yellow-violet-orange) as shown in insert (S2).
- ( / ) Space the combination about half-way between terminal strip AA and socket A. Connect the free end of the 47 K ohm resistor to AA-2 (S2); the free end of the 22 mmf capacitor to AA3 (S2) and the junction of these two components to A6 (NS). Cut off any excess lead.



NOTE: The following wiring must not extend more than 1/2" above the chassis. When this section is mounted, the flexible coupling to the band switch will pass under it.

- ( ) Cut both leads of a 100 K ohm 1/2 watt resistor (brown-black-yellow) to 3/8". Connect one end to AA1 (S2) and the other end to E2 (NS).
- ( ) Cut both leads of a .01 mfd disc ceramic capacitor to 5/8". Connect one lead to E2 (S2) and the other lead to the solder lug at D (S2).
- ( ) Cut one lead of a .01 mfd disc ceramic capacitor to 5/8" and the other lead to 1".
- ( ) Connect the 5/8" lead to BB2 (NS). Connect the 1" lead to the solder lug on socket B (NS). Place capacitor close to the chassis. See Pictorial 1.
- ( ) Cut one lead of a .01 mfd disc ceramic capacitor to 3/8" and the other lead to 5/8".
- ( ) Connect the 3/8" lead to B6 (NS) and the 5/8" lead to the solder lug adjacent to pin B4 (NS).
- ( ) Cut both leads of a .01 mfd disc ceramic capacitor to 3/4". Connect one lead to the solder lug (S4).
- ( ) Run the other lead through B7 (NS) to B2 (S1). Make sure this lead clears the tube center pin.
- ( ) Cut both leads of a 68 K ohm 1/2 watt resistor (blue-gray-orange) to 1-1/16" and cover each lead with a 7/8" length of sleeving.
- ( ) Form resistor as shown and connect one lead to F4 (NS). Connect the other lead to B6 (S2).
- ( ) Run a piece of bare wire through the remaining hole on the center terminal of D (S), then over to E4 (S).
- ( ) Run a 1 3/4" length of bare wire through B1 and slip a 1 1/4" length of sleeving over it. Connect the end to E3 (S1), then solder B1.
- ( ) Run a 1 3/4" length of bare wire through B5, slip a 1 1/4" length of sleeving over it and connect to F1; solder both connections. Make sure the wire will not short near the B5 terminal.
- ( ) Cut both leads of a 1 K ohm 1/2 watt resistor (brown-black-red) to 3/4". Form the resistor as shown and connect one lead to B7 (S2).
- ( ) Connect the other lead to BB1 (S2).
- ( ) Cut both leads of a 470 ohm 1/2 watt resistor (yellow-violet-brown) to a 1/2" length. Connect one lead to BB2 (S3). Connect the other lead to BB3 (NS).
- ( ) Connect another 470 ohm 1/2 watt resistor with 1/2" leads from BB3 (S3) to BB4 (NS).
- ( ) Cut both leads of a .01 mfd disc ceramic capacitor to a 1/2" length. Connect one lead to BB4 (S4), connect the other lead to the rear solder lug on socket C (NS).
- ( ) Cut both leads of a 100 K ohm 1/2 watt resistor (brown-black-yellow) to 5/8". Connect one lead to the rear solder lug adjacent to C4 (S4). Be careful to avoid burning the gray or orange wires.
- ( ) Run the resistor close to socket C (see Pictorial 1) and connect the other end to C7 (S2).
- ( ) Cut one lead of a .01 mfd disc ceramic capacitor to 3/8" and the other lead to 5/8".



- ( ) Connect the 3/8" lead to C6 (NS) and the 5/8" lead to the front solder lug (NS).
- ( ) Cut one lead of a 100 K ohm 1/2 watt resistor (brown-black-yellow) to 3/8" and the other lead to 1/2".
- ( ) Connect the 3/8" lead to C1 (NS); connect the 1/2" lead to the front solder lug (S2).
- ( ) Cut both leads of a 150 K ohm 1/2 watt resistor (brown-green-yellow) to 11/16" length and cover one lead with a 1/2" length of sleeving.
- ( ) Connect the lead with the sleeving to C6 (S2). Connect the bare lead to F4 (NS). Form resistors as shown.
- ( ) Connect a .01 mfd disc ceramic capacitor from F3 (S2) to F4 (S4). Cut off excess leads.
- ( ) Connect a 100 mmf (.0001) silver mica capacitor (brown-black-brown) from F2 (S1) to C1 (S2).
- ( ) Set the 1682 KC sub-chassis aside for a moment and locate the crystal mounting bracket illustrated in Figure 2, page 14.
- ( ) Mount the two ceramic crystal sockets as shown using 4-40 x 3/8" screws and 4-40 nuts.
- ( ) Insert a 6-32 x 1 1/2" screw through a #6 large solder lug, through the bracket from the bottom side and secure with a #6 lockwasher and nut. Place solder lug as shown.

NOTE: There are two holes in the solder lug and four connections to be made to it. Connect the two resistors in the hole nearest the chassis and the capacitors in the other hole. Do not attempt to wrap the leads around the lug.

- ( ) Cut both leads of two 100 K ohm resistors (brown-black-yellow) to 5/16" lengths and connect the resistors between the bottom hole of the solder lug and pin number 2 of the crystal sockets. Space the resistors equidistant between the solder lug and socket pins and solder the bottom hole of the solder lug only.

NOTE: When capacitor color codes are given, they refer to code dots comprising the capacity value only. See manual covers for capacitor code.

- ( ) On two 200 mmf 2% silver mica capacitors (red-black-brown), cut both leads to 3/8" and form as shown in insert.
- ( ) Connect the capacitors from the top hole of the solder lug (S2) to the #2 pin of its crystal socket (NS); arrange as shown in Figure 2. (Trim off excess resistor and capacitor leads.)
- ( ) Cut two pieces of bare wire 1 1/2" long and connect one to each #2 crystal pin (S3). Leave other ends free.
- ( ) Select two .001 mfd mica capacitors (brown-black-red) and cut one lead only of each capacitor to 3/16". Make a hook in the short lead and connect a capacitor to each of the #1 crystal pins so that the body of the capacitor is against the crystal socket terminals (S1). Leave other ends free.
- ( ) Slip a 3/4" length of insulated sleeving over the free lead of the left .001 mfd capacitor. See Figure 2A. Bend this lead at right angles and connect to the right .001 mfd capacitor (S). Cut off excess lead.

( ) Assemble the crystal mounting bracket to the 1682 KC sub-chassis with 3-48 screws, lockwashers and nuts. The bracket mounts behind socket A; be careful to avoid pinching the wires at this point. See Figure 2A.

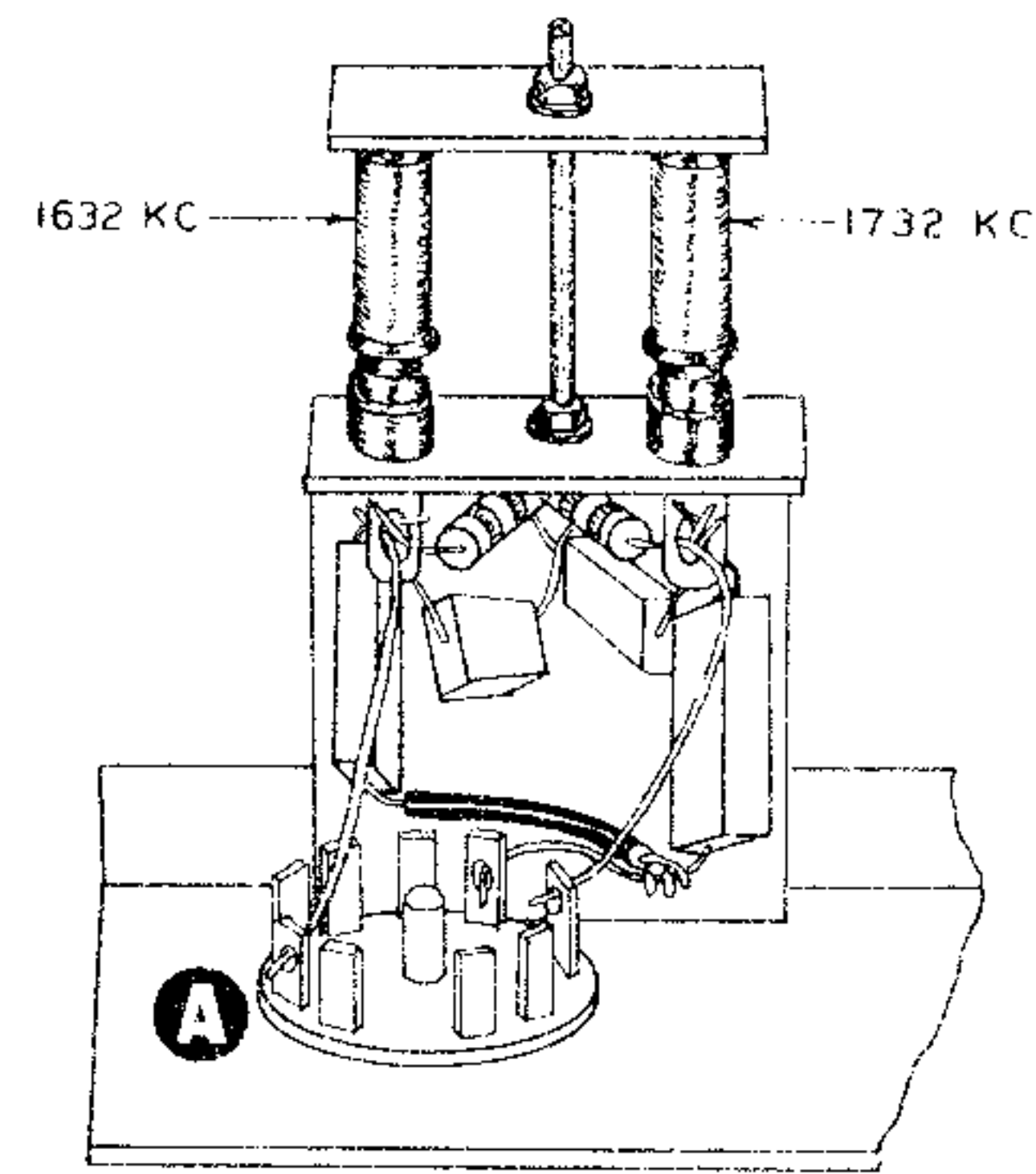


Figure 2A

( ) Cut the free lead of the right .001 mfd capacitor to the proper length and connect to A6 (S3).

( ) Cut the free lead from the #2 pin of the right crystal socket to the proper length and connect to A7 (S1).

( ) Cut the free lead from the #2 pin of the left crystal socket to length and connect to A2 (S1).

( ) Install a 1632 KC crystal in the left socket and 1732 KC crystal in the right socket. Place the crystal plate over the crystals and use a #6 lockwasher and nut to hold them in place. Do not tighten excessively.

( ) Some of the .01 disc ceramic capacitors were left laying flat for wiring convenience. These should now be bent up to clear the main chassis.

This completes the 1682 KC chassis. Inspect the wiring carefully for shorts between bare wires or tube pins and set aside until final assembly.

### SELECTIVITY SWITCH WIRING

See Figure 3 for following wiring.

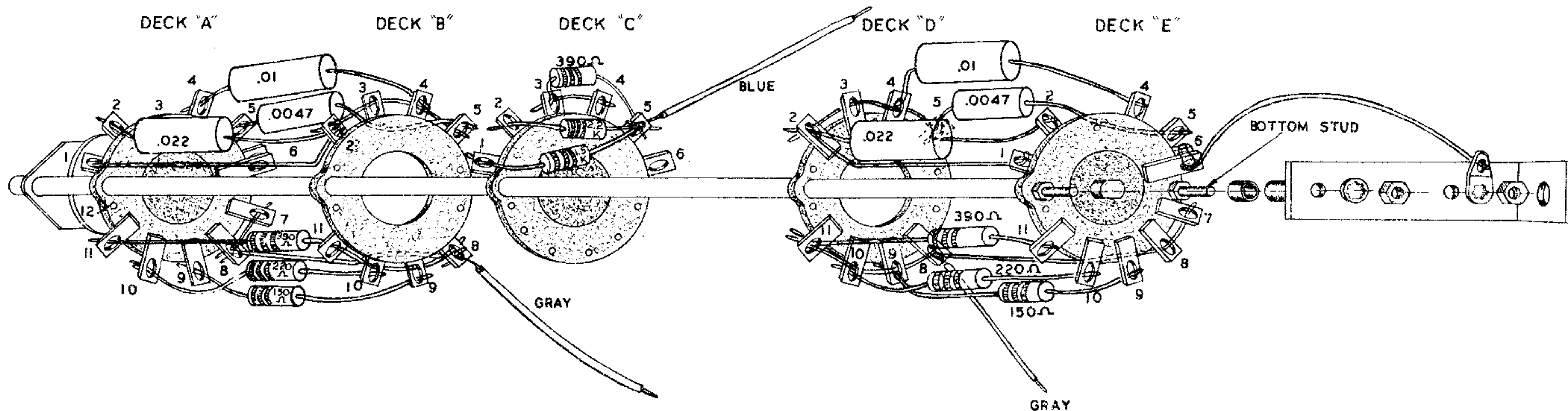


Figure 3

( ) Insert a bare wire through B2 to A1; form the wire as shown between B2 and A1. Run the other end of the wire from B2 through B3, B4 to B5 as shown in Figure 3. Solder A1 only.

( ) See Figure 3 and form a bare wire from B8 through B9, B10 to B11 (NS).

( ) Run a bare wire through A8 to B8 (NS); at the A8 end form the wire over to A7. Solder A7 and A8.

( ) Insert a bare wire through D2 to E1; form the wire as shown between D2 and E1. Run the other end of wire from D2 through D3, D4 to D5, as shown in Figure 3; solder E1 only.

( ) See Figure 3 and form a bare wire from D8 through D9, D10 to D11 (NS).

( ) Run a bare wire through E8 to D8 (NS); at the E8 end form the wire over to E7. Solder E7 and E8.

- ( ) Strip both ends of two 3 1/2" gray wires and connect one end of one to B8 (S3). Leave other end free. Connect one end of the other to D8 (S3); leave end free.
  - ( ) Connect a 150 ohm resistor (brown-green-brown) from A9 (S1) to B9 (S2). Center the resistor and cut off excess leads.
  - ( ) Connect another 150 ohm resistor from D9 (S2) to E9 (S1).
  - ( ) Connect a 220 ohm resistor (red-red-brown) from A10 (S1) to B10 (S2).
  - ( ) Connect another 220 ohm resistor from D10 (S2) to E10 (S1).
  - ( ) Connect a 390 ohm resistor (orange-white-brown) from A11 (S1) to B11 (S).
  - ( ) Connect another 390 ohm resistor from D11 (S2) to E11 (S1).
  - ( ) As with the resistor mounting, connect a .0047 mfd paper capacitor from A5 (S1) to B5 (S2).
  - ( ) Connect another .0047 capacitor from D5 (S2) to E5 (S1).
  - ( ) Connect a .01 mfd paper capacitor from A4 (S1) to B4 (S2).
  - ( ) Connect another .01 mfd capacitor from D4 (S2) to E4 (S1).
  - ( ) Connect a .022 mfd paper capacitor from A2 (S1) to B2 (S2); leave B3 open for future connection.
  - ( ) Connect another .022 capacitor from D2 (S2) to E2 (S1).
  - ( ) On deck C, connect a 1.5 K ohm resistor (brown-green-red) from C1 (S) to C5 (NS); run wire as shown, to avoid shorting other contact.
  - ( ) Strip both ends of a 2" piece of blue wire; connect one end to C5 (NS). Leave other end free.
  - ( ) Form the leads of a 390 ohm resistor (orange-white-brown) so that one lead passes through C3 and connects to C4 and the other lead connects to C5. Lay the resistor back to clear C4 and solder C3 and C4.
  - ( ) Connect a 2.2 K ohm resistor (red-red-red) from C2 (S1) to C5 (S4); leave C6 open for future connection.
- NOTE: The solder lugs E6 and E7 on deck "E" may have to be bent back to clear the rear support bracket.
- ( ) Slip two small insulating washers over the switch studs and mount the rear support bracket. Use a 4-40 nut and lockwasher on the top stud and a #6 solder lug and nut on the bottom (stud), being sure the bracket faces in the right direction. See Figure 3.
  - ( ) Connect a short bare wire through both lugs at E6 (S) to the adjacent solder lug (S). Set the switch aside until final assembly.

#### 50 KC IF AND AUDIO CHASSIS

- ( ) By referring to Figure 4, locate the IF-Audio chassis and mount a 7 pin miniature shielded ceramic socket at hole C with the tube pins faced as shown, using 3-48 x 1/4" screws with a nut and lockwasher on the front mounting holes. On the rear mounting hole, mount a small solder lug with a lockwasher on each side of it. Position and bend lug as shown.
- ( ) In the same manner mount another 7 pin miniature ceramic shielded socket at D. Position the tube pins and bend solder lug as shown.

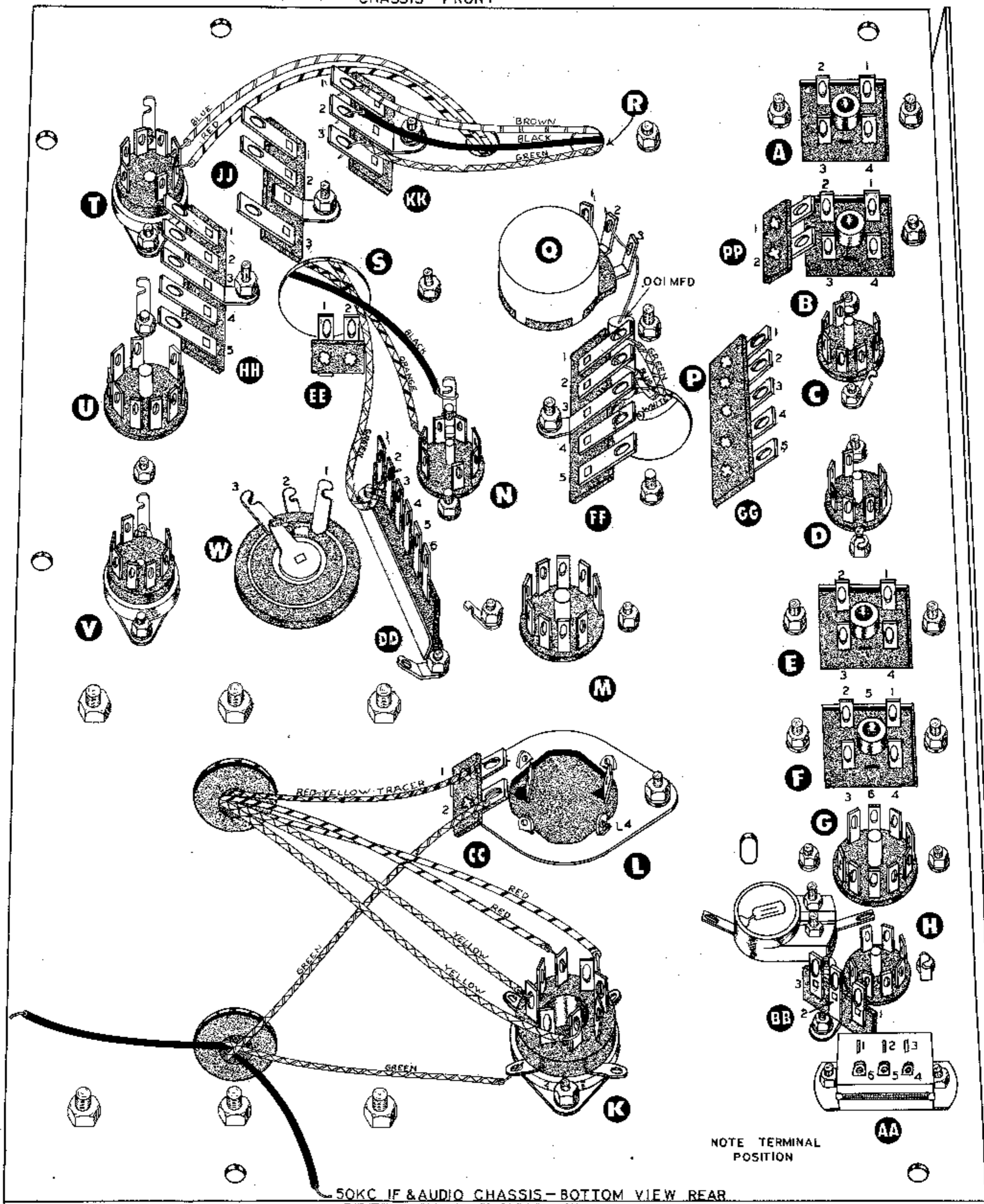


Figure 4

- ( ) Mount a 7 pin miniature ceramic shielded socket at H. Position socket pins and solder lug as shown.
- ( ) Mount a 7 pin miniature ceramic shielded socket at N. Position socket pins and solder lug as shown.
- ( ) Mount a 7 pin miniature unshielded socket at T from the bottom of the chassis. Position socket pins and solder lug as shown.
- ( ) Mount a 9 pin miniature shielded socket at U. Position tube pins and solder lug as shown.
- ( ) Mount a 7 pin miniature unshielded socket at V from the bottom of the chassis. Position socket pins and solder lug as shown.
- ( ) Mount a 9 pin shielded socket at M. Position tube pins and solder lug as shown.
- ( ) Mount a 9 pin shielded socket at G. Position tube pins as shown (no solder lug is used here).
- ( ) Identify the 6 pin special socket by referring to Figure 4 (rear corner). Note that three terminals are at right angles to the others. Mount the socket at location AA, positioning the terminals as shown; use 3-48 screws, lockwashers and nuts.
- ( ) Between sockets G and H are two small holes for mounting the 4.5 to 25 mfd ceramic trimmer capacitor. This is mounted by inserting 4-40 x 1/2" screws from the chassis top, through the holes in the capacitor, through small fibre washer and small (3/16" O. D.) 4-40 nuts. Take care in tightening the screws to avoid breaking the capacitor.
- ( ) Mount a 3 lug terminal strip in the hole next to the ceramic trimmer capacitor as shown in Figure 4.
- ( ) Mount an octal socket at K with the keyway toward the rear of the chassis using 6-32 x 1/4" screws, lockwashers, and nuts.
- ( ) Mount the capacitor wafer at hole L. Identify the metal wafer and a 2 lug terminal strip from Figure 4 and mount the two together as shown, using 6-32 hardware.
- ( ) Mount a 6 lug terminal strip diagonally between sockets N and M. Use a large #6 solder lug (instead of a lockwasher) under the nut nearest socket M. Use 6-32 x 1/4" hardware.
- ( ) Mount the power transformer at the rear corner of the chassis with 8-32 x 3/8" screws, lockwashers and nuts, the black and green wire coming through the rear 3/4" hole and the red, yellow and red-yellow wire through the front hole.
- ( ) There are four 50 KC IF transformers which are all electrically the same. Mount in holes A, B, E, and F, using 4-40 nuts and lockwashers. The transformers have numbers on the base which must be in the positions shown on Figure 4. Using the mounting stud of the 50 KC IF transformer "B", mount a 2 lug terminal strip as shown.
- ( ) The filter capacitor consists of a 100 mfd and 40 mfd section. Note that the 100 mfd section is marked with a U shaped cut out and the 40 mfd section with a triangle. This capacitor is mounted by sliding the ears through the holes in the mounting wafer from the top of the chassis with the U shaped hole toward the power transformer. When the capacitor is correctly positioned, hold it tight against the chassis and secure by twisting the ears approximately 1/8 turn. Solder lug L4 to capacitor mounting wafer as shown in Figure 4.
- ( ) See component mounting procedure drawings on page 11 and mount a 100 K ohm control with screwdriver slot at hole Q. Face terminals as shown.
- ( ) Identify the Bridged T coil by the marking 40-120 on top. It is to be mounted at hole P. The four holes are slotted in case they are needed to align the coil tuning shaft with the panel. In practice, the coil is mounted with its studs centered in the slotted holes and the tuning

shaft toward the front of the chassis (away from the power transformer). Two of the studs have 5 lug terminal strips on them. See Figure 4 page 20 for type and position of terminal strips. Assemble these last and place lockwashers on each side of the terminal strip mounting feet.

- ( ) Identify the BFO coil by the marking 40-121 on top. This unit is mounted in the same manner as the bridged T but at hole S. There are 2 lug, 3 lug, and 5 lug terminal strips mounted by means of the coil studs. See Figure 4 for type and mounting positions of the terminal strips. As before, center the stud in the slotted chassis holes and face tuning shaft toward the front of the chassis.
- ( ) Mount the audio output transformer 51-35 at R using 6-32 x 1/4" hardware, with the green, black, and brown leads coming through the holes nearest the IF transformer. At the same time mount a 3 lug terminal strip where shown.
- ( ) Mount a 100 ohm wire-wound pot. with screwdriver slot at W; face terminals as shown.

NOTE: In mounting parts, holes for tube sockets, pots., etc., were given letter designations. They will be retained for the mounted part during wiring. Pin 3 of the first 50 KC IF tube will become C3. The octal tube sockets also have ground lugs and these will be designated by the tube sockets letter KG to indicate ground, and a number such as KG-1 to designate the terminal. For ease in wiring instructions, it will be necessary to give a letter designation for terminal strips, or tie points. These will consist of designations such as AA-1, HH-3, etc. It would be well to mark these figures directly on the chassis.

See Figure 4 for the following wiring.

- ( ) Connect the red with yellow tracer wire from the power transformer to CC-1 (S1). Cut to proper length.
- ( ) Connect one of the green wires from the transformer to CC2 (NS). Lay wire flat against the chassis.
- ( ) Connect the other green wire to KG1 (S1).
- ( ) Connect one yellow wire to K2 (S); run wire as shown.
- ( ) Connect the other yellow wire to K8 (NS).
- ( ) Connect one red wire to K4 (S1) and the other red wire to K6 (S1). Leave black wires free for the time being.
- ( ) On the audio transformer (front of chassis) connect the red wire to T6 (NS); run wire as shown.
- ( ) Connect the blue wire to T5 (NS).
- ( ) Connect the brown wire to KK1 (NS).
- ( ) Connect the black wire to KK2 (S1).
- ( ) Connect the green wire to KK3 (NS).

NOTE: When stripping wires on the BFO and Bridge T coils, use extreme care to avoid pulling the leads loose.



- ( ) On the BFO coil S, connect the black lead to the ground lug at socket N (NS).
- ( ) Connect the orange lead to N2 (NS).
- ( ) Connect the green lead to DD2 (NS).
- ( ) See Figure 4 page 20 and place a .001 mfd paper capacitor where shown. Connect one lead to FF4 (NS); run the other lead through Q3 to Q2; solder Q3 and Q2.
- ( ) Connect the green wire from the Bridge T coil P to FF1 (NS).
- ( ) Connect the blue wire to FF2 (NS).
- ( ) Connect the white wire to FF4 (S2).

NOTE: When instructions state: Cut a piece of wire and strip ends, the stripped portion will be 1/4" long on both ends, unless otherwise specified.

See Pictorial 2 for the following wiring.

- ( ) Cut a piece of gray wire 2 1/2" long and strip ends. Connect one end to AA2 (NS) and connect the other end to H3 (NS).

NOTE: Form all gray wire (filament leads) close to the chassis.

- ( ) Cut a piece of gray wire 6" long and strip ends. Connect one end to H3 (S2); connect the other end to D3 (NS).
- ( ) Cut a piece of gray wire 2 1/2" long and strip ends. Connect one end to D3 (S2); connect the other end to C3 (NS).
- ( ) Cut a piece of gray wire 3 1/2" long and strip ends. Connect one end to C3 (S2); leave the other end free for the present.
- ( ) Cut a piece of gray wire 5 1/2" long and strip ends. Connect one end of AA2 (S2); connect the other end to CC2 (NS).
- ( ) Cut a piece of gray wire 5 1/2" long and strip ends. Connect one end to CC2 (NS). Form the wire to lay against the chassis with the free end towards the rear of the assembly as shown in Pictorial 2. This end will be connected later.
- ( ) Cut a piece of gray wire 4" long and strip ends. Connect one end to CC2 (S4); connect the other end to M5 (NS).
- ( ) Cut a piece of gray wire 2 1/2" long and strip ends. Connect one end to M5 (S2); connect the other end to N3 (NS).
- ( ) Cut a piece of gray wire 3 1/2" long and strip ends. Connect one end to N3 (S2); connect the other end to U4 (NS).
- ( ) Cut a piece of gray wire 3 1/2" long, strip one end 1/4" and the other end 3/8". Connect the end with 3/8" insulation removed through terminals U5 to U4 (S both terminals). Connect the other end of the wire to T3 (NS).
- ( ) Cut a piece of red wire 4 3/4" long and strip ends. Connect one end to AA6 (S); connect the other end to the terminal of filter capacitor L (NS).



- ( ) Cut a piece of red wire 5" long and strip ends. Connect one end to the ▲ terminal of filter capacitor L (NS). Form wire around tube socket M (as shown in Pictorial 2) and connect to FF5 (NS).
- ( ) Cut a piece of red wire 4 1/4" long and strip ends. Connect one end to FF5 (NS). Connect the other end to PP-2 (NS).
- ( ) Cut a piece of red wire 4 1/2" long and strip ends. Connect one end to FF5 (NS). Connect the other end to HH4 (NS).
- ( ) Cut a piece of red wire 2" long and strip ends. Connect one end to HH4 (NS). Connect the other end to T6 (NS).
- ( ) Cut a piece of red wire 3 3/4" long and strip ends. Connect one end to K8 (NS). Connect the other end to the ▲ terminal of the filter capacitor L (S).
- ( ) Cut a piece of green wire 11" long and strip ends. Connect one end to DD5 (NS). Run the other end toward the front of the chassis as shown in Pictorial 2. This end will be connected later.
- ( ) Cut a piece of green wire 8 1/2" long and strip ends. Connect one end to AA4 (S). Connect the other end to DD5 (NS).
- ( ) Cut a piece of green wire 3 1/2" long and strip ends. Connect one end to DD4 (NS). Connect the other end to HH5 (NS).
- ( ) Cut a piece of green wire 3 1/4" long and strip ends. Connect one end to D1 (NS). Connect the other end to FF2 (NS).
- ( ) Cut a piece of yellow wire 3" long and strip ends. Connect one end to U8 (NS). Connect the other end to terminal 3 of the 100 ohm W. W. pot. as shown in Pictorial 2 (S).
- ( ) Cut a piece of yellow wire 2" long and strip ends. Connect one end to E2 (NS); the other end will be connected to the selectivity switch later.
- ( ) Cut a piece of yellow wire 3" long and strip ends. Connect one end to A2 (NS); the other end will be connected to the selectivity switch later.
- ( ) Cut a piece of blue wire 1 1/2" long and strip ends. Connect one end to A3 (S); the other end will be connected later.
- ( ) Cut a piece of blue wire 2" long and strip ends. Connect one end to E3 (S); connect the other end to D5 (S).
- ( ) Cut a piece of blue wire 3 1/2" long and strip ends. Connect one end to F3 (S); connect the other end to M9 (NS).
- ( ) Cut a piece of orange wire 6 1/2" long and strip ends. Connect one end to AA1 (S). Connect the other end to DD6 (NS).
- ( ) Cut a piece of orange wire 3 1/2" long and strip ends. Connect one end to DD6 (NS); connect the other end to V1 (NS).
- ( ) Cut a piece of orange wire 4 1/2" long and strip ends. Connect one end to V1 (S2); connect the other end to JJ3 (NS).
- ( ) Cut a piece of bare wire 3/4" long. Connect one end to V7 (S); connect the other end to the ground lug as shown in Pictorial 2 (S).

NOTE: All resistors will be 1/2 watt, unless otherwise stipulated.

- (✓) Select a 33 K ohm resistor (orange-orange-orange); cut one lead 3/4" long and cut the other lead 1" long. Over the 1" lead, slip a 3/4" long piece of insulated sleeving and connect this end to V5 (NS); connect the other end to U6 (S).
- (✓) Cut both leads of a 220 ohm resistor (red-red-brown) to a 5/8" length. Connect one end to U3 (S); connect the other end to the ground lug adjacent to pin U9 (NS). See Pictorial 2, page 23.
- (✓) Cut both leads of a 10 K ohm resistor (brown-black-orange) to 3/8" length. Connect one end to U1 (NS); connect the other end to HH4 (S3).
- (✓) Cut both leads of a 1 megohm resistor (brown-black-green) to 3/4" length. Connect one end to U7 (NS); connect the other end to HH5 (S2).
- (✓) Cut a piece of bare wire 1" long. Run wire through U9, and connect to socket center post; solder U9. Connect the other end to ground lug (NS).
- (✓) Cut one lead of a .02 mfd disc ceramic capacitor to 1/2" length. Cut the other lead 1" long. Over the 1" lead, slip a 3/4" piece of insulated sleeving. Connect this lead to U7 (S2). Connect the other lead to the ground lug adjacent to pin U9 (NS).
- (✓) Connect a 220 Kohm resistor (red-red-yellow) to HH2 (NS). Connect the other lead to U2 (NS).
- (✓) Cut both leads of a 500 mmf disc ceramic capacitor to a 1/2" length. Connect one lead to U2 (S2); connect the other lead to the center post (S).
- (✓) Cut both leads of a 500 mmf disc ceramic capacitor to a 1/2" length. Connect one lead to HH2 (NS); connect the other lead to HH3 (NS).
- (✓) Cut both leads of a .003 mfd tubular capacitor to 1/2" length. Connect the lead on the end with the stripe to T7 (S); connect the other end to U1 (S2).
- (✓) Cut both leads of a .005 disc ceramic capacitor to a 1/2" length. Connect one lead to T6 (S3); connect the other lead to T5 (S2).
- (✓) Cut a piece of bare wire 3/4" long. Connect one end to T4 (S); connect the other end to the ground lug adjacent to T4 (NS).
- (✓) Cut one lead of a 470 Kohm resistor (yellow-violet-yellow) to a 3/8" length; and cut the other lead to 3/4" length. Connect the 3/8" lead to T1 (S); connect the other end to the ground lug adjacent to T4 (S2).
- (✓) Cut both leads of a 330 ohm 1 watt resistor (orange-orange-brown) to 1/2" length. Connect one end to T2 (NS); connect the other end to HH1 (NS).
- (✓) Cut both leads of a 2 mf 50 WVDC electrolytic capacitor to a 1" length. Connect the positive (+) lead to T2 (S2); connect the negative (-) lead to HH1 (NS).
- (✓) Cut both leads of a 15 K ohm resistor (brown-green-orange) to 1/2" length. Connect one lead to HH1 (NS); connect the other lead to HH3 (S2).
- (✓) Cut both leads of a 270 K ohm resistor (red-violet-yellow) to 1/2" length. Connect one lead to JJ3 (NS); connect the other end to JJ2 (NS).
- (✓) Cut both leads of a 68 Kohm resistor (blue-gray-orange) to 5/8" length. Connect one lead to JJ3 (S3); connect the other lead to JJ1 (NS).
- (✓) Cut both leads of a 220 K ohm resistor (red-red-yellow) to 3/4" length. Connect one lead

to N5 (NS); connect the other lead to EE2 (NS).

- ( ) Cut a piece of bare wire 1" long. Run one end through N4 (NS) and connect to tube socket center post (S). Connect the other end to ground lug adjacent to N4 (NS).
- ( ) Cut both leads of a 470 K ohm resistor (yellow-violet-yellow) to 3/4" length. Connect one lead to N7 (NS); connect the other lead to the ground lug adjacent to Pin N4 (S3).
- ( ) Cut both leads of a 220 K ohm resistor (red-red-yellow) to 1/2" length. Connect one lead to N1 (NS); connect the other lead to N2 (S2).
- ( ) Cut both leads of a .01 mfd disc ceramic capacitor to 1/2" length and connect one lead to N1 (S2); connect the other lead to DD2 (S2).
- ( ) Cut both leads of a 500 mmfd disc ceramic capacitor to 3/8" length. Connect one lead to N4 (S2); connect the other lead to N5 (NS).
- ( ) Cut both leads of a 68 K ohm resistor (blue-gray-orange) to 1/2" length. Connect one lead to N5 (S3); connect the other lead to N6 (NS).
- ( ) Cut both leads of a 10 K ohm resistor (brown-black-orange) to 5/8" length. Connect one lead to N6 (NS); connect the other lead to DD1 (NS).
- ( ) Cut both leads of a .047 mfd tubular capacitor to 3/4". Connect one lead to N6 (S3); connect the other lead to FF3 (S).
- ( ) Cut both leads of a 2.2 mmf tubular ceramic capacitor (red-red-white) to 1" length. On one lead slip a 3/4" length of insulating sleeving and connect to M9 (NS); connect the other lead to N7 (S2).
- ( ) Cut both leads of a 100 K ohm resistor (brown-black-yellow) 1/2" long. Connect one lead to M8 (NS); connect the other lead to M6 (NS).
- ( ) Cut both leads of a 1.5 megohm resistor (brown-green-green) 7/8" long. Connect one lead to M8 (NS); connect the other lead to DD3 (NS). If later, this appears to clip modulation more than desired on noise limiter, it may be changed to a 1 megohm resistor.
- ( ) Cut both leads of a 680 K ohm resistor (blue-gray-yellow) 3/4" long. Connect one lead to M6 (NS); connect the other lead to DD4 (NS).
- ( ) Cut both leads of a 1 megohm resistor (brown-black-green) 7/8" long. Connect one lead to M7 (NS); connect the other lead to DD3 (NS).
- ( ) Cut both leads of a .01 disc ceramic capacitor 3/4" long; slide a 1/2" length of insulated tubing over one lead. Connect this lead to DD3 (S3); connect the other lead to the ground lug adjacent to DD6 (NS).
- ( ) Cut a piece of bare wire 1 1/2" long. Run one end through M4 (NS), through socket center post, and connect to M3 (NS). Connect other end to ground lug adjacent to pin M4 (S).
- ( ) Cut both leads of a 220 mmf disc ceramic capacitor to 1/2". Connect one lead to M8 (S3); connect the other lead to the tube socket center post (NS).
- ( ) Cut both leads of a 22 mmf silver mica capacitor 5%, (red-red-black) to 5/8" length. Over one lead slip a 3/8" length of insulated tubing; connect this lead to M9 (S3). Connect the other lead to M2 (NS).
- ( ) Cut both leads of a 10 K ohm resistor (brown-black-orange) to 1/2" length. Connect one lead to M1 (NS); connect the other lead to M3 (S2).

- ( ) Cut both leads of a 2.2 megohm resistor (red-red-green) to 1/2" length. Connect one lead to M2 (NS); connect the other lead to M4 (S2).
- ( ) Cut both leads of a 150 K ohm resistor (brown-green-yellow) to 5/8" length. Slip a 3/8" piece of insulated tubing over one lead and connect it to M1 (S2); connect the other lead to DD6 (NS).
- ( ) Cut both leads of a 1 megohm resistor (brown-black-green) to 3/4" length. Connect one lead to M2 (S3); connect the other lead to DD5 (NS).
- ( ) Cut both leads of a 100 K ohm resistor (brown-black-yellow) to 5/8" length. Connect one lead to DD4 (S3); connect the other lead to ground lug adjacent to DD6 (NS).
- ( ) Cut both leads of a .01 mfd disc ceramic capacitor to 1/2" length. Connect one lead to DD5 (NS); connect the other lead to the ground lug adjacent to DD6 (S3).
- ( ) Cut both leads of a 2.5 K ohm 7 watt resistor to 1/2" length. Connect one lead to DD6 (S4); connect the other lead to the terminal of the filter capacitor L (NS).
- ( ) Cut a piece of bare wire to a 2 1/2" length. Connect one end to AA5 (S); connect the other end to the ground lug adjacent to H4 (NS).
- ( ) Cut a piece of bare wire to a 3/4" length. Run one end through H4 and connect to tube socket center post (solder both connections); connect other end to ground lug adjacent to terminal H4 (NS).
- ( ) Cut a piece of bare wire to a 1 1/2" length. Run one end through G1, G9, through trimmer capacitor lug and connect to H1 (solder G1 and trimmer lug). See Pictorial 2, page 23.
- ( ) Cut both leads of a 12 mmfd silver mica capacitor (brown-red-black) to 5/8" length. Connect one end to G9 (S2); connect the other end to the lower lug on the trimmer capacitor (NS). See Pictorial 2.
- ( ) Cut both leads of a .01 mfd disc ceramic capacitor to a 3/4" length. Run one lead through H2 and connect to H7 (NS); do not allow lead to touch socket center post. Solder H2; connect the other end to ground lug adjacent to terminal H4 (NS).
- ( ) Cut both leads of a 680 K ohm resistor (blue-gray-yellow) to a 5/8" length. Connect one lead to H1 (S2). Connect the other lead to the ground lug adjacent to terminal H4 (NS).
- ( ) Cut both leads of a 3.9 K ohm resistor (orange-white-red) to a 5/8" length. Connect one lead to H7 (S2); connect the other lead to the ground lug adjacent to terminal H4 (NS).
- ( ) Cut both leads to a 150 mmfd disc ceramic capacitor to a 5/8" length. Connect one lead to H6 (NS); connect the other lead to the ground lug adjacent to terminal H4 (S6).
- ( ) Cut both leads to a 100 K ohm resistor (brown-black-yellow) to a 5/8" length. Connect one lead to H6 (NS); connect the other lead to BB3 (NS).
- ( ) Cut a piece of bare wire 2" in length. Run one end through G6 and connect to G4 (solder both connections); connect the other end to H6 (S3).
- ( ) Cut a piece of bare wire to a 1 1/2" length. Connect one end to BB2 (NS) and the other end to the trimmer capacitor terminal (S2). See Pictorial 2.
- ( ) Cut both leads of a .01 mfd disc ceramic capacitor to a 1/2" length. Connect one lead to BB2 (S2); connect the other lead to BB3 (NS).
- ( ) Cut both leads of a 2.2 mmf tubular ceramic capacitor (red-red-white) to a 1/2" length. Connect one lead to H5 (NS); connect the other lead to BB1 (NS).

- ( ) Cut both leads of a 220 K ohm resistor (red-red-yellow) to a 5/8" length. Connect one lead to H5 (S2) and the other lead to BB3 (NS).
- ( ) Cut both leads of a .1 mfd 400 V. D. C. tubular capacitor to a 1 1/4" length. Connect one lead to D6 (NS); connect the other lead to the ground lug adjacent to terminal D4 (NS).
- ( ) Cut one lead of a .1 mfd 400 V. D. C. tubular capacitor to 3/8" length and cut the other lead to a 1 1/4" length. Connect the 3/8" lead to GG2 (NS); connect the other lead to the ground lug adjacent to terminal C3 (NS).
- ( ) Cut both leads of a 390 mmf silver mica capacitor (orange-white-brown) to a 3/8" length and connect one lead to F1 (NS); connect the other lead to F2 (NS).
- ( ) Cut both leads of a 390 mmf silver mica capacitor (orange-white-brown) to a 3/8" length and connect one lead to E2 (NS); connect the other lead to E1 (NS).
- ( ) Cut a piece of yellow wire to a 2" length and strip ends. Connect one end to F2 (S2); connect the other end to E2 (S3).
- ( ) Cut both leads of a 2.2 mmf tubular ceramic capacitor (red-red-white) to a 3/4" length. Connect one lead to F1 (S2); connect the other lead to E1 (S2).
- ( ) Cut a piece of red wire to a 2 1/2" length and strip both ends. Connect one end to E4 (S); connect the other end to GG5 (NS).
- ( ) Cut a piece of bare wire to a 1" length. Run one end through D4 and connect to tube socket center post, (solder both connections). Connect other end to ground lug adjacent to D4 (NS).
- ( ) Cut both leads of a .1 mfd 200 volts, paper tubular capacitor, to a 7/8" length. Run one lead through D2 and connect to D7 (NS). Solder D2. (Care should be taken so that this lead does not touch tube socket center post.) Connect the other lead to the ground lug adjacent to D4 (NS).
- ( ) Cut both leads of a 1 megohm resistor (brown-black-green) to a 1/2" length. Connect one lead to D1 (S2); connect the other lead to the ground lug adjacent to D4 (NS).
- ( ) Cut both leads of a .1 mfd 400 volt tubular capacitor to a 7/8" length. Connect one lead to GG5 (NS). Connect the other lead to the ground lug adjacent to D4 (S5).
- ( ) Cut both leads of a 68 K ohm resistor (blue-gray-orange) to a 1/2" length. Connect one lead to D6 (S2); connect the other lead to GG5 (NS).
- ( ) Cut both leads of a 100 ohm resistor (brown-black-brown) to a 1/2" length. Connect one lead to D7 (S2); connect the other lead to GG4 (NS).
- ( ) Cut both leads of a 1 megohm resistor (brown-black-green) to 1/2" length. Connect one lead to C1 (NS); connect the other lead to the ground lug adjacent to C4 (NS).
- ( ) Cut a piece of bare wire 1" long. Run one end through C4 and connect to tube socket center post, (solder both connections). Connect other end to ground lug adjacent to C4 (NS).
- ( ) Cut one lead of a 470 ohm resistor (yellow-violet-brown) to a 3/4" length; cut the other lead to a 1/2" length. Run the 3/4" lead through C2; keep lead clear of socket center post, and connect to C7 (solder both connections). Connect other lead to the ground lug adjacent to C4 (S4).
- ( ) Cut both leads of a 5.6 K ohm resistor (green-blue-red) to a 1/2" length. Run one lead through C5 and connect to C6 (solder both connections). Connect the other lead to GG1 (NS).
- ( ) Cut both leads of a 5.6 K ohm resistor (green-blue-red) to a 1/2" length. Connect one lead to GG1 (NS); connect the other lead to GG2 (NS).

- ( ) Cut both leads of a .00047 mfd silver mica capacitor (this capacitor may be marked .00047 mfd, 470 mmf or yellow-violet-black) to a 1/2" length. Connect one lead to C1 (S2); connect the other lead to B3 (S).
- ( ) Cut both leads of a 470 mmf silver mica capacitor (.00047) to a 1/2" length. Connect one lead to GG1 (S3); connect the other lead to FF1 (NS).
- ( ) Cut both leads of a 2.2 K ohm resistor (red-red-red) to a 7/8" length. Connect one lead to GG2 (S3); connect the other lead to FF5 (NS).
- ( ) Cut both leads of a 2.2 K ohm resistor (red-red-red) to a 5/8" length. Connect one lead to GG5 (S4); connect the other lead to FF5 (S5).
- ( ) Cut both leads of a 390 mmf silver mica capacitor (orange-white-brown) to a 1/2" length. Connect one lead to B1 (NS); connect the other lead to B2 (NS).
- ( ) Cut both leads of a 390 mmf silver mica capacitor (orange-white-brown) to 1/2" length. Connect one lead to A1 (NS); connect the other lead to A2 (NS).
- ( ) Cut a piece of yellow wire 1 3/4" long and strip ends. Connect one end to A2 (S3); connect the other end to B2 (S2).
- ( ) Cut both leads of a 2.2 mmf capacitor (red-red-white) to a 7/8" length. Connect one lead to B1 (S2); connect the other lead to A1 (S2).
- ( ) Cut both leads of a 22 K ohm resistor (red-red-orange) to a 1 1/8" length. Connect one lead to PP2 (NS); connect the other lead to A4 (NS).
- ( ) Cut one lead of a .1 mfd tubular capacitor to a 1 3/4" length; cut the other lead to a 1 1/2" length. Over the 1 3/4" end, slip a 1 1/2" length of insulated sleeving. Connect this lead to A4 (NS); connect the other lead to PP1 (S).
- ( ) Cut a piece of yellow wire 2 1/2" long and strip ends. Connect one end to A4 (S3). The other end will be connected to the selectivity switch later.

#### MAIN FRAME ASSEMBLY

- ( ) Place the main frame on the work bench with the bottom up. The bottom of the frame is readily identified by the triangular metal braces spot welded in each of the four corners. Orient the frame so that the metal partition is running lengthwise of the unit as shown in Figure 5.
- ( ) Place a 3/8" rubber grommet in hole AB.
- ( ) In hole AC, place the 110 volt 2 prong AC socket; fasten in place with 6-32 hardware. Refer to Figure 5.
- ( ) In hole AD, place the fuse holder with the rubber gasket on the outside of frame. On the inside of the frame place a lockwasher and nut; orient fuse holder so that the lug, folded against the body, is facing you.
- ( ) Install an eight pin tube socket in hole AE, with the tube guide slot adjacent to hole AF. Use 6-32 hardware.
- ( ) Install the 3-lug terminal strip (use 6-32 hardware) in hole AF. This strip is installed from the outside as shown in Figure 5 and Pictorial 3.

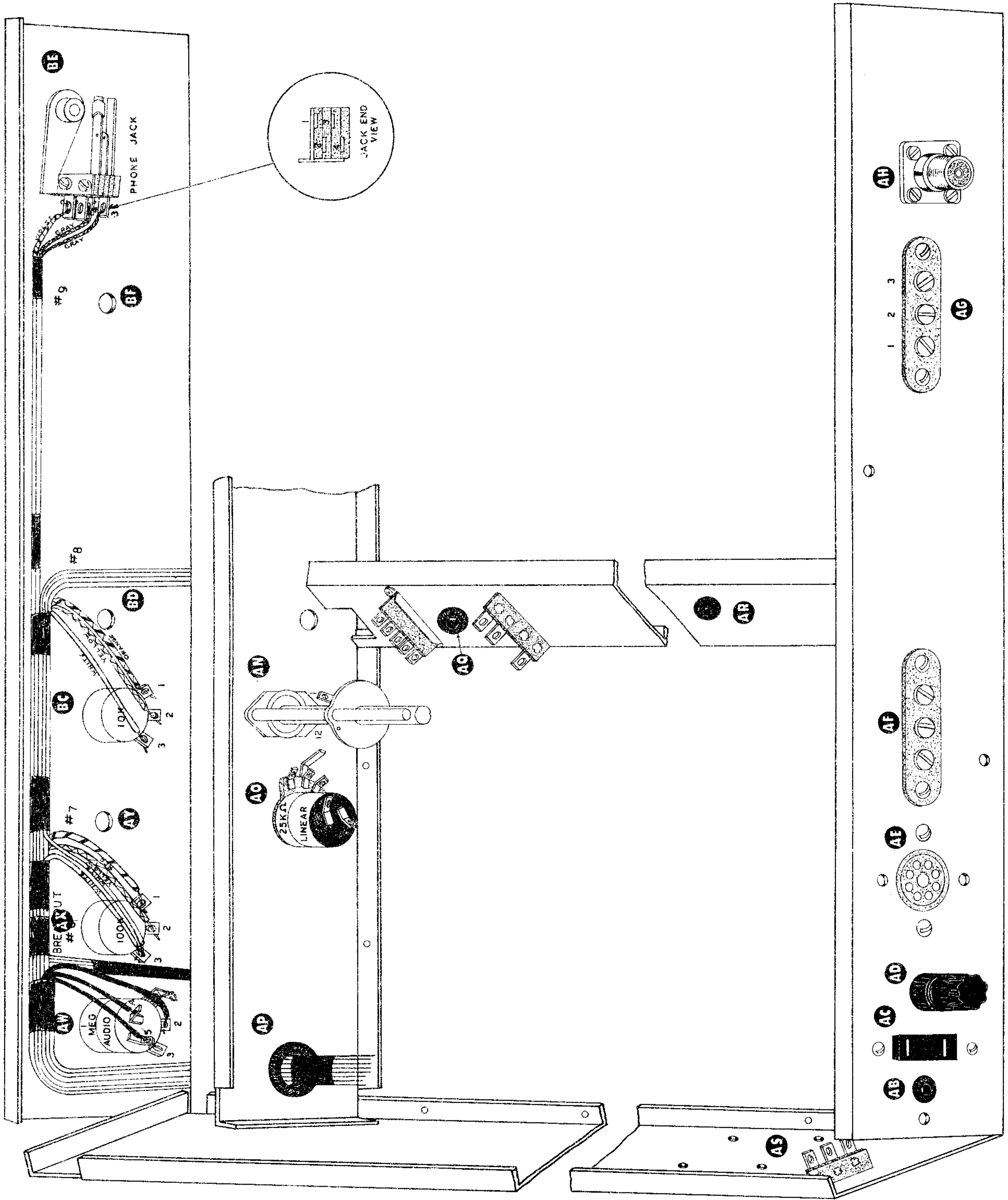


Figure 5

- ( ) Install another 3-lug terminal strip in hole AG, under the 6-32 nut adjacent to hole AH; install a ground lug.
- ( ) In hole AH, place a coaxial jack. This fitting is to be installed from the outside with 3-48 hardware.
- ( ) In hole AS, install a 3 lug terminal strip with ground, using 6-32 hardware. Install with fiber strip towards rear of the chassis.
- ( ) Install a 3/4" rubber grommet in hole AP.
- ( ) Install a 5/16" rubber grommet in hole AR.
- ( ) Place a control solder lug on a 25 K ohm linear potentiometer; form the solder lug so that it lays tight against the center contact of the potentiometer. Mount the 25 K ohm linear pot with the SPST switch, in hole AO. Align solder lug with AO2 (S1), then cut the solder lug to the same length as AO2.
- ( ) Install a 3/8" rubber grommet in hole AQ.
- ( ) Directly in front of grommet AQ are two 5/32" holes. Mount a 5-lug Jones strip using 6-32 hardware.
- ( ) Directly behind grommet AQ is a single 5/32" hole. Mount a 3-lug terminal strip using 6-32 hardware. The insulation strip should be towards the rear of the chassis.

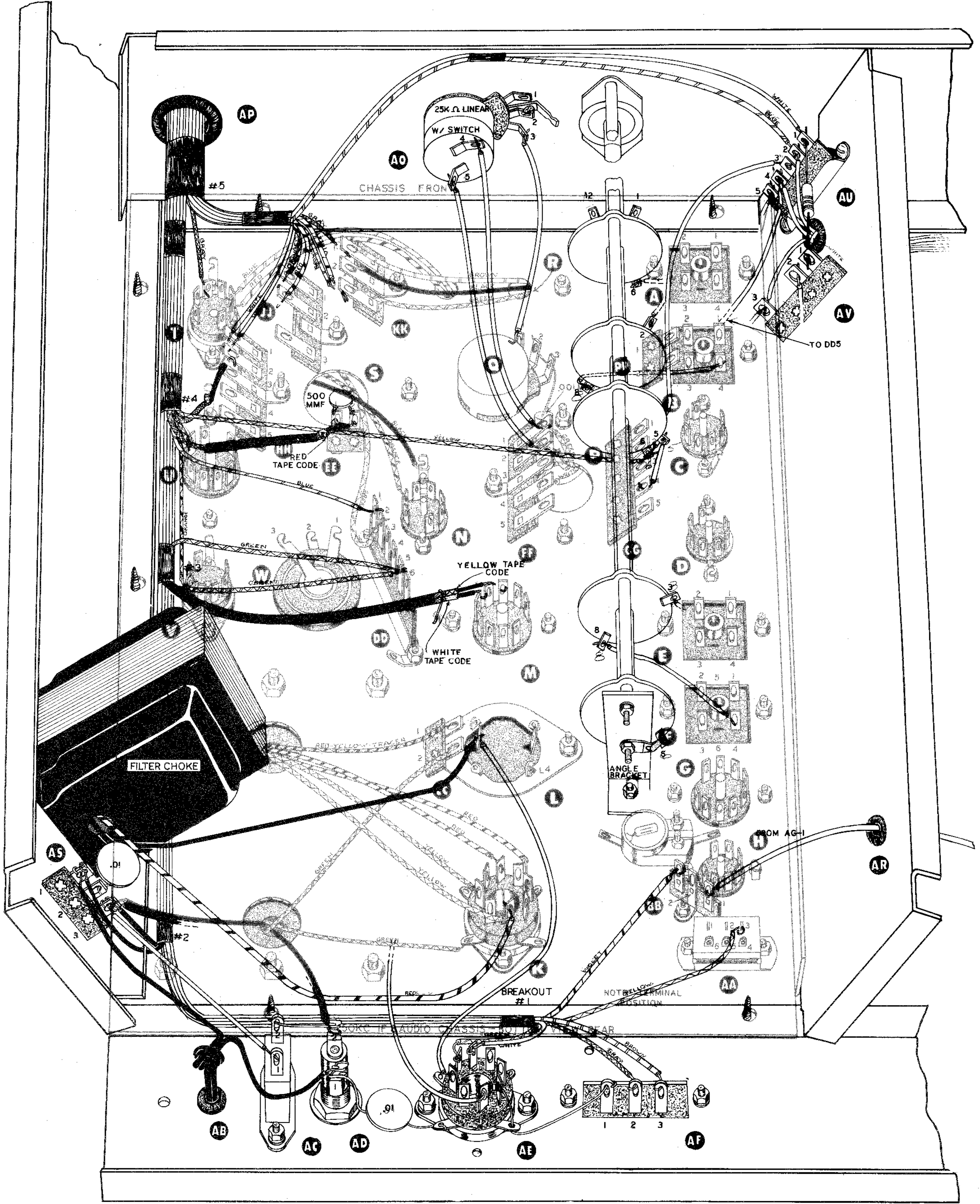
NOTE: In mounting the next 4 components, the holding nuts should be tightened with the fingers. The holding nut will be removed later, when the face panel is installed; at that time, they will be replaced and tightened securely.

- ( ) In hole AW mount the 1 meg audio potentiometer with switch. Place a control solder lug on the bushing and a nut on the front side of the chassis.
- ( ) In hole AX mount the 100 K ohm potentiometer. Place a lockwasher on the bushing, and a nut on the front side of the chassis.
- ( ) In hole BC mount the 10 K ohm potentiometer. Use a nut on the front side of the chassis.
- ( ) In hole BE mount the self-shorting phone jack; use a lockwasher on the bushing and a nut on the front side of the chassis.
- ( ) Mount the selectivity switch, previously wired, in hole AN. Use lockwasher on the bushing side and a nut on the front side of chassis partition. Orient the switch so that the rod separating A1 and A12 is towards the bottom of the unit, when receiver is in its normal position. See Pictorial 3.

Refer to Pictorial 3 for the following wiring:

- ( ) Connect one end of a 2" length of bare wire to AF1 (S). Run the other end through the ground lug adjacent to pin AE1 and connect to AE1; solder both connections.
- ( ) Cut a 5" length of red wire and strip ends. Connect one end to AE4 (S). The other end will be connected later.
- ( ) Connect one lead of a .01 mfd 1400 volt (line bypass) disc ceramic capacitor to the ground lug adjacent to AE4 (S). Connect the other lead to AD1 (NS). Terminal AD1 should be bent away from the body of the fuse holder.





PICTORIAL 3

- ( ) Connect one end of a 1 1/2" length of bare wire to AD2 (NS). Connect the other end to AC2 (S).
- ( ) Cut a 2" length of gray wire and strip ends. Connect one end to AC1 (S); connect the other end to AS3 (NS).
- ( ) Cut both leads of a .01 mfd 1400 volt (line bypass) disc ceramic capacitor to a 1/2" length. Connect one lead to AS2 (S); connect the other lead to AS1 (NS).
- ( ) Run the AC line cord through grommet AB. Tie a knot 2 1/2" from the end, as shown in Pictorial 3. Connect one lead to AD1 (S2); connect the other lead to AS1 (NS).
- ( ) Directly in front of terminal strip AS are four holes. Mount the filter choke, using 8-32 hardware, with the leads towards the rear of the chassis.
- ( ) Cut a piece of green wire to a 4" length, strip ends. Connect one end to AO5 (S); the other end will be connected later.
- ( ) Cut a piece of blue wire to a 4" length, strip ends. Connect one end to AO4 (S); the other end will be connected later.
- ( ) Cut a piece of yellow wire to a 3" length, strip ends. Connect one end to AO3 (S); the other end will be connected later.
- ( ) Cut a 1 3/4" length of bare wire, and tin the ends. Connect one end to the center post of the coaxial jack AH (S). Connect the other end to AG3 (NS). See Detail 5 page 45.
- ( ) Cut a piece of white wire to a 3" length; strip ends. Connect one end to AG3 (S2); the other end will be connected later.
- ( ) Cut a 1 1/4" length of bare wire. Connect one end to AG2 (S); connect the other end to the ground lug adjacent to AG3 (S).
- ( ) Cut an 8 1/2" length of heavy red insulated wire; strip ends. Connect one end to AG1 (NS); the other end will be connected later.
- ( ) Cut a 3" length of white wire; strip ends. Connect one end to AG1 (S2); the other end will be connected later.
- ( ) Follow Pictorial 3 for the correct placement of the wiring harness; breakouts are numbered on Figure 6. Locate breakout #1; this is the end that will be run through grommet AP. This breakout consists of 6 wires; white, brown, gray, green, violet and yellow. Run breakout 1, 2, 3, 4 and 5 through grommet AP, feeding the harness from the front towards the back of the chassis. Breakout #6 should be in front of the chassis partition; this breakout has 4 shielded wires in it. (Recheck the harness placement to be certain of proper placement before proceeding.)
- ( ) Form the wiring harness to lay in the exact position shown in Pictorial 3. From time to time during the assembly, it will be necessary to form the harness so that it will lay against the chassis.
- ( ) Connect the green wire from Breakout Number 1 to AE5 (S).
- ( ) Connect the white lead from Breakout Number 1 to AE6 (S).
- ( ) Connect the gray lead from Breakout Number 1 to AF2 (S).
- ( ) Connect the brown lead from Breakout Number 1 to AF3 (S).

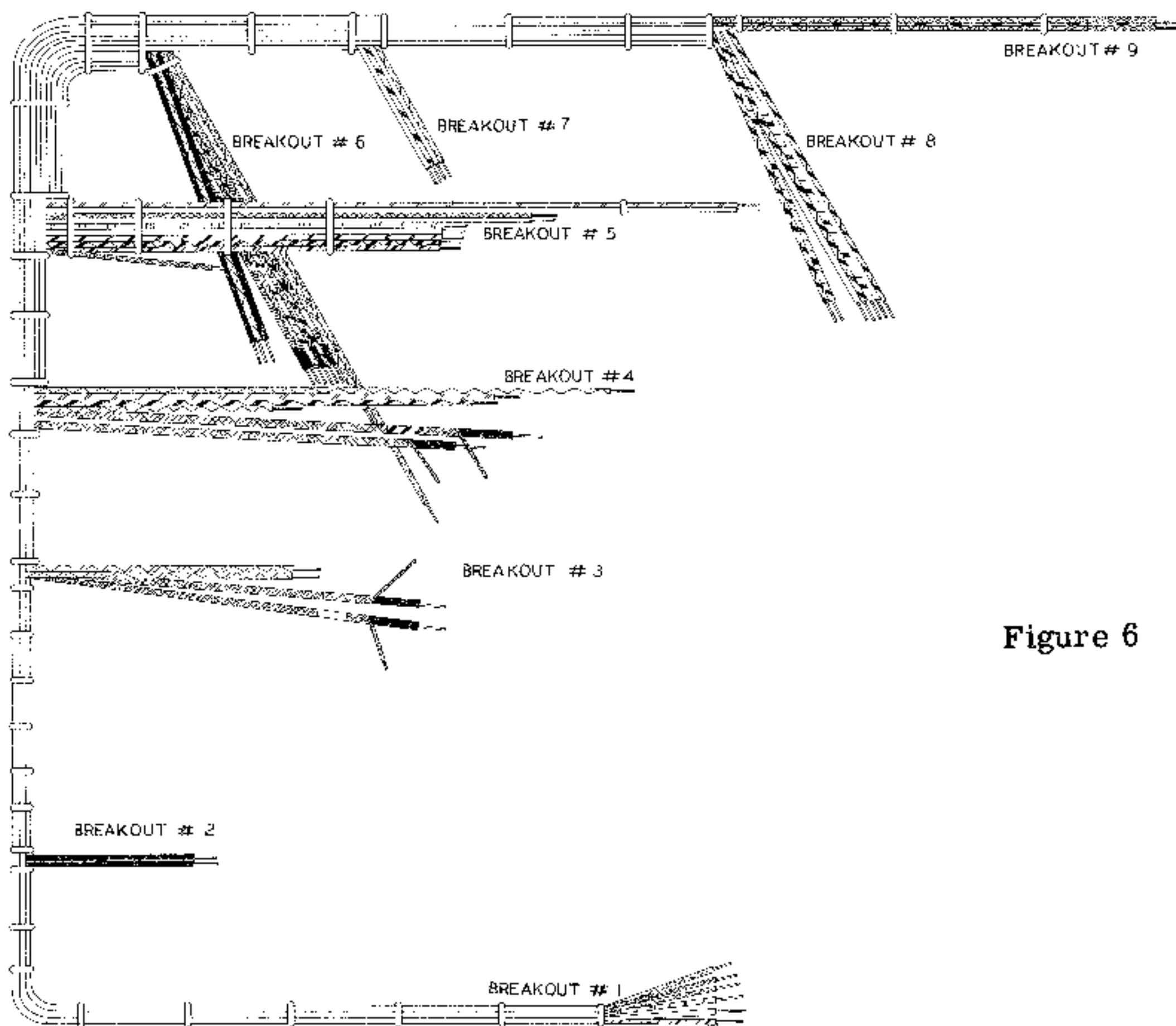


Figure 6

- ( ) Connect one of the black leads from Breakout Number 2 to AS1 (S3); connect the other black lead to AS3 (NS).
- ( ) Connect the long yellow lead from Breakout Number 4 to selectivity switch terminal C6 (NS).
- ( ) Connect the blue lead from Breakout Number 5 to AU2 (NS).
- ( ) Connect the white lead from Breakout Number 5 to AU1 (NS).

See Pictorial 4 for the following wiring.

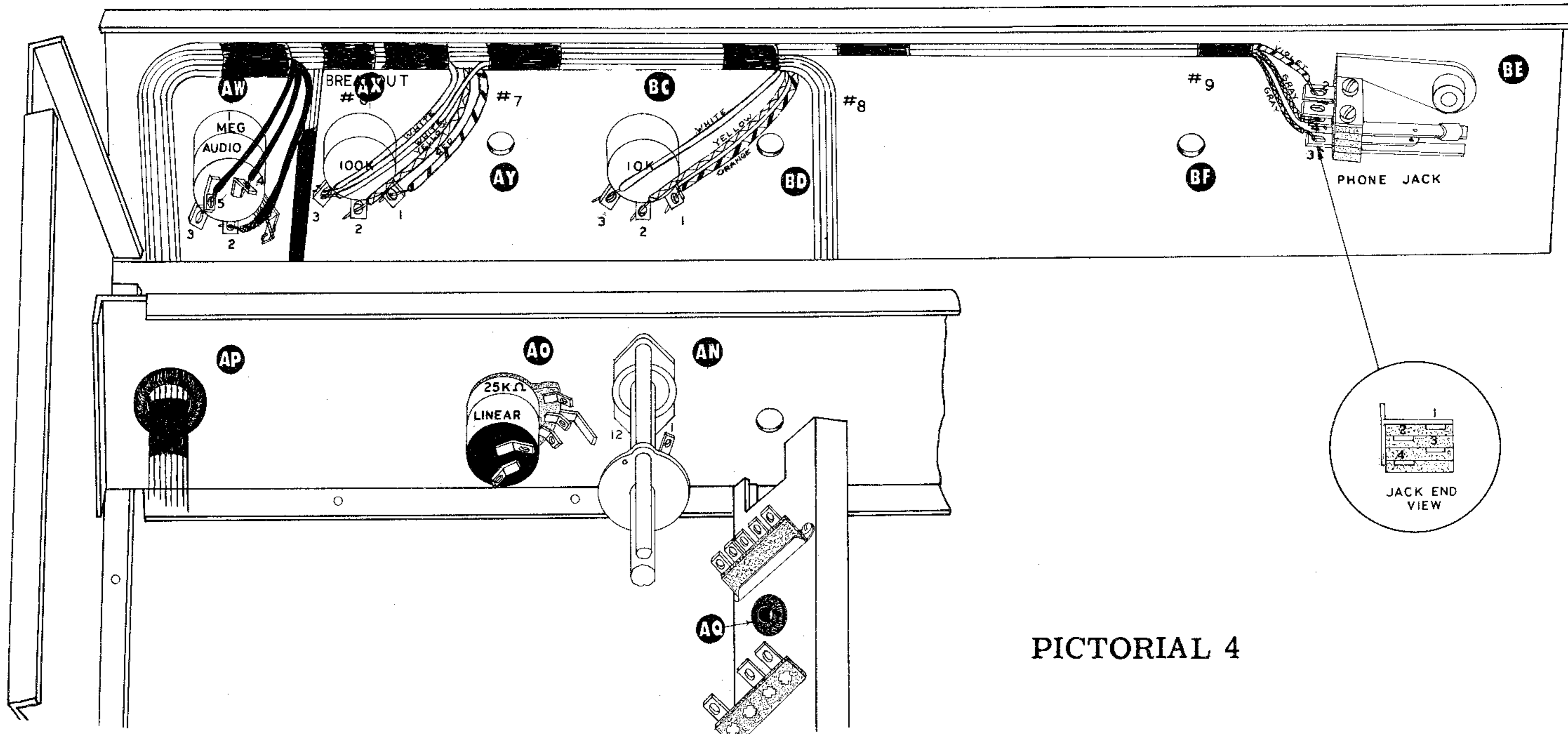
- ( ) Connect one of the black leads from Breakout Number 6 to AW4 (S); connect the other black lead to AW5 (S).

NOTE: In Breakout Number 6 there are four separate shielded wires:

1. One shielded wire with a white tape band.
2. One shielded wire with a yellow tape band.
3. One shielded wire with a red tape band.
4. One shielded wire with no colored band.

Follow the instructions carefully as to the proper color coding.

- ( ) Cut a piece of plastic tape to a 1/2" length; tape the metal shielding on the shielded cable that is not color coded. Connect the lead to terminal AW2 (S). The tape is to protect against possible shorts with other terminals on the AW control.
- ( ) Cut a 1" length of bare wire. Connect one end to AW1 (S); connect the other end to the ground lug adjacent to AW1 (NS).



PICTORIAL 4

- ( ) Slip a 2" length of 1/4" insulated sleeving over the remaining leads in Breakout Number 6. Slide the sleeving down on the Breakout so that it will insulate the leads from controls AW and AX.
- ( ) Connect the two white leads from Breakout Number 7 to AX3 (NS).
- ( ) Connect the yellow lead from Breakout Number 7 to AX2 (S).
- ( ) Connect the red lead from Breakout Number 7 to AX1 (S1).
- ( ) Connect the short white lead from Breakout Number 8 to BC3 (S).
- ( ) Connect the yellow lead from Breakout Number 8 to BC2 (S).
- ( ) Connect the short orange lead from Breakout Number 8 to BC1 (S).
- ( ) See Pictorial 4 for the correct numbering of the phone jacks terminals, (BE).
- ( ) Connect the violet lead from Breakout Number 9 to BE2 (S).
- ( ) Connect one gray lead from Breakout Number 9 to BE3 (S); connect the other gray lead to BE4 (S).

#### FINAL ASSEMBLY

- ( ) Place the main frame assembly on the bench with the controls facing you. The top of the main frame assembly has 7/64" holes in the flanges for mounting the sub-assemblies.

NOTE: Extreme care should be exercised in attaching the "50 KC IF and audio chassis" to the main frame, so that none of the components previously installed are bent or broken.

- ( ) Carefully place the "50 KC IF and audio chassis" on the main frame as shown in the Top Plate Drawing. DO NOT FORCE CHASSIS INTO POSITION. Check to make certain that all components have proper clearance. If the "50 KC IF and audio chassis" seats properly against the main frame, fasten it in place with six #6 sheet metal screws.
- ( ) Fasten the angle bracket, on the rear of the selectivity switch, to the audio chassis using 6-32 hardware as shown in Pictorial 3.

- ( ) Connect the yellow wire from Breakout Number 1 to AA3 (S).
- ( ) Connect the violet wire from Breakout Number 1 to BB3 (S4).
- ( ) Connect the gray wire from CC2 to AE2 (S).
- ( ) Connect the red wire from AE4 to terminal  $\blacktriangle$  on the filter capacitor L (NS).
- ( ) Connect the black lead from the choke to terminal  $\blacktriangle$  on the filter capacitor L (S5).
- ( ) Form the red wire, from the choke, to terminal K8 (S3). See Pictorial 3.
- ( ) Connect one black lead from the power transformer to AS3 (S3).
- ( ) Connect the other black lead from the power transformer to AD2 (S2).
- ( ) Connect the two green leads from Breakout Number 3 to DD5 (S6).
- ( ) Cut a 3 3/4" piece of 1/4" insulated sleeving. Slide sleeving on the 2 shielded wires coming from Breakout Number 3.
- ( ) Connect the shielded wire, with the white tape coding, to M6 (S3). Connect the outside shield to the tube socket center post (NS).
- ( ) Connect the shielded wire, with the yellow tape coding, to M7 (S2). Connect the outside shield to the tube socket center post (S5).

NOTE: Check tube socket M very carefully to insure that none of the terminals or their associated components have unintentionally been shorted to ground or to an adjacent terminal.

- ( ) Cut a piece of 3/16" insulated sleeving to a 3" length. Slip sleeving over the shielded lead having the red tape color coding on it. This lead comes from Breakout Number 4.
- ( ) Connect the short yellow lead from Breakout Number 4 to U8 (S2).
- ( ) Connect the shielded wire, (with no color tape coding), from Breakout Number 4 to HH2 (S3). Connect the outside shield to the ground lug adjacent to HH3 (S4).
- ( ) Connect the orange wire from Breakout Number 4 to V5 (S2).
- ( ) Connect the blue wire from Breakout Number 4 to DD1 (S2).
- ( ) Connect the shielded lead (with the red color tape coding) to EE2 (NS); connect the metal shield to EE1 (NS).
- ( ) Cut the leads of a 500 mmfd disc ceramic capacitor to a 1/2" length. Connect one lead to EE2 (S3); connect the other lead to EE1 (S2).
- ( ) Connect the brown lead from Breakout Number 5 to KK3 (NS).
- ( ) Connect the violet lead from Breakout Number 5 to KK3 (S3).
- ( ) Connect the gray wire coming from the base of Breakout Number 5 to terminal T3 (S2).
- ( ) Connect the gray lead that is laced up 1 1/2" from the base of Breakout Number 5 to terminal KK1 (S2).
- ( ) Connect the orange wire from Breakout Number 5 to JJ1 (S2).

- ( / ) Connect the red wire from Breakout Number 5 to JJ2 (S2).
- ( ) Connect both white wires from Breakout Number 5 to HH1 (S5).
- ( ) Connect the blue lead from AO4 to FF1 (S3).
- ( ) Connect the green lead from control AO5 to FF2 (S3).
- ( / ) Connect the yellow lead from control AO3 to Q1 (S1).
- ( / ) Connect the green lead from DD5 to AU4 (NS).
- ( / ) Connect the yellow wire from A4 on the IF transformer to A6 on the selectivity switch (S). See Pictorial #3.
- ( / ) Connect the blue wire from IF transformer A3 to terminal AU5 (NS).
- ( ) Connect the yellow wire from IF transformer A2 to selectivity switch terminal B3 (S2).
- ( / ) Connect the gray wire from B8 on the selectivity switch to terminal B4 (S) on the IF transformer.
- ( ) Connect the blue wire from C5 on the selectivity switch to terminal GG4 (S2).
- ( ) Connect the yellow wire from IF transformer E2 to terminal D3 (S2) on the selectivity switch.
- ( / ) Connect the gray wire from terminal D8 on the selectivity switch to IF transformer terminal F4 (S).
- ( / ) Cut a piece of yellow wire to 3 1/2" length. Connect one end to selectivity switch terminal C6 (S2); connect the other end to terminal AU-3 (NS).
- ( / ) Connect the gray lead from tube socket terminal C3 to terminal AV2 (NS).
- ( ) Cut a piece of red wire to a 1 1/2" length and strip ends. Connect one end to PP2 (S3); connect the other end to AV3 (NS).
- ( ) Run the free end of the red wire, with heavy insulation, which is connected to terminal AG1, through grommet AR. Cut wire so that it will connect to BB1 (S2). Wire should be pulled tight. Set the chassis aside for the present.

#### ASSEMBLY AND INSTALLATION OF THE DIAL MECHANISM

- ( ) Refer carefully to Figure 7, 8 and 9. Locate the parts illustrated and note their designation. Parts will be given two letter designations (XA, XB, etc.), and holes will be numbered.

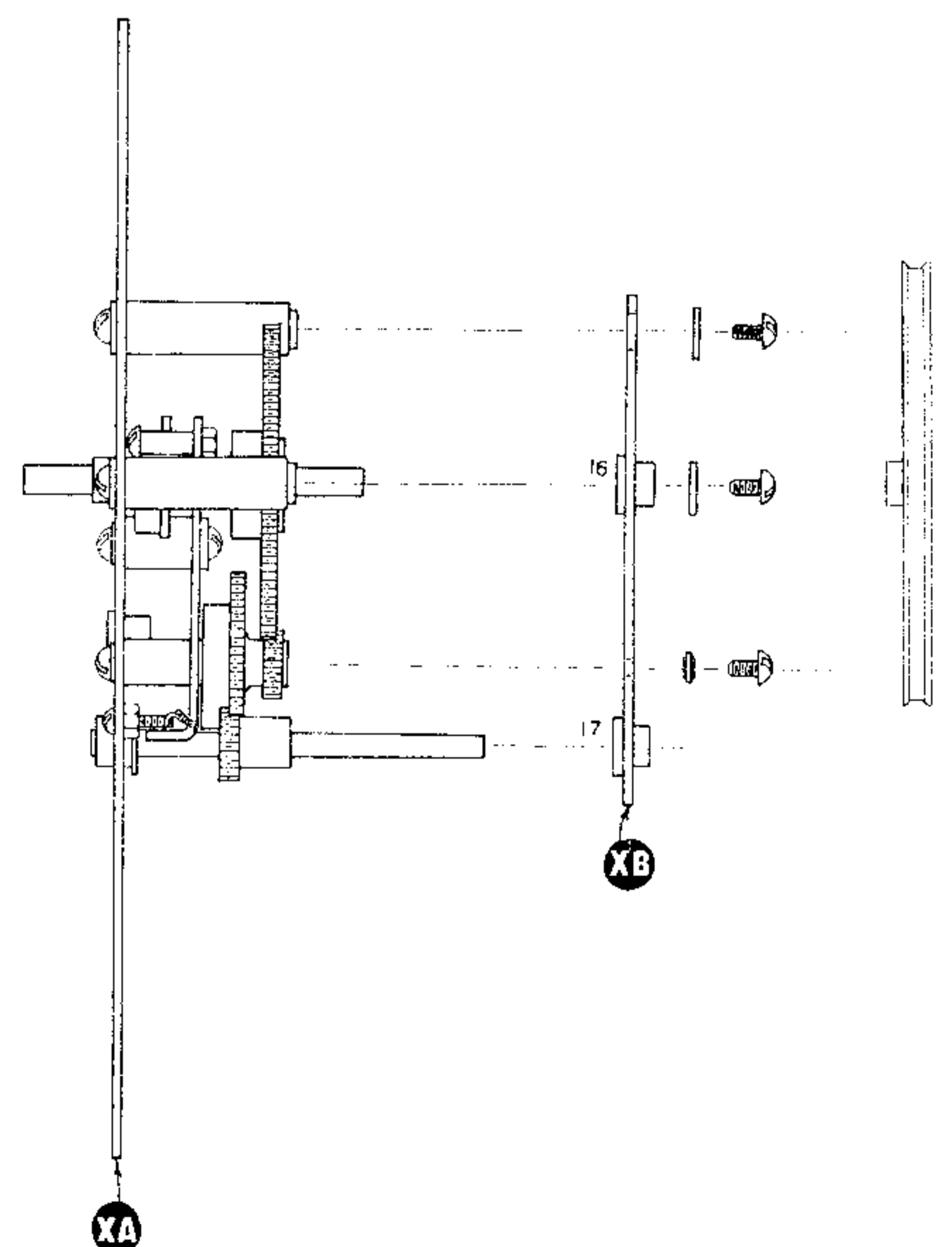
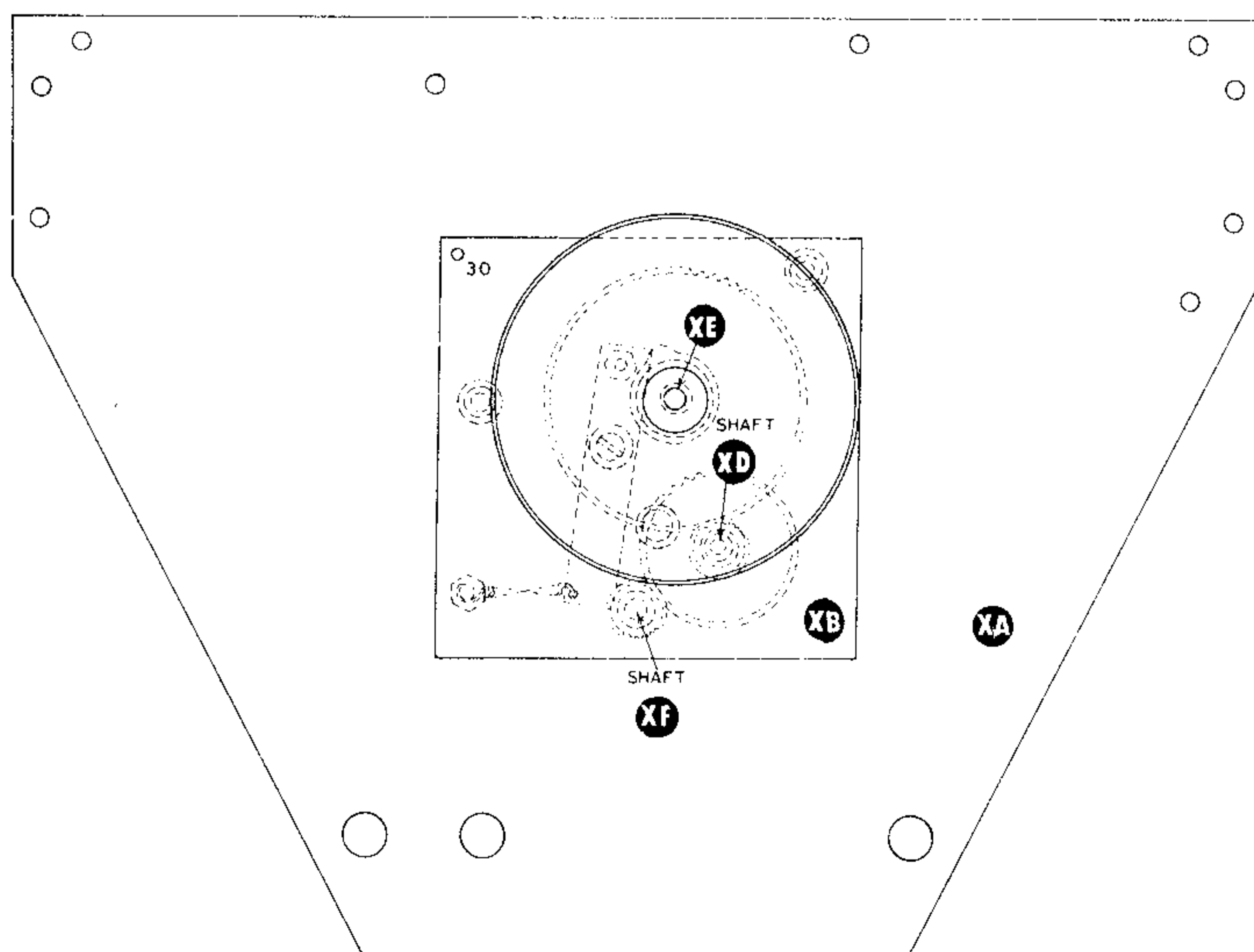


Figure 7

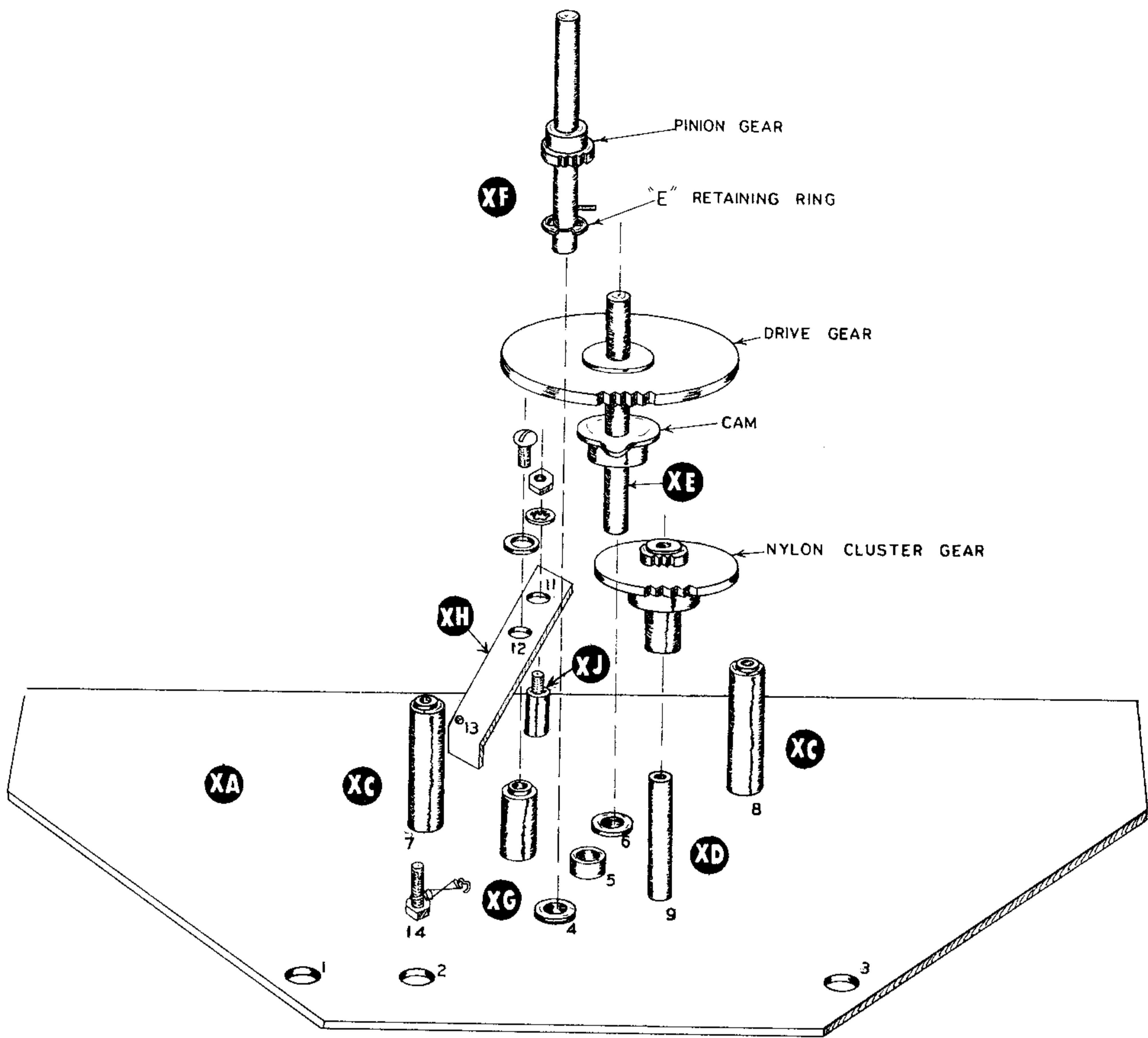


Figure 8

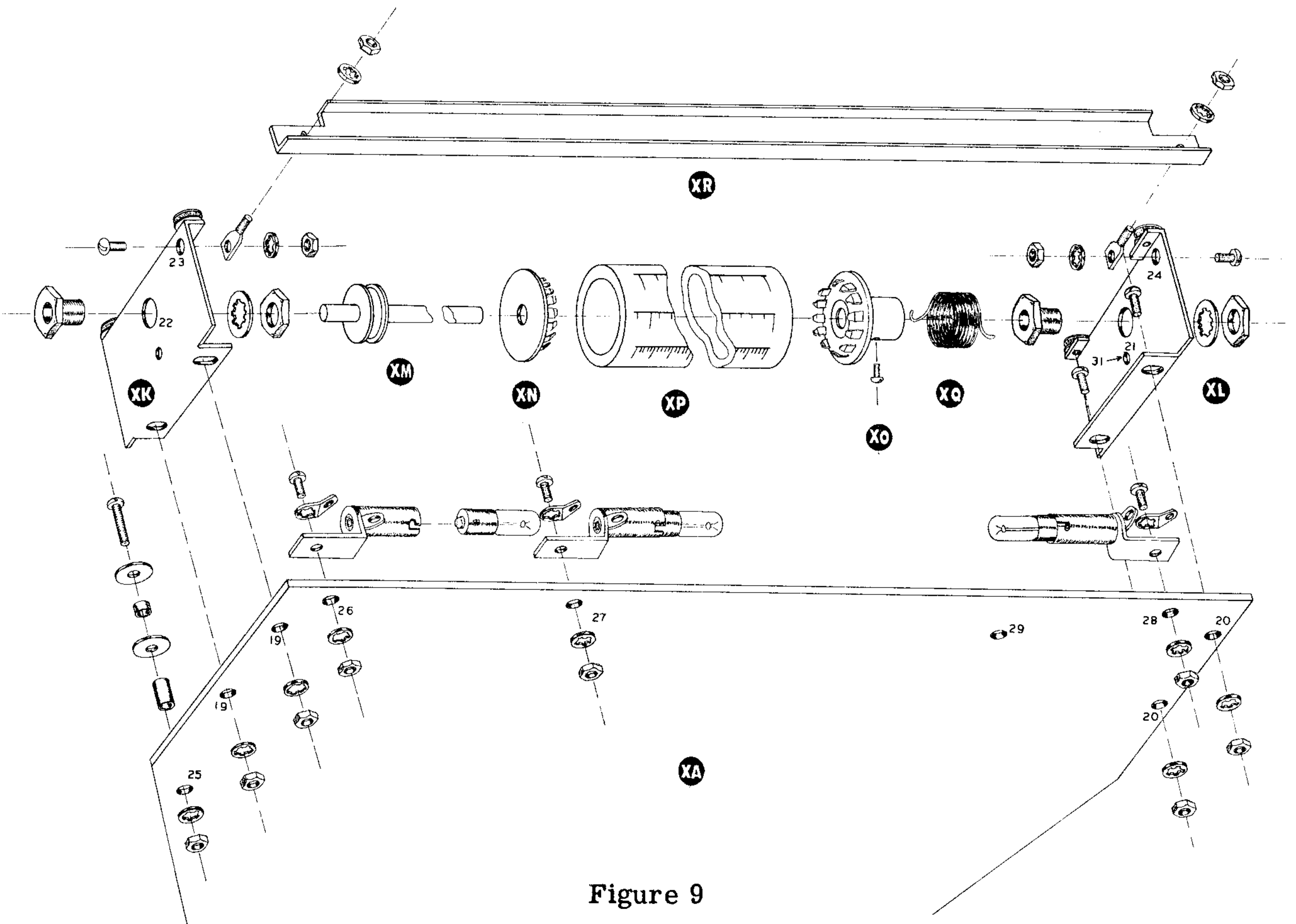


Figure 9

The gear train will be assembled first, then the dial drum. The figures presented here will be worth more than all the words that could be used to describe this assembly process. A complete understanding of the figures before starting will result in a rather simple assembly job.

NOTE: This dial mechanism is used in both the Heathkit TX-1 "Apache" and the RX-1 "Mohawk". Therefore, in the interest of standardization, some holes will not be utilized in several of the parts. These items will be pointed out during assembly.

- ( ) Place the backplate XA on the top of an open cardboard box with the flanged side of the three bronze bearings up and the narrow side toward you, as in Figure 8. Placing the unit on a box allows it to be flat and permits the shaft to be inserted through the bearings and supports them in position. From time to time it will be necessary to pick up the backplate for assembly purposes but returning it to the "reference" position will make the assembly instructions clearer.
- ( ) Mount the two shouldered spacers XC, one at location 7 and one at location 8. Use #6-32 x 3/8" RHMS and #6 washers, inserting the screws from the back of the plate.
- ( ) Mount the cluster gear shaft XD at the slotted hole 9. Secure temporarily with a #6-32 x 1/4" RHMS, #6 lockwasher and a #6 flat washer from the backside of the plate.
- ( ) Slip the nylon cluster gear over the shaft XD with the smaller gear up as shown.
- ( ) Locate the drive gear shaft XE with the driver gear assembled to it. Also locate the dial stop cam and start a #8-32 x 1/4" Allen Head set screw into the hub.
- ( ) Slip the cam over the end of shaft XE with the bushing side of the cam toward the end of the shaft, as shown. Do not tighten the set screw at this time.
- ( ) Slip the cam end of the shaft XE into the bearing at 6 on the backplate until the drive gear engages the small gear on the nylon cluster gear. The mesh may not be perfect at this time but this will be adjusted later.
- ( ) Locate the pinion gear shaft XF with the pinion gear assembled to it.
- ( ) Press the 7/16" roll pin through the hole in shaft XF until one end is flush with the surface of the shaft. This leaves 3/16" of the pin extending from the shaft.
- ( ) Snap an "E" retaining ring in the groove of shaft XF.
- ( ) Slip the retaining ring end of the shaft into bearing 4 on the backplate until the retaining ring is flush against the bearing flange. The pinion gear will now mesh with the large gear of the nylon cluster gear. It is normal that the pinion gear is not centered on the large nylon gear, but rather rides near the top edge of the nylon gear.
- ( ) Locate the dial stop arm XH. In hole 11, mount the cam rider stud XJ. Insert the cam rider in hole 11 so the stud extends from the arm in the direction of the flange at the other end of the arm. Secure with a #6 nut and lockwasher.
- ( ) Insert the shouldered end of the stop arm spacer XG in hole 12 of the arm XH so it extends in the same direction as the rider stud. Place a #6 washer over a #6-32 x 1/4" RHMS and secure in the tapped hole in the shouldered end of XG. Notice that the arm XH now pivots freely around the spacer XG.



- ( ) Now slide the spacer-arm assembly into position over hole 10 on the backplate XA. Secure with a #6 x 3/8" RHMS and lockwasher from the backside of the backplate into the other tapped hole in XG.
- (✓) Now place the front plate XB in position, referring to Figure 7. The shaft XE will enter bearing 16 and the shaft XF will enter bearing 17. Mating holes in XB for the spacers XC and cluster gear shaft XD will now be readily apparent. Make sure the shoulders of the spacers XC are properly seated. Now secure the front plate with #6-32 x 3/8" RHMS and #6 washers and a #6 washer in XD. Do not worry about adjustment yet.
- ( ) Insert the #4-40 x 1/2" RHMS through hole 14 in the backplate XA from the backside. Secure with a #4 nut and a #6 lockwasher.
- ( ) Two small tension springs are provided. Select the weakest of the two and insert one end in hole 13 on the stop arm XH and slip the other over the top end of the #4-40 screw at hole 14.
- ( ) Loosen cluster gear shaft XD and adjust for rough gear mesh and then retighten temporarily.
- ( ) Adjust the cam on shaft XE along the shaft to the point where the shaft will be held in place between the two plates, the large drive gear acting as one limit, the cam itself as the other. Now, by rotating the cam in small steps, adjust the stop action so the pin hits the stop before the arm hits the shaft XF at each end of the rotation cycle.
- ( ) Once again loosen the screws at each end of the cluster gear shaft XD and position the shaft until the proper mesh is obtained. Proper mesh should provide no backlash in the gear train with a fairly free running action. If a stiff gear train is desired, mesh the cluster gear more tightly. A free action can be obtained by backing off the cluster gear, but a small amount of backlash may be introduced. Once the setting you prefer is determined, tighten shaft XD securely.

NOTE: Temporarily placing the large aluminum tuning knob on the shaft XF extending from the front plate, will give a better indication of the "feel" of the dial mechanism after assembly.

- (✓) Insert the #5-40 x 3/4" RHMS through the hole in the single plastic pulley provided. Place a #5 nut on the screw and screw it close to the pulley to a point where the pulley just turns freely. Place a second #5 nut on the screw and secure against the first. Now place the screw through hole 30 in front plate XB from the front and secure with a third #5 nut and #6 lockwasher. Check once again for free rotation of the pulley.
- ( ) Place the large 3 1/2" dial cord pulley over shaft XE extending from the front plate XB. Place with the hub out, as shown, and secure with the face of the hub flush with the end of the shaft. Orient the opening in the rim of the pulley opposite the shaft XF when the shaft XF is in its full clockwise position.
- (✓) Mount one of the two identical dial drum support brackets, at hole location 20 at the upper left corner of the backplate XA, when observing it in its reference position. This lefthand bracket is now designated XL. Mount firmly, but not securely as yet, with a #6-32 x 3/8" RHMS in the top hole and a #6-32 x 3/8" RHMS in the bottom hole using lockwashers under the nuts. Insert the screws from the bracket side.

NOTE: The two 17/64" bushings will have a very loose fit on the 1/4" shafts that they support. This is done intentionally to eliminate possible binding. Check to make certain that the 17/64" and not the 1/4" bushings are used in the next operation. By sliding the 1/4" diameter selectivity switch drive shaft in each bushing and observing the clearance, it will be evident which is 17/64" ID.

- (✓) Mount a 3/8" long shaft bushing with a 17/64" ID in hole 21 on bracket XL, positioning as shown with the threaded portion out. Secure with a 3/8" nut and lockwasher.

- ( ) Mount a spade lug on the inside of the bracket XL at hole location #24 with a #6-32 x 1/4" RHMS, as shown, using a lockwasher under the nut.
- ( ) Locate the plastic calibrated dial drum XP and the end plugs XN and XO. Place plug XN in the end of the dial drum at the high end of the calibration and place plug XO in the other end. Press in place firmly.
- ( ) Slip the long dial drum shaft XM through the drum, inserting the end opposite the fixed pulley into the hole in XN. Slide the shaft through the drum and out through the bushing on plug XO.
- ( ) Slip the spring XQ, looped end first, over the bushing on XO and place a #6-32 x 1/4" RHMS through the loop and into the tapped hole on the bushing. Do not secure the screw as yet.
- ( ) Now, take the other dial drum support bracket, and mount a spade lug in hole 23 as before. This bracket now becomes XK.
- ( ) Mount a second 3/8" long shaft bushing with a 17/64" ID in hole 22 of XK, this time with the threaded portion on the inside of the bracket, or opposite to the bushing in XL. Secure with a 3/8" nut and lockwasher.
- ( ) Insert the shaft end of the dial drum-shaft assembly with the spring mounted on the bushing into the bushing on bracket XL previously installed. Now slip bracket XK over the pulley end of the shaft and secure the bracket to the backplate at holes 19. Use #6-32 x 3/8" RHMS with lockwashers; insert the screws from the bracket side as before. Do not tighten securely yet.
- ( ) Place the dial pointer support piece XR in position on the two spade lugs as shown. The notches on the ends face out to clear the pulleys on the end brackets, and the flanges are up. Adjust the spacing of the brackets XK and XL until XR drops into place easily. Now center the whole drum assembly on the backplate and tighten securely the screws at holes 19 and 20; secure the dial pointer bracket XR with #6 nuts and lockwashers over the spade lugs.
- ( ) Insert the free bend end of the spring XQ through the small hole 31 in XL. Holding the spring firmly in place against the bracket with a pair of pliers, bend the short length of spring extending from hole 31 on the outside of bracket XL back in the direction it enters the hole at the inside, thus forming a square U shaped hook to hold the spring in place.
- ( ) Holding the pulley on the shaft XM against the bushing in bracket XK, slide the dial drum toward XL until the bushing XO is flat against the bushing in XL. Adjust for a free turning action, but do not allow any slop which could upset the dial calibration. Now tighten the #6 screw in the bushing XO.
- ( ) With the dial mechanism in the "reference" position, rotate the drum from rest (no spring tension) in a direction such that the top of the drum moves away from you (clockwise looking at end XK) for about 1/4 of a revolution, thus placing tension on the spring return. Now, holding end plug and bushing XO firmly in the position, turn the plastic dial drum XP so it slides on the end plug until the 80 meter dial calibration is up (directly in line with the internal drum shaft and away from the backplate). Now release the drum and proceed with assembly.
- ( ) On a #6-32 x 1" RHMS, place, in the following order, a #6 x 7/16" metal washer, a 1/8" #6 spacer, a second #6 metal washer, and a 3/8" #6 spacer. Now insert the screw through hole 25 in backplate from the front side and secure with a #6 nut and lockwasher.
- ( ) Mount the bayonet pilot light sockets at locations 26, 27 and 28 as shown on the top of backplate XA. Observe that the sockets all point toward the center, making the mounting position of 28 opposite 26 and 27. Secure with #6-32 x 3/8" RHMS, inserted from the back of the backplate, placing #6 solder lugs under the nuts on the sockets. Bend up at right angles to clear the drum.

( ) Using #20 bare wire, connect the bottom socket lug to the near solder lug on each socket and solder all six connections.

( ) For the next step in final assembly, the chassis should be placed on the bench with the bottom down and the front of the chassis facing to the left.

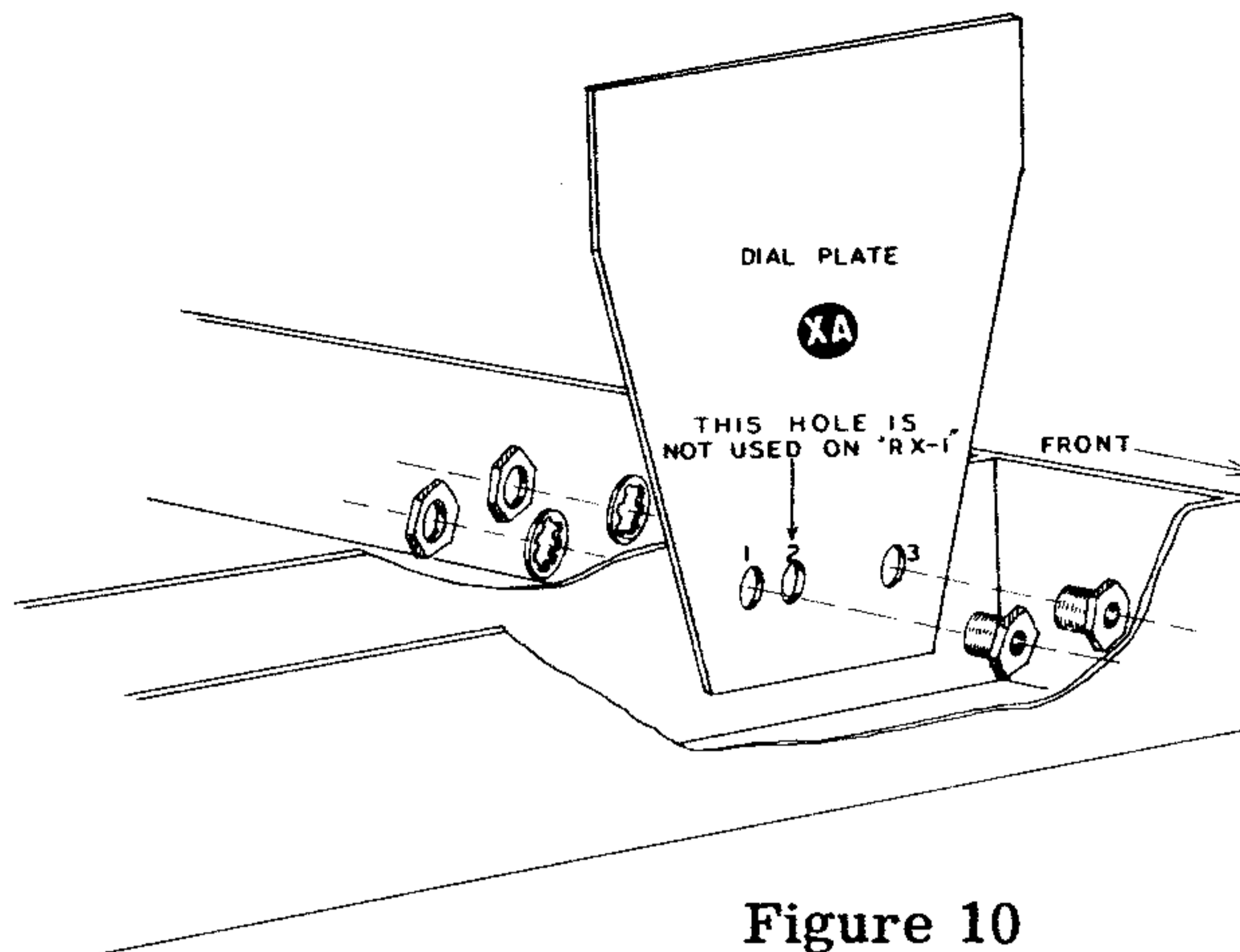


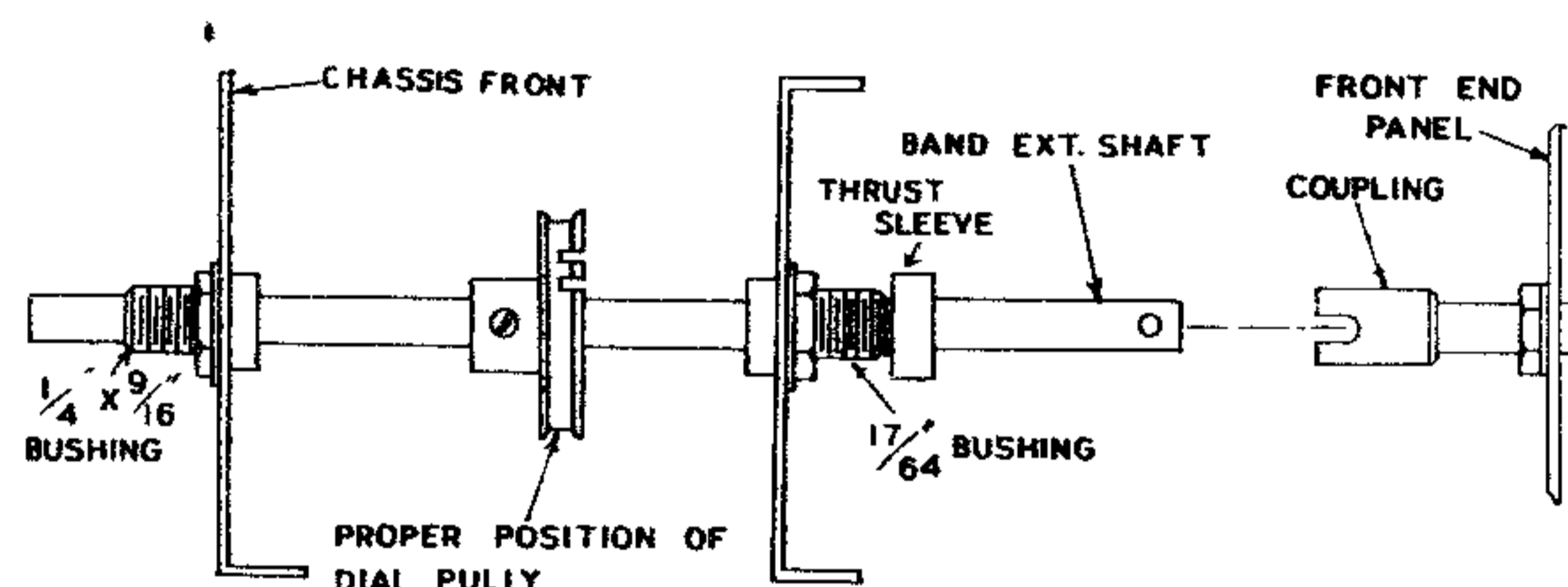
Figure 10

Follow Figure 10 closely in mounting the dial mechanism and face panel.

Place the dial mechanism so that hole #3 aligns with hole AL, in the main frame. Place a  $17/64$ " bushing through dial mechanism and the main frame; place a lockwasher and nut on the bushing. Repeat the same operation for bushing hole AM, then tighten both lock nuts.

( ) Mount a  $1/4$ " x  $9/16$ " bushing in hole BF. Place a control lockwasher on the bushing; insert the bushing from the back of the main frame. Use a washer and nut on the front. This nut should be snug but not tight, as it will be removed when the front panel is installed.

( ) Place the  $1/2$ " OD x  $1/4$ " ID x  $1/4$ " thrust sleeve on the band extension shaft. Slide the band extension shaft through bushing AL, place the  $1 1/4$ " dial drive pulley on this shaft, as shown in Detail 1. Slide the extension shaft through bushing BD.



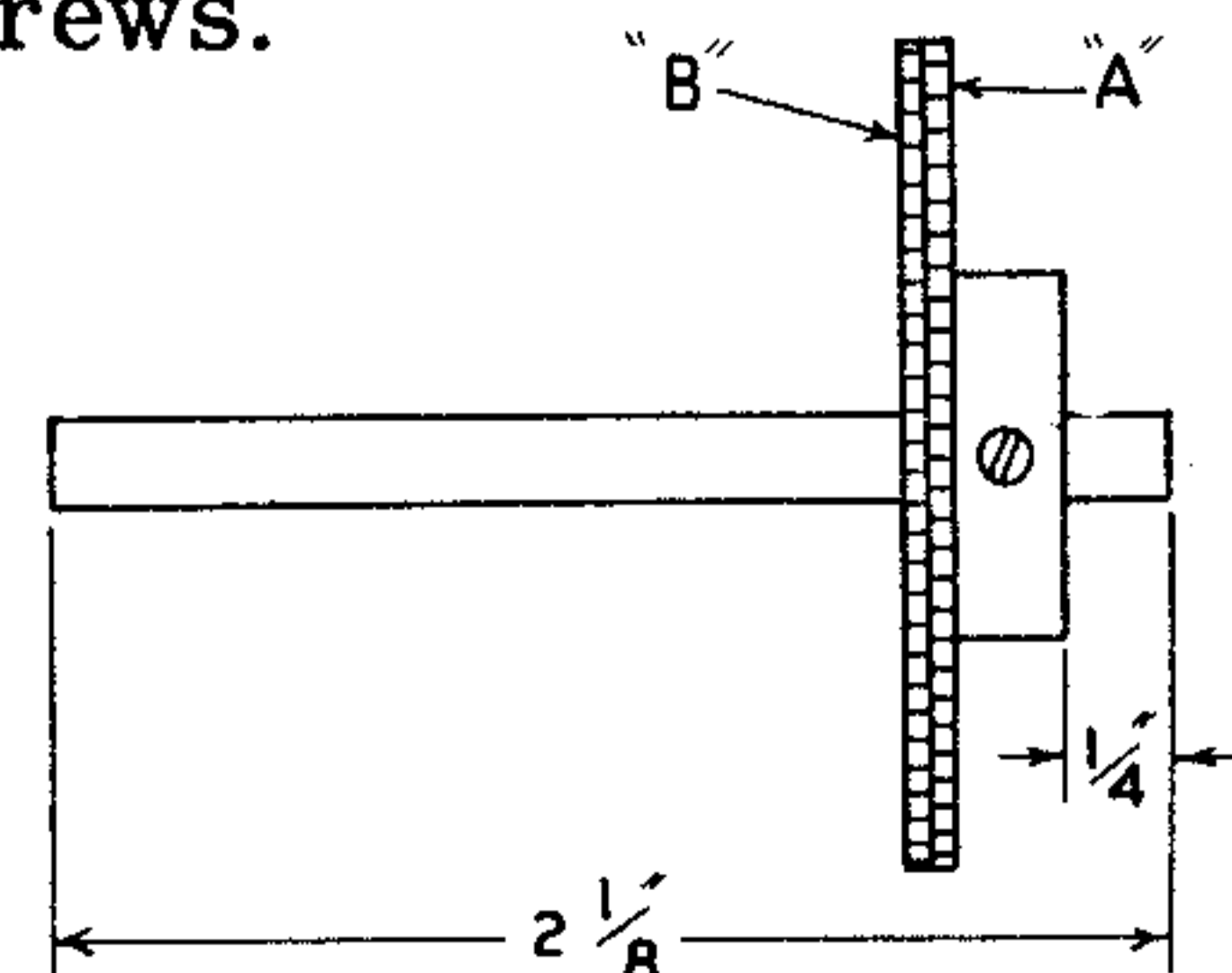
Detail 1

NOTE: To avoid costly damage to the receiver, extreme caution must be taken in attaching the front end and 1682 IF section to the main frame. The front end assembly is completely pre-tuned. DO NOT ADJUST ANY OF THE TUNING SLUGS OR TRIMMERS.

( ) Look the front end assembly over carefully. Note that the coils next to the edge of the assembly have the solder lugs that are not in use, clipped short. This was done to give as much clearance as possible while attaching the front end to the main frame. The clearance between the coils and the main frame flange is approximately  $1/8$ ". Keep this in mind in the next step. Above all, if the front end assembly does not slip into place, DO NOT FORCE IT. Check for the component or components that are out of their proper position. If such a condition should exist, carefully tip the front end assembly to clear the main frame mounting flange.

( ) Place the front end on the main frame as shown on the "top plate drawing". If all wires and components have proper clearance, fasten with 8 #6 sheet metal screws.

( ) Mount the 1682 IF chassis on the main frame; run the 7 wires, previously connected, through grommet AQ. Make certain that none of the wires or components are positioned so that they will be pinched between the mainframe and the IF chassis. If everything has proper clearance, fasten IF chassis to main frame with 2 #6 sheet metal screws.



Detail 2

( ) Mount the tuning drive anti-backlash gear on the 453-40 extension shaft ( $1/4$ " x  $2 1/8$ ") as shown in Detail 2.

( ) Slide the 1/4" to 3/8" coupling over the long end of the anti-backlash gear shaft with the 1/4" ID end next to gear "B". This coupling will be tightened later.

( ) Place the anti-backlash gear shaft in the mounting bushing, as shown in Figure 11.

( ) The next step consists of mounting the tuning drive gear and adjusting the anti-backlash mechanism. Refer to Detail 3. Place the tuning drive gear on shaft "XE", inmesh with gear "A" on the anti-backlash gears. Gear "B" should be free to rotate against the built-in spring mechanism. Hold gear "A" in position, rotate gear "B" one tooth, then slide the tuning drive gear to its proper position and tighten to shaft with #8 Allen screw. Recheck this step to make certain that a tension exists between gear "A" and "B". If play is still evident between the drive gear and the backlash gear; repeat this step, but increase the amount of rotation on gear "B" to 2 teeth.

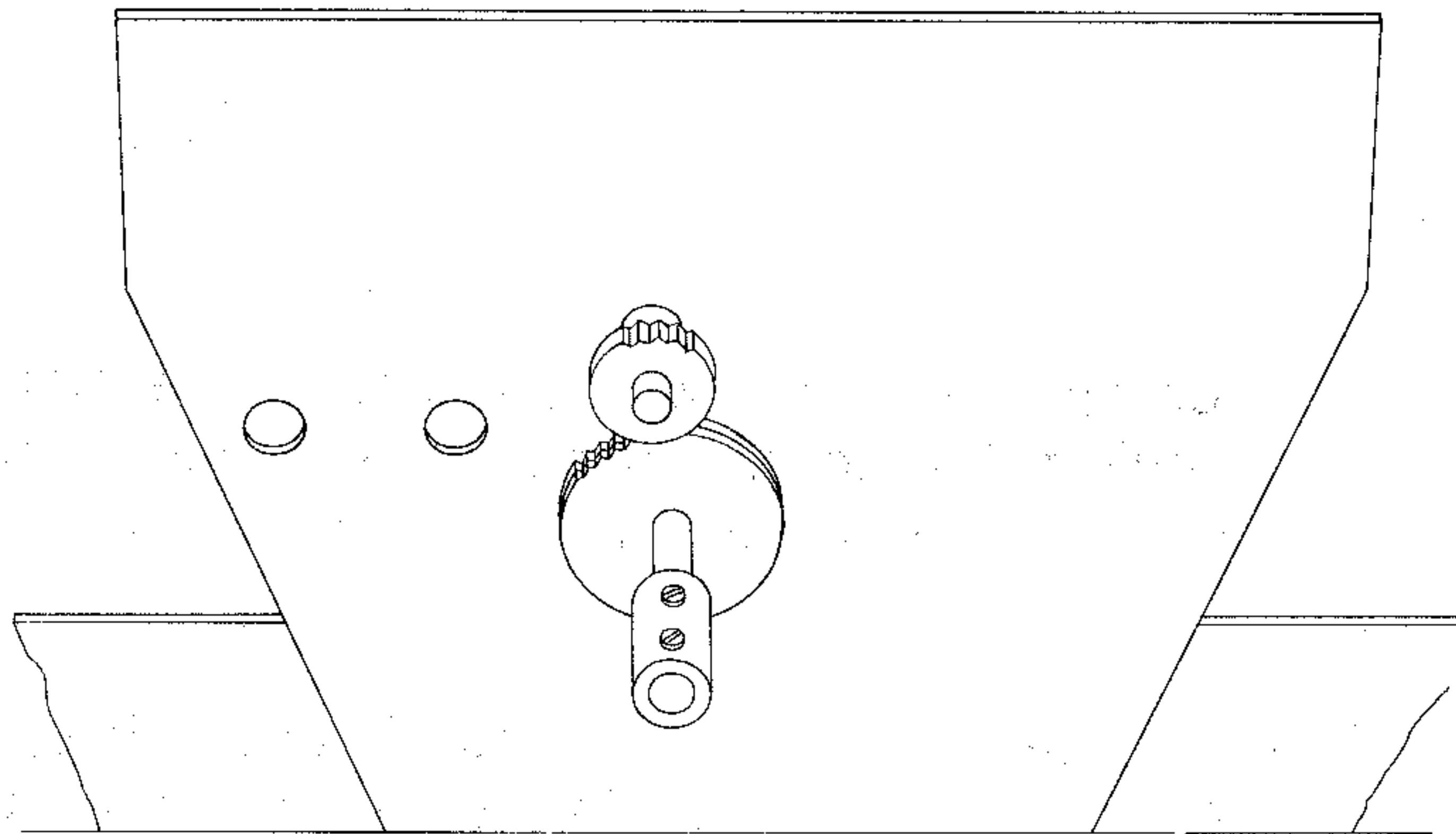
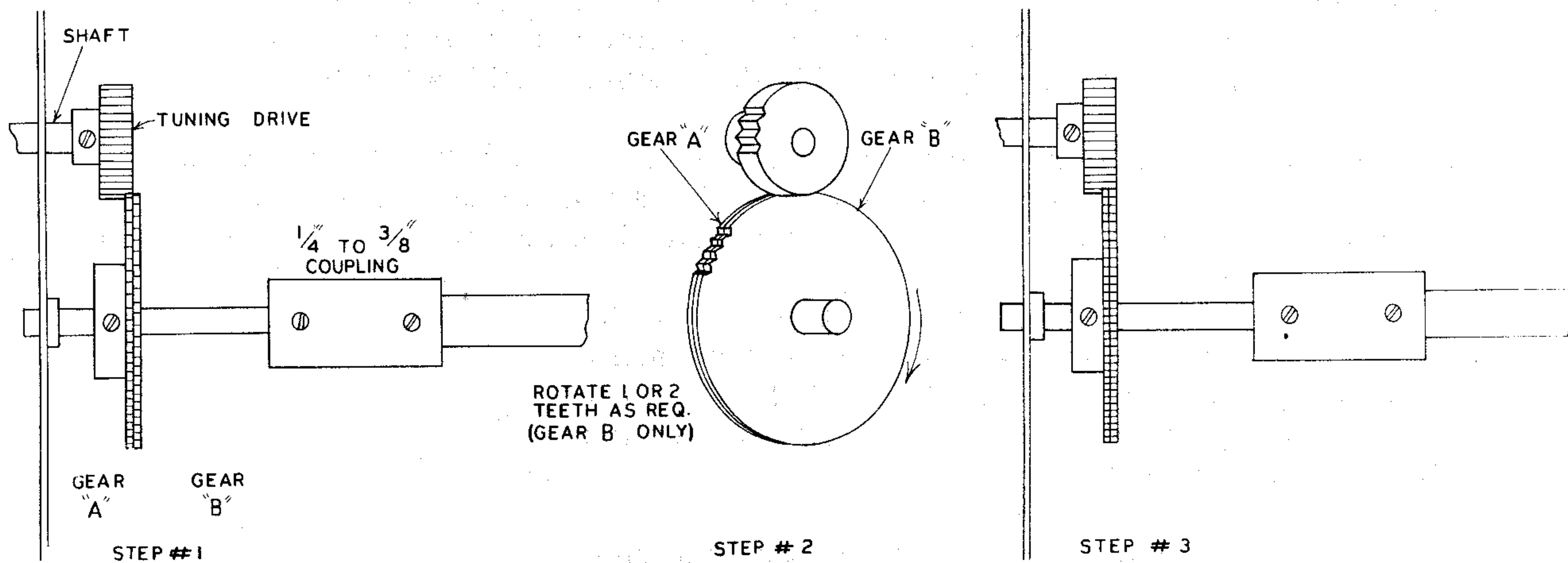


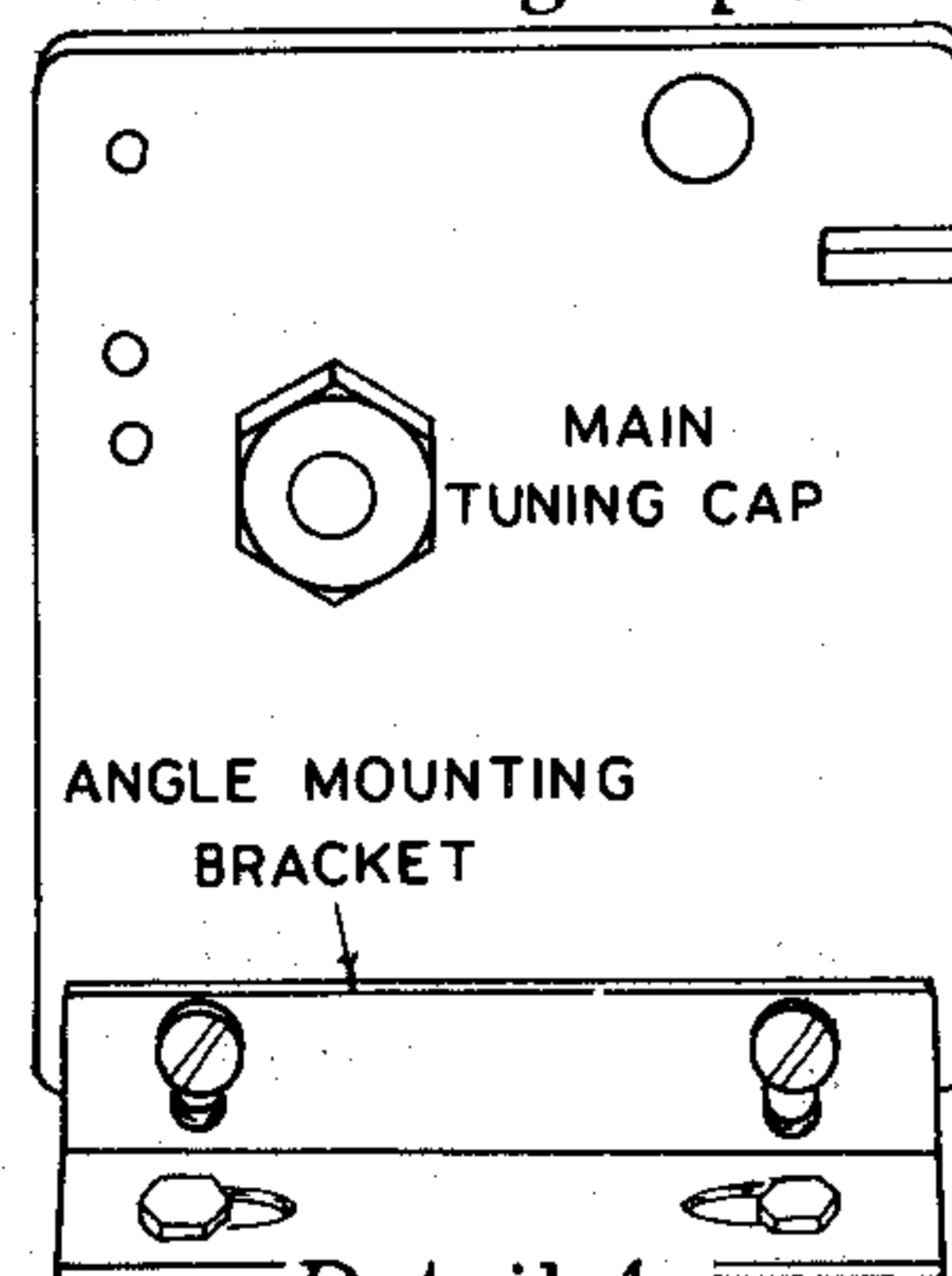
Figure 11



Detail 3

( ) The main tuning capacitor has 4 screws in the angle mounting brackets as shown in Detail 4. The holes in these brackets are slotted to allow for aligning the main tuning capacitor shaft, to the anti-backlash gear shaft. There is an angle mounting bracket on each end of the main tuning capacitor. Loosen 4 screws in each bracket for next step.

( ) Slide the 1/4" to 3/8" coupling over the main tuning capacitor shaft, so that the coupling covers an equal distance on both shafts. Before tightening this coupling, make certain that the two shafts are in line. If a misalignment exists, move the main tuning capacitor. When the two shafts are properly aligned, tighten the 8 screws in the angle mounting brackets. Tighten the 2 #8 Allen screws in the 1/4" to 3/8" coupling, on the 1/4" shaft only.



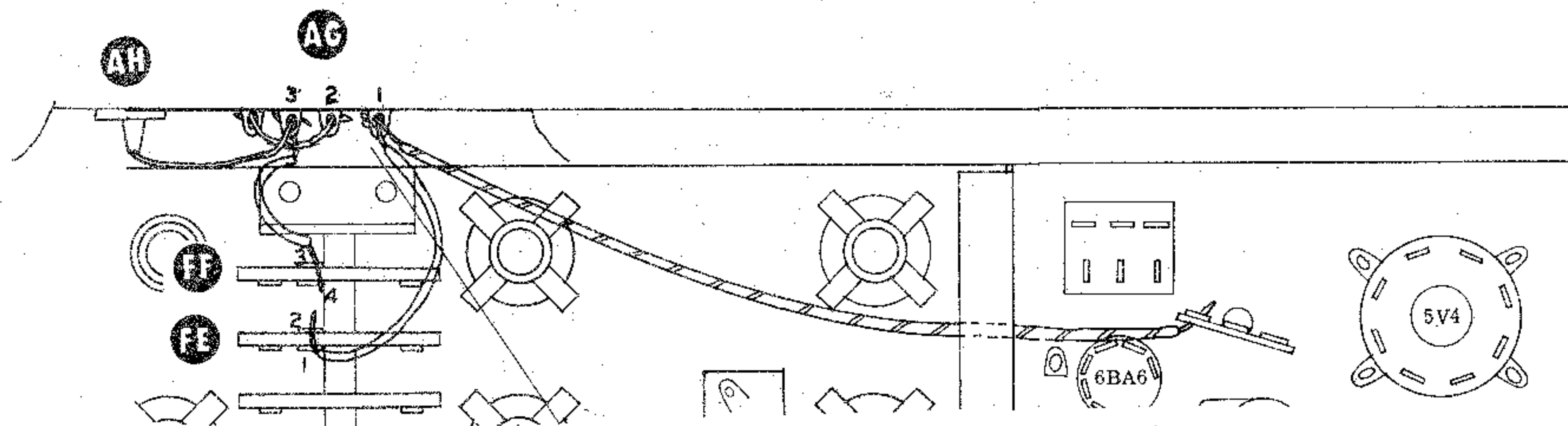
Detail 4

( ) Carefully set the chassis on end, so the power transformer on the 50 KC IF and audio chassis, will support it.

NOTE: See Detail 5 for connecting the antenna terminals to the front end.

- ( ) Run the white wire from terminal AG1 through FE1 and connect to FE2 (solder both terminals).
- ( ) Run the white wire from terminal AG3 through FF3 and connect to FF4 (solder both terminals).

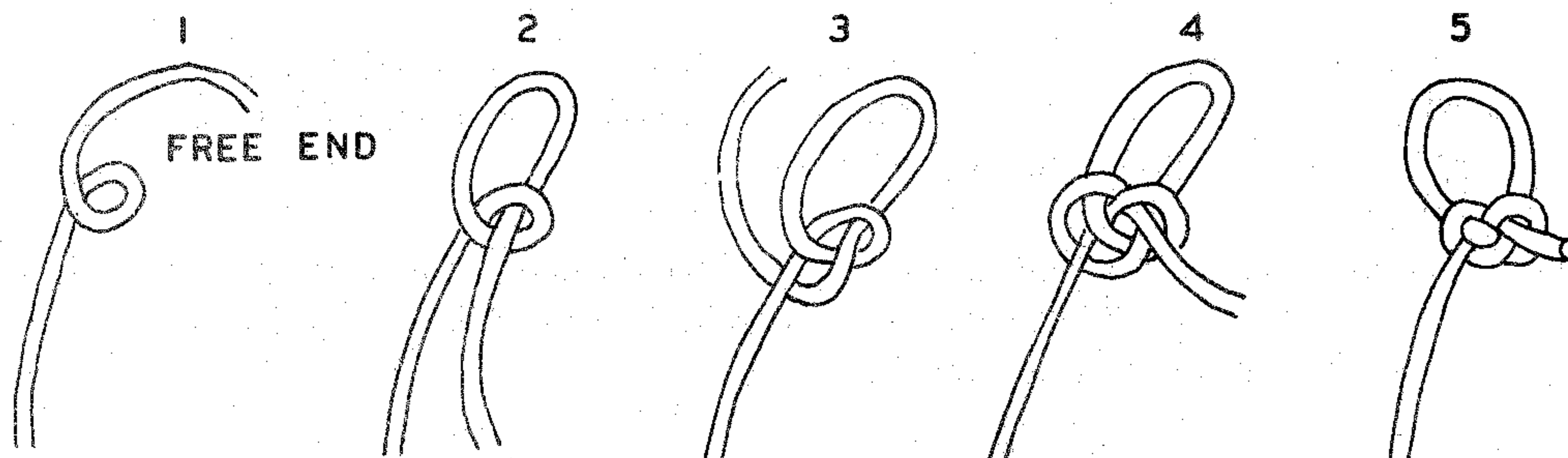
Detail 5



NOTE: Refer to the large fold-in Pictorial #3, for the connection of the 1682 KC IF chassis to terminal strips AV and AU.

- ( ) Connect the red lead, from grommet AQ, to AV3 (S2).
- ( ) Connect the gray lead, from grommet AQ, to AV2 (S2).
- ( ) Connect the white lead, from grommet AQ, to AV1 (NS).
- ( ) Connect the orange lead, from grommet AQ, to AU5 (S2).
- ( ) Connect the green lead, from grommet AQ, to AU4 (S2).
- ( ) Connect the yellow lead, from grommet AQ, to AU3 (NS).
- ( ) Connect the blue lead, from grommet AQ, to AU2 (S2).
- ( ) Cut both leads of a 2.4 K ohm resistor (red-yellow-red) to a 7/8" length. Connect one lead to AU1 (S2); connect the other lead to AV1 (S2).
- ( ) The next step in the final assembly, is the stringing of the dial cord. Follow Figure 12 closely.
- ( ) Place the chassis on the bench, with the dial mechanism facing toward you.
- ( ) Turn the main tuning shaft until the 3.4" dial pulley wheel "A" is fully clockwise.
- ( ) Tie a bowline in one end of the dial cord, leave about a 1/2" loop above the knot. See Detail 6.

Detail 6



NOTE: Pull the knot tight. If the 1/2" loop in the end slips, an error has been made in the step, and this step should be repeated.

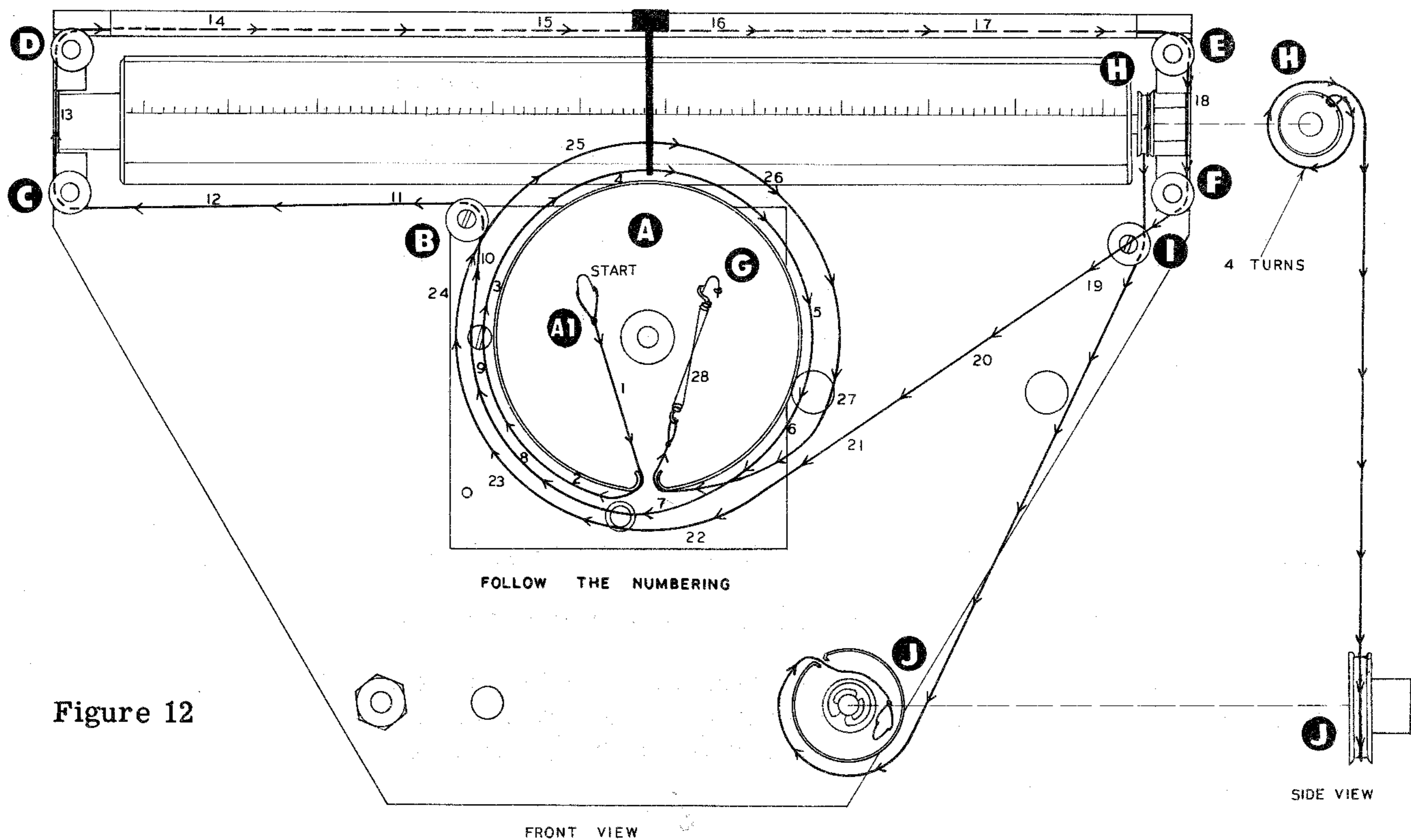
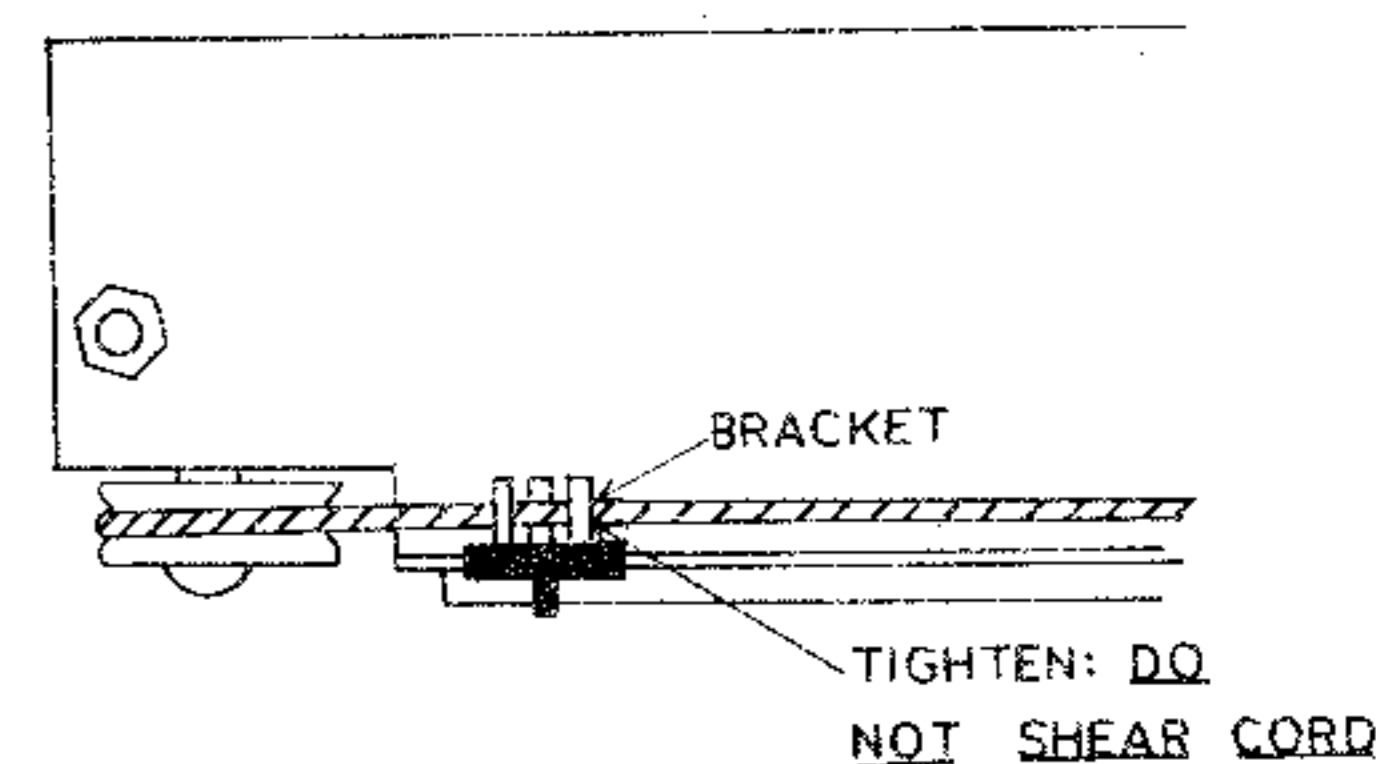


Figure 12

- ( ) Place the bowline over lug A1, down through the opening in the bottom of the pulley, then around the pulley, clockwise, once, then up over pulley B, around pulleys C, D, E, and F. Run dial cord to the bottom of pulley "A", then around once clockwise and back through opening in the bottom of "A". Fasten a spring to "G" by hooking the loop over the lug. Stretch this spring to 1" and tie the dial cord on the spring loop opposite the A2 end. Check to make certain that the dial cord is tight. If the dial cord is slack, repeat the preceding step, this time stretching the spring to about 1 1/4" to provide more tension. When this step is complete, cut off the excess dial cord about 1/4" from the spring where it is tied.
- ( ) Tie a bowline in the end of the remaining piece of dial cord. Fasten this bowline over the lug in dial drum pulley "H". Make 4 complete turns around pulley "H", as shown in Figure 12. Run dial cord over pulley "I" and down to pulley "J", then tie to the lug provided for fastening the dial cord to this pulley.
- ( ) Slide the special flexible coupling 456-10 on the band switch as shown in Detail #1 page 43. Slide extension shaft into coupling until pin rests in coupling slots. Tighten the #8 Allen set screws in coupling
- ( ) Slide thrust sleeve tight against bushing AL, then tighten #8 Allen set screws.
- ( ) Place a knob on the band switch shaft.
- ( ) Rotate the band switch to the left (counterclockwise), until it stops. This is the 160 meter band. Now rotate pulley "J", clockwise, until the 1800 to 2000 KC scale, on the drum, is facing toward the front of the receiver.
- ( ) Rotate the band switch clockwise 1 step. If the dial drum assembly is properly strung, the 80 meter band (3500 to 4000 KC) should be facing toward the front of the chassis.
- ( ) Turn the main tuning shaft counterclockwise until it stops. Place the dial pointer on the dial pointer bracket. See Detail 7.



Detail 7

- ( ) Slide the dial cord in the bracket, as shown in Detail 7. Extreme caution must be taken in fastening the dial cord to the dial pointer, so as not to cut the cord in two. Do not squeeze these lugs too hard or they will shear the dial cord. With the dial mechanism turned fully counterclockwise, place the dial pointer 1/8" from the left end of the dial support bracket. Tighten the dial cord in the dial pointer by bending the center lug up. Now turn the tuning shaft clockwise, so that the dial pointer is all the way to the right hand side of the dial drum. Check to make certain that there is approximately 1/8" space between the dial pointer and the end of the support bracket. If there is more than 1/8" space between the dial pointer and the end of the bracket, hold the dial cord with one hand and slide the pointer along the cord until an equal amount of space exists on each end of the dial bracket, when the tuning mechanism is rotated from the extreme right to the extreme left.
- ( ) Turn the main tuning control, on the front of the receiver, until the dial pointer is to the extreme left hand side of the 80 meter band. Now rotate the 3/8" MAIN TUNING CAPACITOR shaft until the plates of the capacitor are fully meshed. If the plates of this capacitor are incorrectly positioned, the calibration of the receiver will be incorrect. Recheck this step, then tighten the set screws in 3/8" end of coupling.
- ( ) Place a soft cloth on the bench to avoid possible scratching of the front panel.
- ( ) Mount the long dial escutcheon plate as shown in Figure 14, using 4-40 hardware.
- ( ) Mount a 1/4" OD x 3/8" shaft bushing, with the lockwasher and nut on the backside of the front panel, in each of the following listed holes:
  - ( ) Antenna tuning
  - ( ) Calibrate (next to Antenna tuning)
  - ( ) Notch Tune
  - ( ) BFO
- ( ) Use a knife and carefully scrape the paint from the holes before installing the toggle switches.
- ( ) In the hole marked LSB-USB mount a S. P. D. T. Rotary Switch. Orient as shown in Figure 13, Page 48. Use a control solder lug on the bushing, a plain washer and nut on the face of the front panel.
- ( ) Mount the 64-3 S. P. S. T. Push Button Switch (red button) in the calibrate hole in center of front panel. Use a lockwasher on the back and a flat washer and nut on the front. Orient switch as shown in Figure 13.
- ( ) In the Standby-Receive hole, place the S. P. S. T. toggle switch with the ON position corresponding with RECEIVE position. Use a nut on the face of the front panel, and a lockwasher and nut on the back of the front panel. The nut on the backside of the front panel should be used for locking the switch in place, to avoid unnecessary scratching.
- ( ) In the ANL hole, mount the S. P. D. T. switch. The ON position on the switch must correspond with the ANL position on the front panel.
- ( ) In the AVC hole, mount the D. P. S. T. switch. The ON position on the switch must correspond with the OFF position on the front panel.
- ( ) In the SW-SSB-AM hole, mount the D. P. D. T. switch. The ON position on the switch must correspond with the CW-SSB position on the front panel.
- ( ) Cut a 1" length of bare wire. Connect one end to terminal BK2 (S); connect the other end to the ground lug adjacent to terminal BK2 (S).

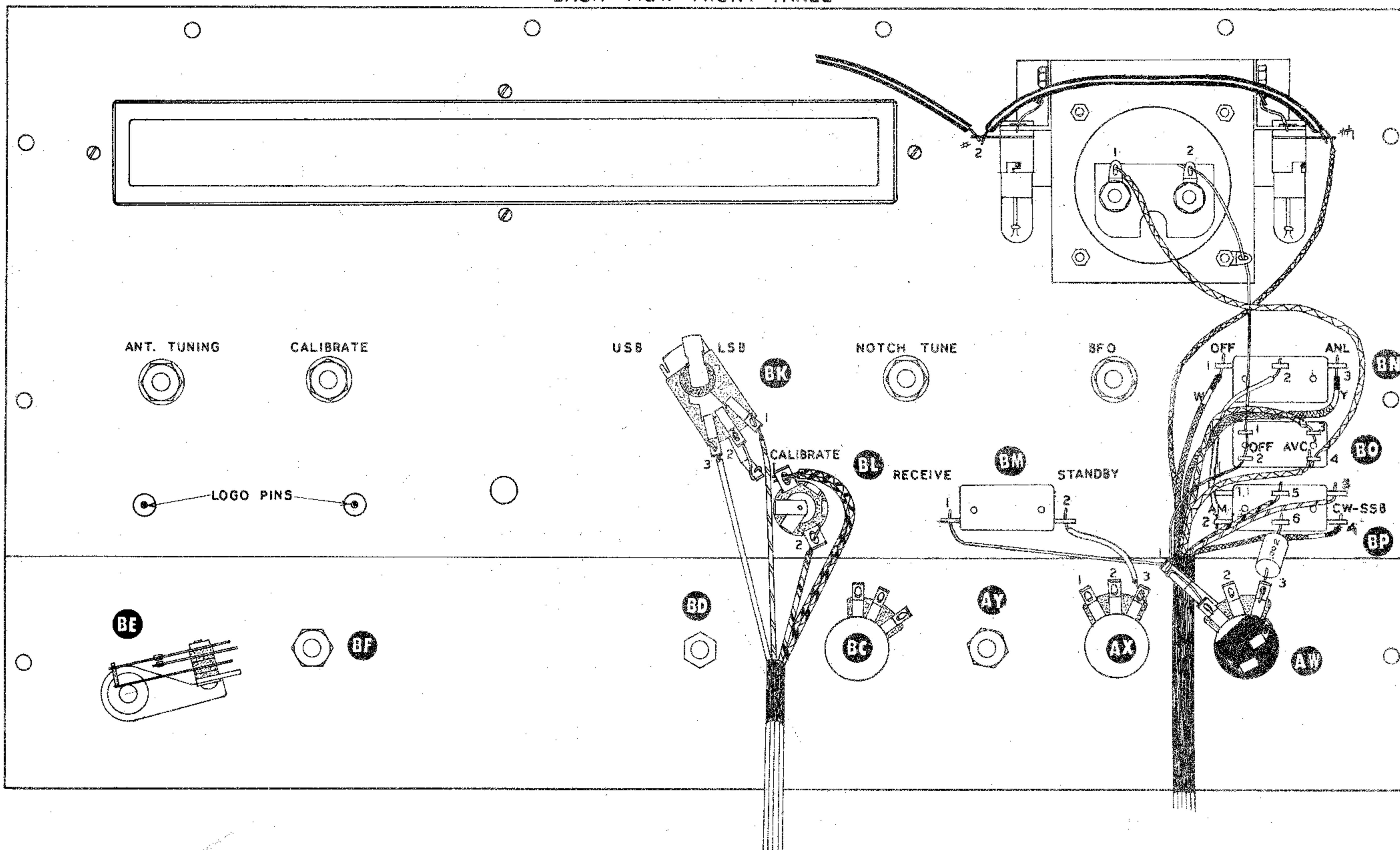
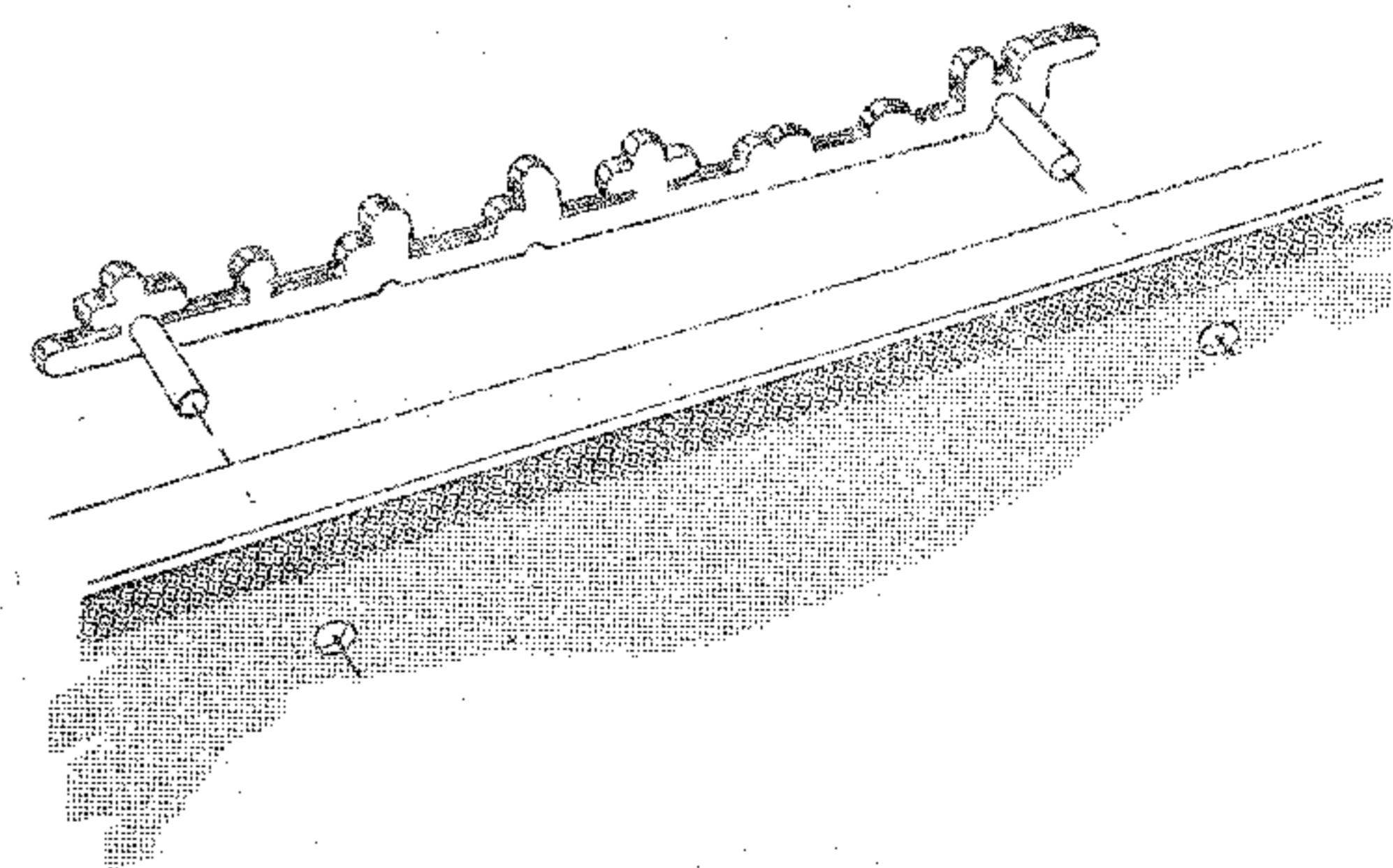


Figure 13

- ( ) Remove the knob previously installed on the band switch.
- ( ) For the next wiring operation, set the front panel in its proper position against the main frame. DO NOT FASTEN PANEL to main frame. Now lean the top away from the chassis and prop it against a box.
- ( ) Connect the blue wire from Breakout Number 8 to BK1 (S).
- ( ) Connect the white wire from Breakout Number 8 to BK3 (S1).
- ( ) Connect both orange wires from Breakout Number 8 to BL1 (S2)
- ( ) Connect the violet wire from Breakout Number 8 to BL2 (S).
- ( ) Place the "Heathkit" nameplate in the 2 holes above the word "receiver" in the panel escutcheon plate, as shown in Insert. Turn escutcheon plate down on bench and make certain that the "Heathkit" nameplate is tight against escutcheon. The two plastic pins that are protruding from the rear should be cut to a length of 1/8". Using a hot soldering iron, melt these pins so they rivet to the back of the escutcheon plate.
- ( ) Carefully remove the nuts previously placed on phone jack (BE), IFG (AZ), RFG (AX), AFG (AW), and on the bushing of the band switch.
- ( ) Place the front panel tight against the main frame assembly; align the panel so that the four components called out in the previous step, are in their correct holes.





(  ) Place the panel escutcheon plate against the front panel, aligning the holes to their correct position as shown in Figure 13. Using a nut and flat washer, secure the front panel escutcheon plate to the main frame, by permanently installing the following listed components:

(  ) The phone jack

(  ) IFG

(  ) RFG

(  ) AFG

(  ) Bushing on band switch

(  ) In hole BD, install a 1/4" x 9/16" shaft bushing in the same manner.

(  ) In hole AY, install a 1/4" x 9/16" shaft bushing in the same manner.

NOTE: It will be evident in the next few steps that the length of the leads are longer than is necessary to make the connections, however, do not shorten the leads from Breakout Number 6. These leads are intentionally long, as it is possible that the front panel may have to be removed for maintenance at some future date.

(  ) Cut a piece of bare wire to a 4 1/2" length. Connect one end to BM1 (S); connect the other end to the ground lug adjacent to AW1 (NS). Form this wire around control AX to prevent possible grounding of terminals.

(  ) Cut a piece of bare wire to a 3" length. Connect one end to ground lug adjacent to AW1 (S3). Run the other end through BO2 and connect to BO1 (solder both terminals).

(  ) Cut the leads of a .002 mfd tubular capacitor to a 1" length. Over each lead slip a 3/4" length of insulated tubing. Connect one lead to AW3 (S); connect the other lead to BP6 (S).

(  ) Cut a piece of white wire to a 2" length, and strip ends. Connect one end to AX3 (S3); connect the other end to BM2 (S).

(  ) Connect the shielded lead with the red colored tape, from Breakout Number 6 to BP4 (S).

(  ) Cut a 3 1/2" length of white wire and strip ends. Connect one end to BP-2 (S); connect the other end to BN2 (S).

(  ) Connect the shielded lead, with the white tape coding, from Breakout Number 6 to BN1 (S).

(  ) Connect the shielded lead, with the yellow colored tape coding, from Breakout Number 6 to BN3 (S).

(  ) Connect the orange lead from Breakout Number 6 to BP5 (S).

(  ) Connect the yellow lead from Breakout Number 6 to BO4 (NS).

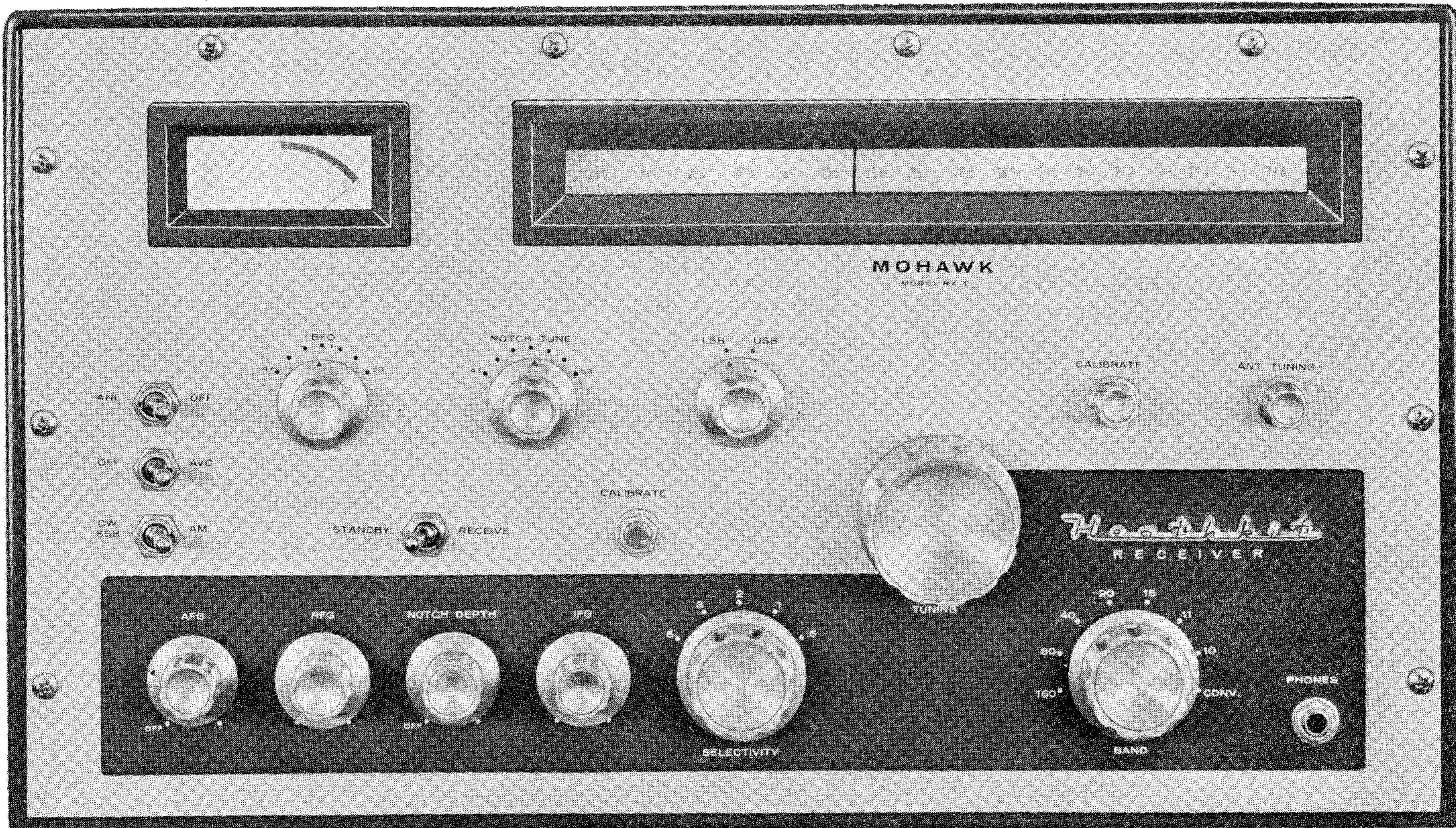
(  ) Connect the blue lead from Breakout Number 6 to BP3 (S).

(  ) Connect the green lead from Breakout Number 6 to BO3 (S).

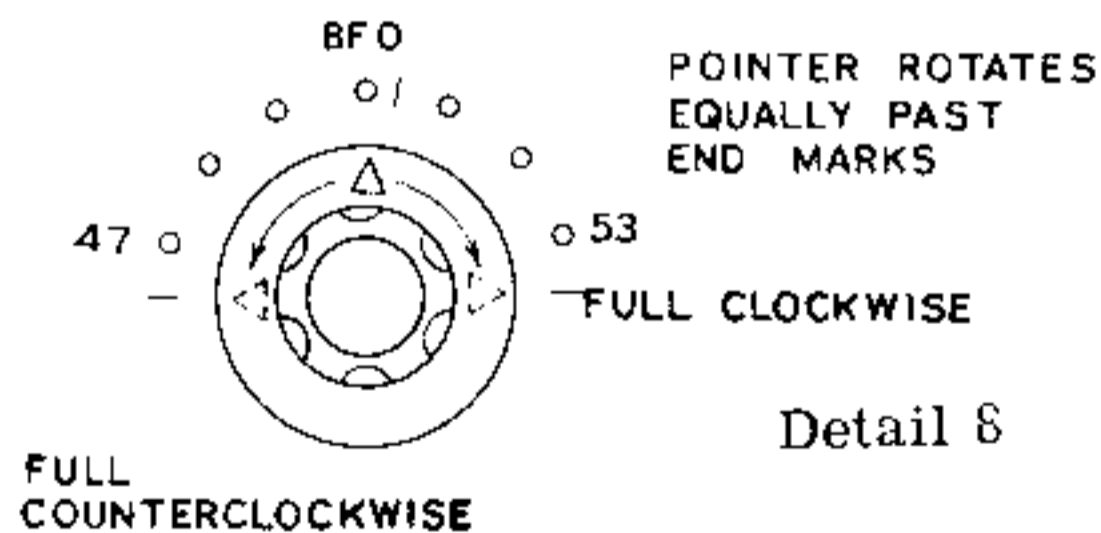
(  ) Mount the S-meter in the S-meter support bracket using lockwashers and 4-40 nuts. On the lower right-hand mounting stud place a ground solder lug instead of the lockwasher, as shown in Figure 13. Do not tighten these nuts too tight, as the heads are mounted in plastic and breakage may occur.

- ( ) Mount the S-meter assembly to the face plate with two 4-40 x 3/8" bolts and lockwashers. The bolts are to be installed through the S-meter bracket through the front panel and into the S-meter escutcheon plate, which is drilled and tapped for this purpose.
- ( ) Cut a 5 1/2" length of bare wire and run one end through the ground lug previously mounted on the S-meter support bracket and connect to BO1 (solder both connections). Connect the other end to S-meter terminal 2 (S).
- ( ) Cut a piece of yellow wire to a 7 1/2" length and strip ends. Connect one end to BO4 (S2). Connect the other end to the S-meter terminal 1 (S).
- ( ) Mount a pilot light socket on both sides of the S-meter bracket, using 6-32 hardware and a #6 solder lug. See Figure 13, page 48.
- ( ) Run a short piece of bare wire from one lug on the pilot light (S) to the solder lug (S), as shown in Figure 13.
- ( ) Connect the gray wire from Breakout Number 6 to the terminal on pilot light socket #1 (NS).
- ( ) Cut a 5" length of bare wire; place a 4 1/2" length of insulated sleeving on it; connect one end to the terminal on pilot light socket #1 (S2). Connect the other end to pilot light socket #2 (NS).
- ( ) Cut a 3 1/2" length of bare wire and place a 3" length of insulated sleeving on it. Connect one end to the terminal on pilot light socket #2 (S2). Connect the other end to pilot light #3 (NS).
- ( ) Cut a 7" length of bare wire; place a 5 3/4" length of insulated sleeving on it; connect one end to the terminal on pilot light #3 (S2). Connect the other end to pilot light #4 (NS).
- ( ) Cut a 3 1/2" length of bare wire; place a 3" length of insulated sleeving on it; connect one end to the terminal on pilot light #4 (S2). Connect the other end to the terminal on pilot light #5 (S).

NOTE: Use the large "top plate drawing" and Figure 14 for the following steps.



- ( ) Locate the antenna tuning capacitor (trimmer) on the right rear corner of the front chassis. Mount a 456-1 flexible coupling on the antenna tuning capacitor shaft. The "component mounting page" shows the correct mounting procedures.
- ( ) Slide the antenna trimmer extension shaft (453-34) through the bushing on the front panel marked, "Antenna tuning" and into the flexible coupling on the antenna trimmer. Leave 3/8" of the 1/4" diameter shaft protruding from the bushing on the front of the panel. Then tighten the set screw.
- ( ) Locate the calibration capacitor on the "top plate drawing". This variable capacitor is immediately ahead of the 1st. oscillator tube. Mount a 456-1 flexible coupling on the capacitor shaft.
- ( ) Slide the 453-35 extension shaft through the bushing on the front panel marked "calibrate", and into the flexible coupling mounted on the calibration capacitor. Leave 3/8" of the 1/4" diameter shaft protruding from the bushing on the front panel, then tighten the set screw.
- ( ) Mount a 456-1 flexible coupling on the shaft of the bridged "T" filter. Slide the 453-35 extension shaft through the bushing on the front panel marked, "notch tune", and into the flexible coupling on the bridged "T" coil. Tighten the set screws.
- ( ) Rotate the notch tune shaft. Note that there is a dot placed on the shaft. The shaft should be rotated until the dot is facing horizontally towards the left side of the can, as shown on the "top plate drawing". When the shaft is positioned as shown, place 1 1/4" diameter aluminum knob on the shaft protruding from the front panel.
- ( ) Align the knob pointer on the center notch tune calibration point, then tighten the set screw.
- ( ) Mount a 456-1 flexible coupling on the 50 KC BFO shaft.
- ( ) Slide a 453-35 shaft through the bushing on the front panel, marked BFO, and into the flexible coupling mounted on the BFO shaft. Tighten set screws.
- ( ) Place a 1 1/4" diameter aluminum knob on the BFO shaft. Temporarily tighten the set screw. Now rotate the knob counterclockwise until it stops. Note where the knob pointer stops. Now rotate the knob clockwise until it stops. Rotate the knob to a position exactly halfway between these two points. Carefully remove the knob, without moving the BFO extension shaft. Replace the knob with the knob pointer aligned to the center mark of the BFO calibration, as shown in Detail 8.
- ( ) The switch for the "LSB-USB" control has two positions. Make certain that it is setting in the counterclockwise position. Place a 1 1/4" aluminum knob on the shaft, with the knob pointer on the mark below the "LSB" position. Righten the set screw, then rotate the knob clockwise; also check the pointer alignment with the "USB" position.
- ( ) Red dot should be up, then place a 11/32" aluminum knob on the calibrate shaft. Set the capacitor at half mesh and tighten set screw.
- ( ) Red dot should be up, then place a 11/32" aluminum knob on the antenna tuning shaft. Set the capacitor at half mesh and tighten set screw.
- ( ) Insert the 6 contact plug, from the front end section, into the 6 contact plug socket on the 50 KC LF and audio chassis.

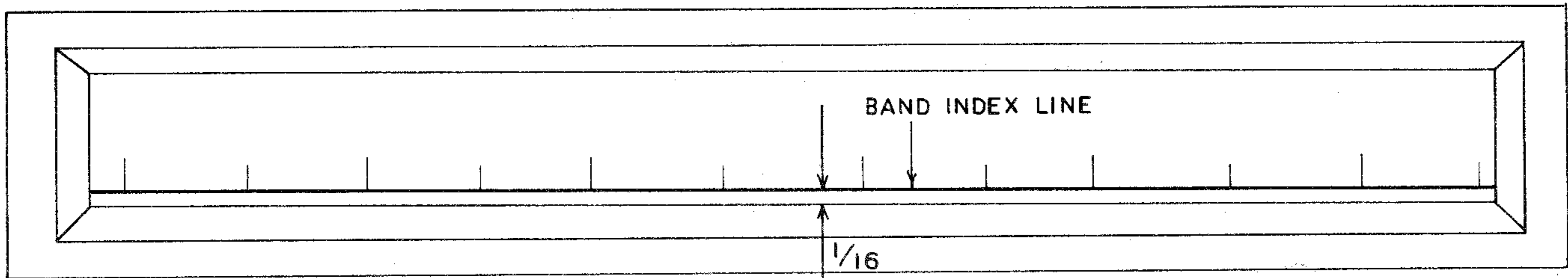


- ( ) Insert one end of the RF cable in socket "A" on the front end section. Insert the other end in socket "B" on the 1682 KC chassis. NOTE: Carefully set the chassis on end.
- ( ) The band switch should be in the 80 meter position, from the previous step in aligning the dial drum. Place a 1 3/4" aluminum knob on the band switch extension shaft. Align the knob pointer with the 80 meter position on the front panel. Tighten set screw. Check to make certain that the 3500 KC to 4000 KC calibration is showing through the dial escutcheon when the band switch is in the 80 position. Now rotate the band switch counterclockwise to the 160 meter position. The dial drum should read 1800 to 2000 KC.
- ( ) Turn the band selector knob clockwise one step at a time. At each step check the dial drum for the following listed bands:

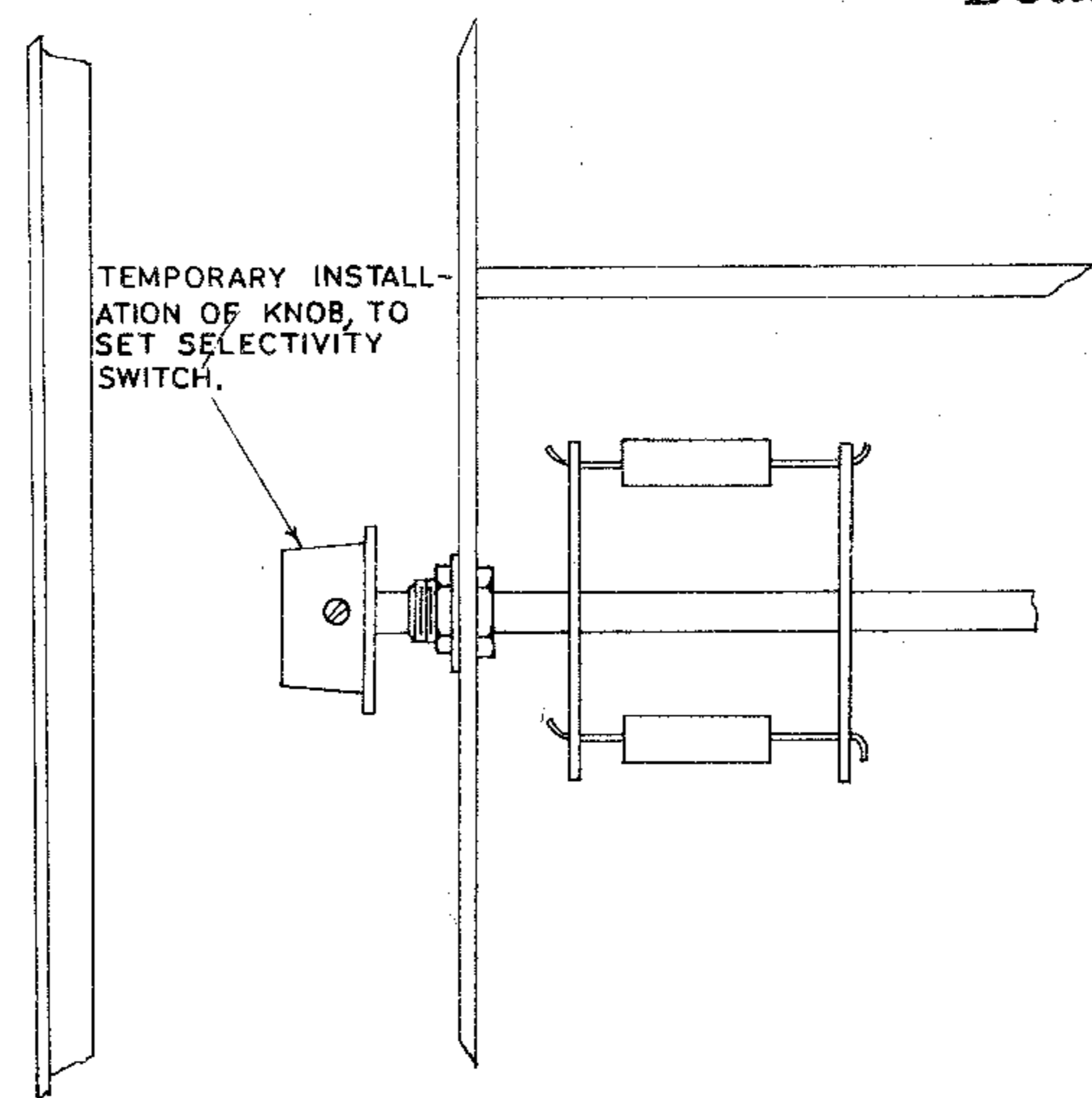
160 - 1800 to 2000 KC	15 - 21000 to 21450 KC
80 - 3500 to 4000 KC	11 - 26.8 to 27.2 MC
40 - 7000 to 7300 KC	10 - 28. to 29.7 MC
20 - 14000 to 14350 KC	Conv. - $\frac{50}{144}$ to $\frac{54}{148}$ MC

If all the bands fall on the correct band switch position, continue to the next step. If not, turn the band switch counterclockwise until it stops. Loosen the set screw on the band switch knob and adjust the knob pointer until it aligns with the 160 position on the front panel. Loosen the set screw on the dial string pulley "J" and rotate the pulley, against the dial drum spring, until the 1800 to 2000 KC dial drum scale is centered in the dial escutcheon plate. Tighten pulley set screw, and repeat previous step to insure correct positioning of dial drum to band switch.

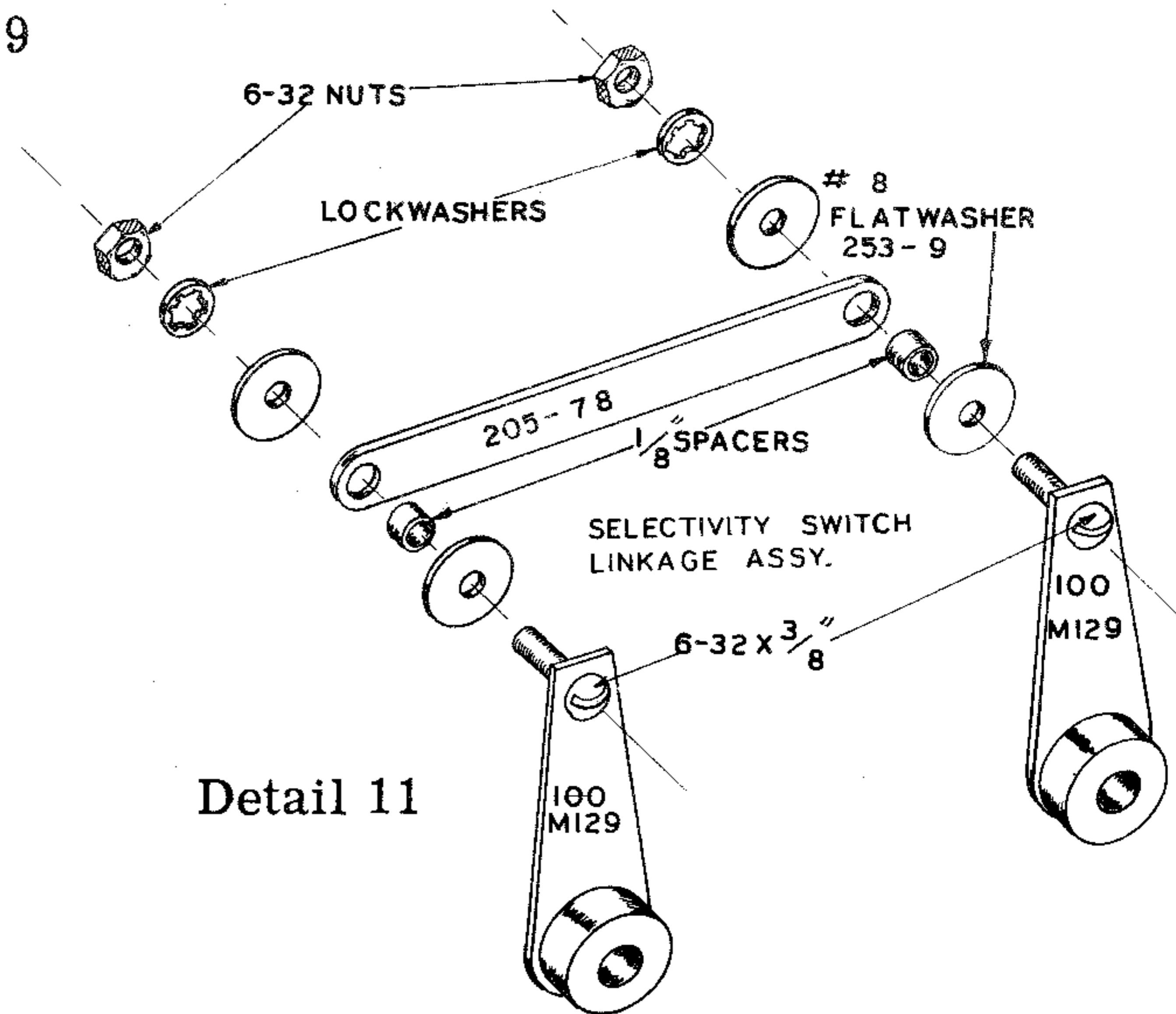
- ( ) Turn the band switch to the 20 meter position. Observe the 14000 to 14350 band appearing on the dial drum. Hold the dial string pulley "J" and loosen the set screw. Now rotate the pulley until the band index line is 1/16" above the escutcheon plate (see Detail 9), then tighten the set screw.



Detail 10



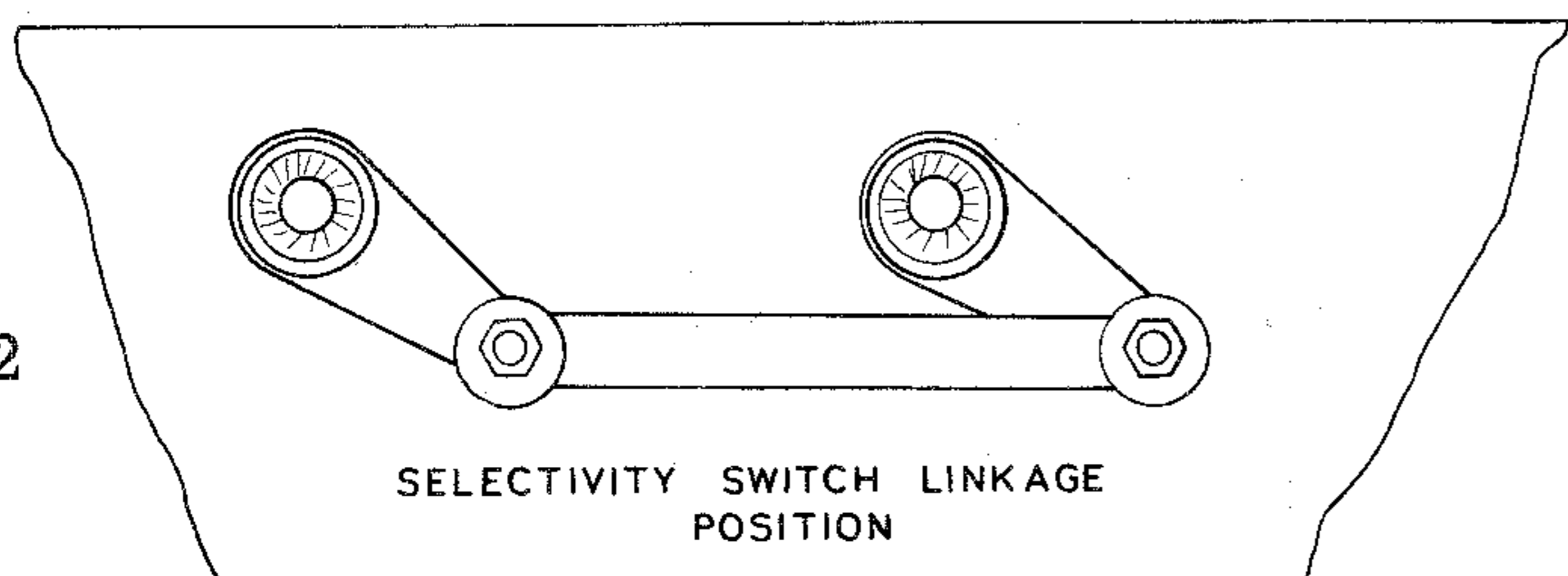
Detail 9



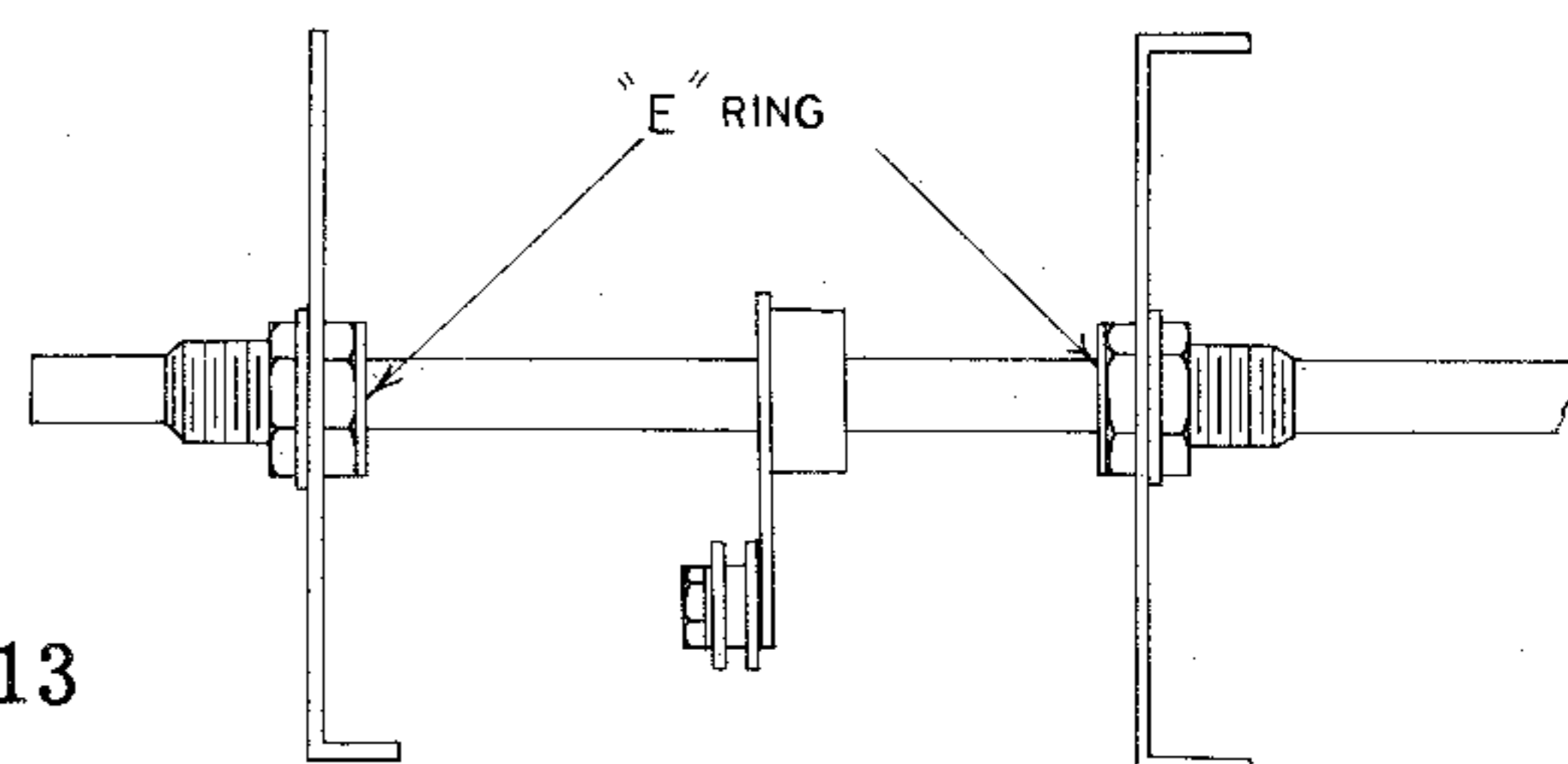
Detail 11

- ( ) Place a 1 1/4" knob (temporarily) on the selectivity switch, and tighten set screw. See Detail 10.
- ( ) Rotate this knob counterclockwise until it stops. Remove knob, leaving selectivity switch in the counterclockwise position.
- ( ) Assemble the selectivity switch linkage as shown in Detail 11.
- ( ) Slide one end of the selectivity linkage on the selectivity switch shaft, bushing first. See Detail 12.

Detail 12



Detail 13



- ( ) Slide the 453-37 selectivity switch shaft in the bushing on the front panel. Place the grooved end of the shaft in first. Slide the selectivity switch linkage over the shaft, then slide the shaft into the rear support bushing.
- ( ) Place an E ring in the groove on the rear of the selectivity switch shaft. Place an E ring in the front groove on the selectivity switch shaft. Rotate the linkage to the position shown in Detail 13 and tighten set screws.
- ( ) Place a 1 3/4" aluminum knob on the selectivity shaft. Rotate the pointer so that it aligns with the 5 position. Tighten set screws.
- ( ) Rotate the selectivity knob to make certain that it aligns in each position.
- ( ) Mount a 456-8 flexible coupling on the variable resistor shaft immediately behind the notch depth bushing.
- ( ) Slide the 453-40 notch control extension shaft through the notch depth bushing and into the flexible coupling, leave 3/8" of shaft extend in front of the bushing. Tighten set screws.
- ( ) Rotate the notch depth shaft counterclockwise until it clicks. This is the full "OFF" position.
- ( ) Mount a 1 1/4" aluminum knob on the notch depth shaft. Align the knob pointer with the "OFF" position and tighten set screw.
- ( ) Rotate the IFG control shaft, counterclockwise, until it stops. Mount a 1 1/4" aluminum knob on this shaft, with the knob pointer on the left-hand mark. Tighten the set screw.
- ( ) Rotate the RFG control shaft, counterclockwise, until it stops. Mount a 1 1/4" aluminum knob on this shaft, with the knob pointer on the left-hand mark. Tighten the set screw.
- ( ) Rotate the AFG control shaft, counterclockwise, until it clicks. This is the receiver "OFF" position. Mount a 1 1/4" aluminum knob on this shaft, with the knob pointer at the "OFF" position. Tighten set screw.
- ( ) Mount the 2 1/4" aluminum knob on the main tuning shaft. Tighten set screws.
- ( ) Set the receiver on the bench in operating position.
- ( ) Install the two dial assembly support brackets as shown on the top plate drawing. Refer to Figure 9 page 39, dial drum assembly. Use holes #19 and #29 for mounting the top of the brackets, and the holes indicated on the top plate drawing for mounting the bottom ends of the brackets.

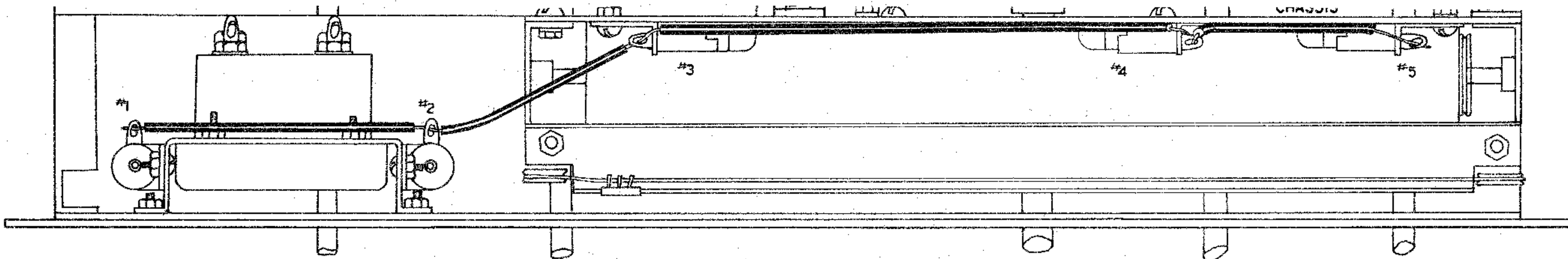


Figure 15

- Install 5 #47 pilot lights, as shown in Figure 15.
- Install a 1.5 amp fuse in the fuse holder on the rear of the chassis.
- Apply the rear apron label as shown in Figure 16 page 68.
- Attach a speaker to the terminal strip on the rear of the chassis or use earphones.

**CAUTION:** Do not operate receiver without a speaker or earphones connected to the output.

- See the top plate drawing and install the 100 KC crystal. This crystal is very delicate and extreme care should be taken so as not to break the glass envelope.
- See the top plate drawing and install the tubes. Miniature tubes are easily broken, so care should be taken when installing.

### ALIGNMENT

Turn on the receiver (with no antenna) and after allowing time for warm up, observe the "S" meter; it should rest near "S zero". If it does not, switch to the STANDBY position and adjust the meter control, shown on the "Top Plate Drawing", until the meter is at "S zero". This is all the adjustment necessary on the "S" meter.

The main alignment of the Mohawk Receiver is completed in two stages: first, a rough alignment to set up internal calibration of the receiver; and finally, the fine alignment which achieves selectivity and sideband rejection in the IF stage.

**NOTE:** Before proceeding with the alignment, read the "Operating Instructions" to become familiar with the receiver controls. See page 57.

The Mohawk "front end" comes completely aligned, and all necessary equipment for the remaining alignment is incorporated in the receiver. Although no expensive external test equipment is required, this receiver can be aligned as accurately as any factory built model, if the instructions are carefully followed.

The crystal Calibrator and Beat Frequency Oscillator are utilized as signal generators to align the two 1682 KC IF transformers and the four 50 KC IF transformers.

**NOTE:** The four 50 KC transformers have screwdriver adjustments on top. The two 1682 KC transformers have internal cores both top and bottom, which are adjusted by the hexagonal plastic alignment tool supplied with the kit.

The first step is to peak all of these transformers to the point where the receiver will be capable of receiving signals, then proceed as follows. Controls should be set in the following listed positions:

- Noise Limiter, OFF.
- AVC, ON.
- CW-AM in AM Position.
- AFG, half ON.
- RFG and IFG full ON (clockwise).
- Notch, OFF.
- Selectivity, .5 KC.
- Band Switch, 80M.
- The Calibrate Knob set with the capacitor halfway meshed.

( ) LSB-USB Switch in either position.

( ) The Antenna Tuning is used to peak the signal.

( ) Do not connect an antenna to the receiver at this time.

Depress the calibrate pushbutton, tune the receiver dial and watch the "S" meter for an upward swing. Even without an antenna it will be possible to obtain spurious responses and beats from incoming signals which will give an "S" meter reading between crystal check points. To overcome this trouble, pick the strongest signal which does not result in a beat whistle; then, if the signal is over S9, adjust the RFG control to bring the signal to about S9.

NOTE: All of the 50 KC and 1682 KC transformers have been set approximately by the manufacturer and will require only a slight adjustment for peak output.

Now starting from the last 50 KC transformer near the rear of the chassis, adjust each of the 50 KC transformers for the highest reading on the "S" meter, and at the same time readjust the RFG control to maintain a maximum reading of approximately S9.

Use the hexagonal plastic tool for the 1682 KC transformers and peak them by adjusting both the top and bottom slugs. As IF transformers usually have some interaction upon each other, particularly those having two adjustments, the above procedure should be repeated to compensate for this effect.

Connect an antenna to the receiver, set the selectivity to 3 or 5 KC, and try all bands to ascertain if the receiver is operating properly. If not, turn to the section on Trouble Shooting (Page 60). Assuming there are no complications, proceed as follows:

NOTE: Refer to Figure 17 for the alignment tie points **(A)** **(B)** **(C)** **(D)** **(E)** **(F)** **(G)** **(H)** and **(J)**.

Furnished with the receiver are two preset compression trimmer capacitors in paper bags marked Osc., and Mixer. These are used to temporarily shift the 20 meter band to 10 megacycles so that the internal calibrator may be precisely adjusted to the government frequency check station WWV. The oscillator trimmer has been preadjusted to bring WWV approximately within the tuning range of the receiver. **WHEN ADDING OR REMOVING TEMPORARY PARTS, ALWAYS TURN OFF THE MAIN POWER TO THE RECEIVER.**

Carefully solder a 6" length of insulated wire on each lug on the trimmer capacitors. Temporarily solder one 6" lead from the Mixer Trimmer to Point **(B)** (as shown on Figure 17). Solder the other 6" lead to Point **(A)**. Temporarily solder one 6" lead from the Osc. trimmer to Point **(C)**. Solder the other 6" lead to Point **(D)**. Temporarily connect an antenna to Point **(A)**.

Turn on the receiver; set the band switch at 20 meters; set selectivity at 3 KC in the AM position, and tune for WWV. It can be recognized by a series of tone beats like a clockticking, interspersed with time signals. If it cannot be found on the main tuning, adjust the temporary oscillator trimmer until it is located. This adjustment will be very slight. After tuning in WWV, peak the temporary Mixer Trimmer for the strongest signal. Temporarily solder an insulated wire from Point **(A)** to Point **(E)**. Now depress the calibration push-button and adjust the trimmer, Point **(F)** for zero beat between WWV and the crystal calibrator.

The zero beat is obtained by combining WWV (at 10 megacycles) with the 100th harmonic of the 100 kilocycle crystal oscillator. Consequently, any small error in zeroing WWV will be divided by 100. At the crystal fundamental, this error becomes extremely small and the calibration extremely accurate.

As WWV's signal contains 400 cycle modulation, there is a confusing collection of tones produced by the two signals, however, they drop the 400 cycle tone just before giving the time and this is the best time to zero the calibrator.

After calibrating the crystal oscillator against WWV, the two trimmers, the wire jumper between Points **(A)** and **(E)**, and the antenna are removed. The Mixer Trimmer will be used again, then both should be stored for future alignment.

Since the calibration oscillator has been accurately adjusted to 100 KC, the 50 KC BFO can be set equally accurate by beating its second harmonic against the calibrator, then proceed as follows. Refer to the "Top Plate Drawing", and remove the 6BA6 IF amplifier tube **(X)**. This eliminates the possibility of spurious responses leaking through from the front end. Connect one end of the 6" leads, from the mixer trimmer to Point **(H)**; connect the other lead to Point **(G)**. Turn on the receiver; set the BFO control to its CENTER index, and operate the receiver in CW-SSB position with no antenna. Now depress the calibrate button and, with a small short screwdriver, turn the adjust screw on the backside of the BFO can until zero beat between the two oscillators is obtained. Note the small index to the right of the BFO center line and turn the BFO control toward it. The object is to obtain a 400 cycle beat note between the oscillators, which should occur approximately at this point. After obtaining the 400 cycle beat tone, leave the BFO set there for future alignment.

### FINAL ALIGNMENT

In actual practice the 50 KC transformers are aligned slightly above 50 KC to provide better rejection of the unwanted sideband on an SSB station. Set up the receiver as follows:

- Receiver OFF.
- 6BA6 IF Tube in place.
- 6" wire lead moved from Point **(H)** to Point **(J)**.
- Point **(G)** remains as it is.
- Receiver in SSB Position.
- RFG full OFF.
- IFG full ON.
- Selectivity in .5 KC position.
- AVC ON and either in LSB or USB position.

Turn on receiver and switch CW-AM back and forth. You should note an increased "S" meter reading in the CW position. Using this indication in CW position, adjust the four 50 KC transformers for peak reading. Go through the tuning at least twice. You are now using the BFO as a 50.4 KC signal generator to align the second IF stages.

Turn the receiver off. Disconnect the trimmer from both terminals. Turn the receiver on. Increase the RF gain, depress the calibrate button and tune in its signal. Now readjust the two 1682 KC transformers (top and bottom adjustment) for peak "S" meter reading (do not touch the 50 KC stages).

### BRIDGE T ALIGNMENT

Reset the BFO and the notch tune control to the center index, and the receiver to AM position. Tune in a signal from the calibrator (depress pushbutton and turn on the notch depth control to about mid-position). Turn the screwdriver adjustment on the back of the Bridge T can until maximum dip in S meter reading occurs. Also adjust the potentiometer just in front of the Bridge T can for maximum dip. Retouch both adjustments for maximum dip or rejection.



( ) The last step in final alignment is correcting for any dial calibration error. Place the calibration capacitor at half-mesh; the CW-SSB/AM switch in CW-SSB position; the band switch on 80 meters; the dial pointer on 3500. Loosen the set screws in the 3/8" end of the coupling on the main tuning capacitor. Depress the calibrate button and tune in the signal by rotating the shaft of the main tuning capacitor. When the signal is peaked tighten the set screws.

## OPERATION

AUDIO GAIN: Advancing control from full counterclockwise position turns on power and controls volume of receiver.

STANDBY-RECEIVE: Switch disables receiver without removing plate or filament voltages and thus maintains stable operation.

IF GAIN: Controls sensitivity of receiver. In general, should be full ON but may be reduced slightly for strong CW or SSB signals to improve quality.

RF GAIN: Provides additional sensitivity control of RF stage only. In general should be full ON, however, by backing off control, blocking of the receiver by extremely strong stations can be prevented.

SELECTIVITY: Switch provides five degrees of selectivity from 5 KC to .5 KC. For best quality on AM the 5 KC position is usual, however, in practice on the crowded bands, the 3 KC or even 2 KC position will be most useful. For SSB, use 3 KC or, if necessary, use 2 KC. For CW operation the 2 KC, 1 KC, or .5 KC positions are used, depending on QRM encountered.

BAND SWITCH: Changes bands and dial calibration. External converters must be used for the 6 and 2 meter bands.

CALIBRATE: Consists of a red pushbutton and small knob. The pushbutton turns on a 100 KC crystal standard and the knob provides fine adjustment of the receiver oscillator. The receiver dial should be set to a 100 KC calibration point near the frequency of operation, for example, 21200, 21300, 14200, 28500, etc. Then press the red button and use the calibrator control to zero the signal of the 100 KC standard. CAUTION: on the higher frequency bands, the control has quite a range and it is possible to zero the wrong harmonic of the standard. The front end has been prealigned with the calibrate capacitor half meshed, consequently the calibration for any band will be very close to this position.

ANTENNA TRIMMER: This control peaks the RF amplifier and should be readjusted for each band. Because of the wide range of the ten meter and particularly the converter band, it will be necessary to readjust the trimmer when wide excursions in tuning are made.

ANL: A switch at the left of the panel switches in a series type noise limiter to eliminate excessive ignition or line noise. As all noise limiters are essentially clipper circuits with automatic threshold setting, they do tend to clip modulation peaks to some extent. This introduces a small but unavoidable distortion, consequently, the noise limiter should be used only when absolutely necessary.

AVC: The middle switch at the left of the panel allows the receiver to operate with Automatic Volume Control, whereas the incoming signal controls the receiver sensitivity. In the OFF position the receiver is operating at maximum sensitivity, subject, of course, to the position of the IF and RF gain controls. Delayed AVC is used in the Mohawk; this means that the incoming signal must reach a predetermined level before the AVC will act. This system permits maximum gain on very weak signals! The AVC is also of the slow acting type and as such can be left in operation on SSB or even CW signals, although not recommended for CW. A portion of the AVC voltage developed is amplified and used to operate the S meter.

CW-SSB-AM: This switch actually changes the form of detection used. In the AM position detection is accomplished by a diode tube which rectifies the incoming signal and removes the audio

component from the carrier. In the CW-SSB position a pentode tube is used as a local oscillator and mixer. Within the tube, the signal and the local oscillator (BFO) are combined and the product of the two passed on to the audio section, hence the name "product detector".

BFO: This panel knob controls the frequency of the local oscillator (beat frequency oscillator). It may be used in two ways: first, when two CW stations cannot be separated, the BFO may be tuned to pitch one into zero beat where it becomes inaudible and thus allow the other to be copied. Second, on SSB the BFO is carefully set to 50 KC frequency and left there; now upper or lower sideband stations can be copied by merely switching the LSB-USB control.

The method of setting the BFO exactly to 50 KC is as follows: With the CW and AM switch in CW position, depress the calibrate button and tune its signal to zero beat on the receiver. Now switch from LSB to USB or vice-versa; the signal should remain at zero beat. If not, carefully tune BFO knob while switching sidebands, and, if necessary, also retune receiver until zero beat is maintained in both LSB and USB positions. This sets the receiver for SSB reception and will not have to be readjusted unless the BFO control is moved.

BRIDGE T NOTCH: Consists of two panel controls, Notch Tune and Notch Depth. A switch on the Notch Depth knob places the circuit in operation when the control is rotated clockwise. It should always be in the OFF position when not actually in use or there will be some unexpected blank spots on the band. The Bridge T Filter produces a deep tuneable notch in the IF band pass that is used to reject heterodynes or unwanted CW signals. It is not broad enough to take out an entire phone signal, but will remove the interfering heterodyne it causes. In practice, the notch filter is turned on and the Notch tune adjusted to remove the interfering signal, then the Notch Depth adjusted for maximum rejection. The Notch Tune will produce the greatest results; the Notch Depth is more of a fine adjustment.

This control will require quite a bit of practice before its value is fully realized. Most operators, before becoming thoroughly familiar with a notch filter, invariably remove the signal they are trying to receive.

LSB-USB: This control operates either of two crystal controlled oscillators at the second conversion stages, one at the 1632 KC and the other at the 1732 KC. Note that one is 50 KC below the first intermediate frequency, 1682 KC, and the other 50 KC above it. By the use of these oscillator frequencies, either the lower or upper sideband of an incoming signal is placed in the 50 KC IF band pass.

PHONE JACK: This jack provides 500 ohm impedance output for ear phone use. The speaker is automatically cut out when an earphone jack is inserted in the receptacle.

NOTE: After reading this far, proceed with the receiver alignment, then reread this section while actually trying the controls. Between these two sections you will gain a good basic understanding of operation, however, a communications receiver, like a musical instrument, improves as the operator improves with practice.

### TUNING AM SIGNALS

The receiver is set for AM operation with the toggle switch in AM position, RF and IF gain controls full ON, either sideband selected, AVC ON and audio gain used to control volume. Select the band desired and either the 5 KC or 3 KC selectivity position, then adjust the antenna trimmer for maximum signal or background noise.

When tuning in a station, tune for maximum S meter reading. If signal is badly covered up with QRM, it is possible to operate in the 2 KC selectivity position and/or remove the interference with the notch filter. The best audio quality is achieved in the 5 KC selectivity position, however, many times it will be necessary to sacrifice quality for readability. Under conditions of heavy impulse noise, such as auto ignition, the noise limiter ANL should be used.

Sometimes switching to the other sideband will alleviate QRM. This will require a slight retuning to place the AM carrier in the IF band pass (not necessary when receiving SSB). The calibrate controls are used, as explained earlier, to correct the receiver dial for each band. If signals are strong enough to override the calibration oscillator, temporarily disconnect the antenna. When transmitting, throw the Standby-Receive switch to Standby position. Frequency or phase modulated signals can be received by tuning slightly off the station's frequency. This is known as slope detection.

On extremely strong signals from local stations, turn down the RF gain control slightly.

### TUNING SSB SIGNALS

The receiver is set for the band desired, dial calibration checked and antenna peaked as before. The switch is set for the CW-SSB position and the BFO adjusted to exactly 50 KC and, as previously explained, the AVC is left on.

The main points in tuning SSB signals are: determine which sideband is being transmitted, and tune slowly. The receiver must be tuned to the sideband station's frequency within a few cycles or distortion will result. With an AM station, both the carrier and sidebands are received and the carrier is properly orientated in respect to the sidebands. With an SSB signal, the local receiver furnishes the carrier and the distant station one sideband, consequently the receiver must be tuned very carefully so that the "local carrier" is properly orientated with the distant sideband. If the local carrier is displaced 50 cycles high or low, the sideband modulation will be 50 cycles high or low producing the "monkey chatter" or "Donald Duck" effect associated with SSB.

Remembering that the receiver must be tuned within a few cycles out of several megacycles explains why the operator must practice careful and slow tuning to receive SSB stations. However, with practice, it can be done easily and the SSB stations will sound as good as any AM stations. Most SSB stations use the lower sideband on the lower frequencies and the upper sidebands on the higher frequencies. If the receiver is set to the wrong sideband, it will be impossible to tune in the station clearly. If this occurs, try switching sidebands. The receiver is normally operated in the 3 KC position for SSB but may be used in the 2 KC position. The notch filter again is useful for removing heterodynes. On strong SSB stations, reduce the RF or IF gain controls for best quality reception.

### TUNING CW SIGNAL

The receiver is set up the same as for SSB and may be used with AVC ON. However, for CW reception, it is preferable to turn off the AVC, advance the audio gain to a high level and reduce the IF gain to control the volume. The selectivity switch may be used in the 2 KC, 1 KC, or, if necessary, the .5 KC position to eliminate interference. In the .5 KC position, the receiver becomes extremely sharp in tuning and tends to "ring", consequently, when searching the band it is better to use the wider selectivity positions. Again, extremely strong stations can be contained by use of the RF gain control and the notch filter is used for rejection of interfering signals. It might be well to mention that the use of earphones for CW reception will do much to promote good family relations.

### "S" METER CALIBRATION

The "S" meter in the Mohawk Receiver is calibrated to 100 micro-volts = S9 on the 10 meter band. On the 10, 11, 15 and 20 meter bands, no adjustment is required to maintain this reading. On the 40, 80 and 160 meter band, the IFG control should be backed off 25% to compensate for the natural increase in gain on low frequencies.

NOTE: Complete the following after you are satisfied that the receiver is functioning correctly.

- ( ) Place the 4 rubber feet on the receiver cabinet, as shown on "The Standard Parts Mounting," Page 11.

- ( ) Carefully slide the receiver into the cabinet. Feed the AC line cord through the rear opening to avoid pinching of the cord.
- ( ) Place 10 #10-32 Phillips Chrome Plated screws in the front panel, as shown in Figure 14, "Front Panel" drawing.
- ( ) Secure the chassis to the rear of the cabinet with 8 #10 sheet metal screws.

### IN CASE OF DIFFICULTY

In the assembly of a piece of electronic equipment as complex as the "Mohawk" Receiver, certain difficulties could arise. The most common causes of trouble are due to mistakes in wiring or parts incorrectly placed. These types of mistakes are easily made and difficult to find. Comparing the completed assembly with the pictorials, section by section, will help if the trouble is in wiring. Often having a friend check the wiring against the pictorials, will locate an error that has been consistently overlooked.

The maintenance and servicing of any electronic equipment is basically a problem in reasoning. The first step is to obtain as many facts as possible by observing how the equipment is functioning. The facts for troubleshooting may be obtained by many methods, a few of which are listed below:

1. Test Equipment - For voltage, resistance and current measurements.

NOTE: Before using the following methods, remove the AC plug from the outlet. Always consider any electronic equipment lethal. Using a screwdriver blade, short from the ▲ and ■ terminals to the chassis on the filter capacitor L. This will discharge any potential that could possibly remain in the capacitor.

2. Visual Check - Carefully inspect the apparatus for any mechanical breakdown, poor solder joints, shorts, etc.
3. Touch - Turn the apparatus off (disconnect the AC line), and immediately feel resistors, capacitors, etc., for an excess of heat. In the "Mohawk" receiver, any component (with exception of the tubes) that you cannot hold your hand on is wired incorrectly or breaking down internally.
4. Odor - Electronic components, when overheated or burnt, emit a very distinctive odor. This condition can often be used for rapid location of a faulty component.

The second step in servicing is to accumulate all known data from the aforementioned checks. Analyze the known data, and generally a logical answer is obtained. Previous experience is useful in determining the correct solution of a service problem, although it is not necessary. To aid you in troubleshooting on the "Mohawk" receiver, the following categorical list was compiled, showing the Condition, Cause, and Correction.

<u>Condition</u>	<u>Possible Cause</u>	<u>Correction</u>
Receiver dead (no pilot lights, filaments, etc.)	Blown-out fuse	Check for short circuit.
	Open Power Switch	Check for continuity of the switch on the rear of the volume control. Replace if open.
	Open AC line	Check continuity of AC line. Repair or replace.

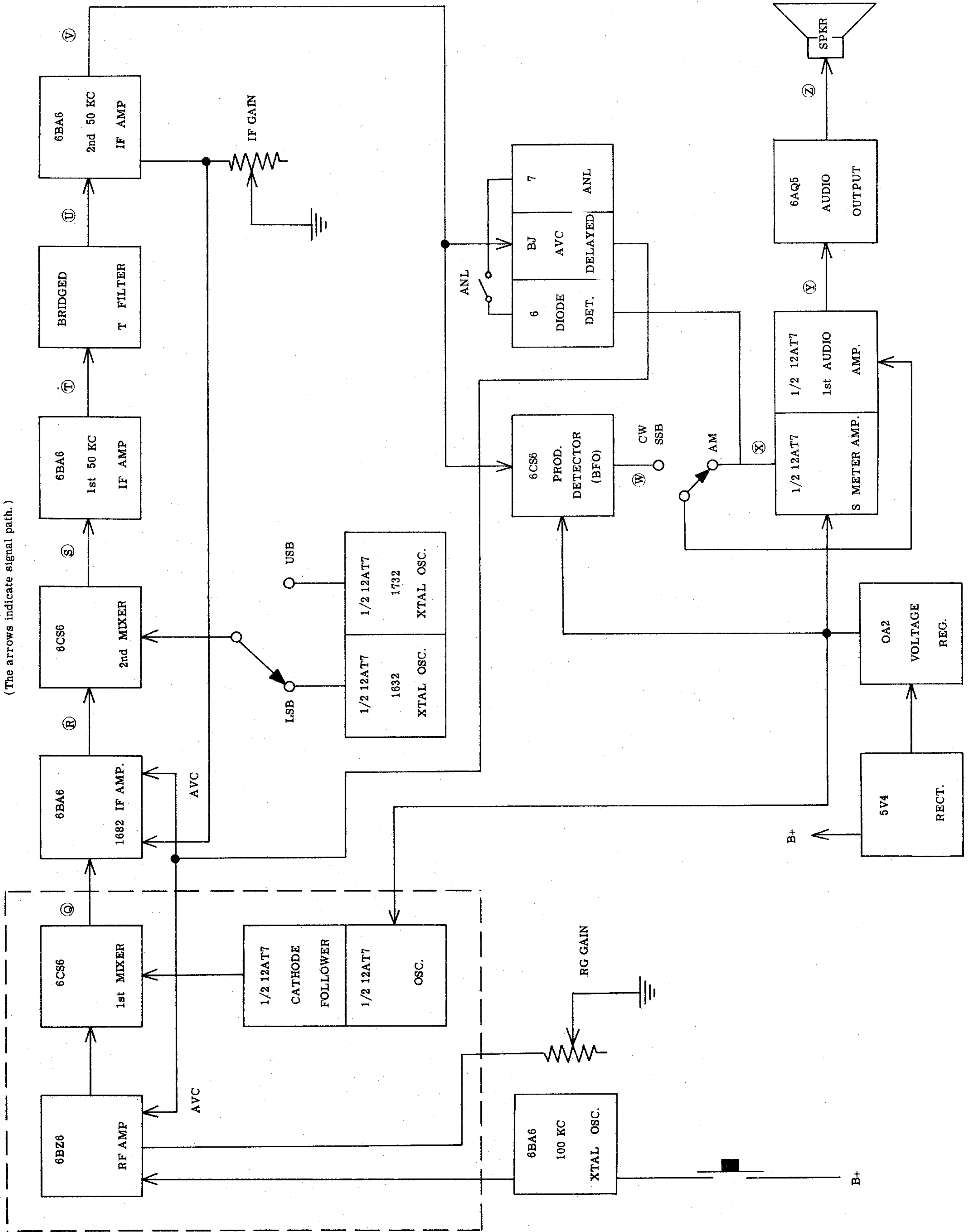
<u>Condition</u>	<u>Possible Cause</u>	<u>Correction</u>
Receiver dead. Pilot lights work, filaments lit.	Open filament winding on transformer	Check continuity of filament winding. Replace if open.
	Check Standby-Receive Switch for correct wiring.	Rewire switch per instructions.
	Shorts between socket terminals, leads, components, etc.	Relocate or clear components to allow proper operation.
	Oscillator failure.	Switch receiver from the "USB" position to "LSB" position. If one position works and the other does not, recheck the switch wiring and the 1682 KC chassis wiring.
Excessive noise in adjustment.	Special 6 contact plug not making contact.	Check plug over carefully.
	Phono cable connectors not making contact.	Check Point <b>(A)</b> and <b>(B)</b> (shown on the top plate drawing.)
	Metal particles between plates of tuning capacitor.	Carefully clean. NOTE: Do not attempt to straighten main tuning capacitor plates. They are purposely bent for calibration purposes.
Hum	Breakdown of the resistive coating of the potentiometer.	Check for continuity between potentiometer terminals. If open or intermittent, replace.
	Open grid return circuit.	Recheck all wiring. Associate with the grid circuits.
Improper reception.	Misalignment.	Repeat alignment procedure.
Notch tune does not notch on center index.	Misalignment.	Repeat alignment procedure of notch filter. <u>Zero beat signal.</u>

If the receiver should fail to function correctly, use a good quality signal tracer (such as the Heathkit Signal Tracer), and either a received signal or a signal generator. Trace the signal starting from Point **(Z)** through Point **(Q)** in that order, (see Figure #17 for correct connections). This will show the defective stage rapidly. Once the defective stage is located, carefully recheck the wiring, inspect for shorts, component failure, etc.

If the kit builder so desires, he may contact the "Engineering Consultants" that is maintained by the Heath Company. This department will give rapid efficient service to the kit builder. However, in trouble shooting, even the most competent engineer requires as many facts

BLOCK DIAGRAM OF THE RX-1 MOHAWK RECEIVER

(The arrows indicate signal path.)



as possible as to the condition and the abnormal operation of the electronic gear, in order to base recommendations for the repair or maintenance. When contacting the Consulting Engineers, list as many clues as possible to aid in the rapid and correct analysis of your difficulty.

## REPLACEMENTS

Material supplied with Heathkits has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument 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 Receiver, 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 Receiver 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 Receiver to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a fixed fee of \$30.00, plus the price of any additional parts or material required. However, if the Receiver 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 also 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 modifications 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 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

Before returning a unit for service, be sure that all parts are securely mounted.

**ATTACH A TAG TO THE INSTRUMENT GIVING  
NAME, ADDRESS AND TROUBLE EXPERIENCED.**

Pack in a rugged container, preferably wood, using at least three inches of shredded newspaper or excelsior on all sides. **DO NOT SHIP IN THE ORIGINAL KIT CARTON AS THIS CARTON IS NOT CONSIDERED ADEQUATE FOR SAFE SHIPMENT OF THE COMPLETED INSTRUMENT.** Ship by prepaid express if possible. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damage in transit if packing, in HIS OPINION, is insufficient.



## SPECIFICATION CHANGES

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	PART No.	PARTS Per Kit	DESCRIPTION
Resistors			Resistors (cont.)		
1-3	1	100 ohm 1/2 watt	1-34	2	680 K ohm 1/2 watt
1-6	4	470 ohm 1/2 watt	1-35	6	1 megohm 1/2 watt
1-9	1	1 K ohm 1/2 watt	1-36	1	1.5 megohm 1/2 watt
1-11	1	1.5 K ohm 1/2 watt	1-37	1	2.2 megohm 1/2 watt
1-18	2	5.6 K ohm 1/2 watt	1-44	3	2.2 K ohm 1/2 watt
1-20	3	10 K ohm 1/2 watt	1-45	2	220 ohm 1/2 watt
1-21	1	15 K ohm 1/2 watt	1-46	1	3.9 K ohm 1/2 watt
1-22	1	22 K ohm 1/2 watt	1-48	3	390 ohm 1/2 watt
1-24	1	33 K ohm 1/2 watt	1-60	4	68 K ohm 1/2 watt
1-25	1	47 K ohm 1/2 watt	1-66	2	150 ohm 1/2 watt
1-26	10	100 K ohm 1/2 watt	1-89	1	2400 ohm 1/2 watt
1-27	2	150 K ohm 1/2 watt	1-20A	1	330 ohm 1 watt
1-29	4	220 K ohm 1/2 watt	3-1E	1	2500 ohm 7 watt W. W.
1-30	1	270 K ohm 1/2 watt			
1-33	2	470 K ohm 1/2 watt			

PART No.	PARTS Per Kit	DESCRIPTION	PART No.	PARTS Per Kit	DESCRIPTION
<b>Capacitors</b>			<b>Sockets-Terminal Strips-Wafers-Knobs (Cont.)</b>		
20-2	2	200 mmf silver mica 2%	434-35	6	7 pin ceramic shielded socket (miniature)
20-33	2	.001 mfd mica	434-36	1	9 pin miniature ceramic shielded
20-38	1	100 mmf silver mica 5%	434-39	2	Octal mica
20-40	2	470 mmf silver mica 5%	434-42	1	Phono connector
20-41	2	22 mmf silver mica 5%	434-43	3	9 pin miniature shielded
20-79	4	390 mmf silver mica 2%	434-44	5	Pilot light socket
20-98	1	12 mmf silver mica 5%	434-74	2	Ceramic crystal socket
21-11	1	150 mmf disc ceramic 500 V.	436-5	1	Coaxial jack
21-13	4	500 mmf disc ceramic 500 V.	436-14	1	Phone jack 1/2 bushing
21-16	15	.01 mfd disc ceramic	462-58	1	Aluminum knob 2 1/4" dia.
21-22	1	220 mmf disc ceramic	462-59	2	Aluminum knob 1 3/4" dia.
21-31	1	.02 mfd disc ceramic	462-60	7	Aluminum knob 1 1/4" dia.
21-27	1	.005 mfd disc ceramic	462-61	2	Aluminum knob 11/32" dia.
21-50	4	2.2 mmf tubular ceramic 500 V.	481-1	1	Metal capacitor mounting wafer
21-70	2	.01 line bypass 1400 V.			
23-28	1	.1 mfd paper tubular 200 V.	<b>Hardware</b>		
23-1	1	.001 mfd paper tubular 400 V.	73-1	2	3/8" rubber grommet
23-18	1	.002 mfd paper tubular 400 V.	73-2	1	3/4" rubber grommet
23-26	1	.003 mfd paper tubular 400 V.	73-4	1	5/16" rubber grommet
23-39	2	.0047 mfd paper tubular 400 V.	250-4	6	4-40 x 3/8" RHMS
23-41	2	.01 mfd paper tubular 400 V.	250-8	16	#6 sheet metal screw
23-43	2	.022 mfd paper tubular 400 V.	250-9	16	6-32 x 3/8" RHMS
23-52	1	.047 mfd paper tubular 400 V.	250-13	1	6-32 x 1" RHMS
23-53	4	.1 mfd paper tubular 400 V.	250-105	4	8-32 x 1/8" Allen Set Screw
25-35	1	2 mfd 50 V. electrolytic	250-18	14	8-32 x 3/8" RHMS
25-59	1	100-40 mfd 300 V. electrolytic	250-31	38	6-32 x 1/4" RHMS
31-9	2	300-400 mmfd ceramic trimmer (preset)	250-34	3	4-40 x 1/2" RHMS
31-10	1	4.5-25 mmf NPO trimmer	250-40	1	6-32 x 1 1/2" RHMS
<b>Coils-Chokes-Transformers</b>			250-49	36	3-48 x 1/4" BHMS
40-120	1	Bridged T coil 50 KC	250-50	10	10-32 x 3/8" Phillips Head screw
40-121	1	BFO coil 50 KC	250-51	8	#10 x 3/8" BH sheet metal screw
46-11	1	150 ma choke	250-52	6	4-40 x 1/4" PHMS
51-35	1	Audio output transformer 8 ohms-500 ohms	250-93	26	8-32 x 1/4" Allen set screw
52-15	4	50 KC IF transformer	250-95	1	5-40 x 3/4" RHMS
52-16	1	1682 KC input transformer	251-1	2	#6 spade bolt
52-17	1	1682 KC interstage transformer	252-1	32	3-48 x 7/32" nut
54-66	1	Power transformer	252-2	17	4-40 x 1/4" nut
<b>Sockets-Terminal Strips-Wafers-Knobs</b>			252-3	54	6-32 x 1/4" nut
423-1	1	Fuse holder	252-4	14	8-32 x 3/8" nut
431-3	2	3 lug terminal strip	252-7	18	3/8" x 32 nut
431-5	1	4 lug terminal strip	252-15	2	4-40 x 3/16" nut
431-8	2	3 lug terminal strip	252-33	3	5-40 nut
431-10	4	3 lug terminal strip w/ground	253-10	16	Control flat washer
431-11	3	5 lug terminal strip w/ground	253-11	5	Driver shaft E washer
431-14	3	2 lug terminal strip w/ground	253-21	13	9/16" OD 5/32" ID flat washer
431-19	1	5 lug Jones terminal strip	253-23	4	Flat fiber washer 3/16" OD 7/64" ID x 1/16" thick
431-20	1	6 lug Jones terminal strip	254-1	67	#6 lockwasher
431-27	1	3 lug terminal strip w/ground	254-2	14	#8 lockwasher
432-5	1	6 contact female plug	254-4	18	Control lockwasher
434-20	1	110 V. 2 prong AC socket			
434-34	2	7 pin miniature tube socket			

PART No.	PARTS Per Kit	DESCRIPTION
Hardware (Cont.)		
253-9	4	#8 flat washer
254-7	40	#3 lockwasher
254-9	13	#4 lockwasher
255-1	3	1/8" spacer
255-3	1	3/8" spacer
255-16	2	Dial driver spacer
255-17	1	Dial stop spacer
259-1	13	#6 solder lug
259-6	15	#6 small solder lug
259-10	5	Control solder lug
260-7	2	Clip, mounting IF transformer
261-6	4	Rubber feet

#### Controls-Switches

10-44	1	100 K ohm pot. w/screwdriver slot
10-70	1	10 K ohm pot. linear w/9/16" bushing
10-71	1	100 K ohm pot. linear w/9/16" bushing
11-17	1	100 ohm W. W. screwdriver slot
19-38	1	25 K ohm linear w/SPST switch normally closed
19-39	1	1 meg audio taper w/9/16" bushing
61-7	1	SPDT toggle switch
61-3	1	DPST toggle switch
61-4	1	SPST toggle switch
61-8	1	DPDT toggle switch
63-3	1	SPST rotary switch
63-156	1	5 deck 5 position rotary switch
64-3	1	SPST Pushbutton switch (red button)

#### Meters-Tubes-Crystals

404-5	1	Matched pair (1632-1732 KC) crystals
404-6	1	100 KC crystal
407-50	1	1 ma meter right hand zero
411-24	2	12AT7 tube
411-35	1	5V4G tube
411-59	1	OA2 tube
411-60	1	6AQ5 tube
411-90	4	6BA6 tube
411-105	2	6CS6 tube
411-113	1	6BJ7 tube
412-1	5	#47 pilot light
421-1	1	1 1/2 amp fuse

#### Sheet Metal Parts

100-M117	1	Chassis base assembly
100-M120	1	Dial drive stop cam assembly
100-M121	1	Dial pulley assembly

PART No.	PARTS Per Kit	DESCRIPTION
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#### Sheet Metal Parts (Cont.)

100-M122	1	Dial drum shaft w/pulley
100-M125	1	Dial drum left end plug
100-M129	2	Single link drive arm assembly
100-M131	1	Dial escutcheon assembly
100-M132	2	Dial drum support assembly
100-M136	1	Dial drive front plate assembly
100-M137	1	Dial drive back plate assembly
100-M138	1	Band switch pulley assembly
200-M168	1	2nd conversion chassis
200-M169	1	IF and audio chassis
203-M149F192	1	Panel, painted and screened
204-M151	1	Dial pointer bracket
204-M158	1	Meter mounting bracket
204-M159	1	Dial drive stop bracket
204-M162	2	Dial assembly support bracket
204-M163	1	Crystal bracket
204-M168	1	Selectivity switch mounting bracket
204-M169	2	Dial brace bracket
205-71F	1	Meter escutcheon painted
205-73 F194	1	Front panel escutcheon painted and screened
205-M84	1	Crystal plate
266-M9	2	Selectivity switch linkage arm

#### Gears-Shafts-Bushings-Couplings

451-12	1	Dial drive nylon cluster gear
100-193	1	Dial drive pinion gear assembly
100-194	1	Dial drive gear assembly
451-15	1	Tuning drive gear
451-16	1	Tuning drive antibacklash gear
452-3	1	Roll pin 1/16"
453-32	1	Dial drive nylon cluster gear shaft
453-34	1	Antenna trimmer extension shaft
453-35	2	1/4" x 4 3/8" extension shaft
453-67	1	Band switch extension shaft
453-37	1	Selectivity switch extension shaft
453-39	1	Bridged T extension shaft
453-40	2	1/4" x 2 1/8" extension shaft
453-53	1	Dial stop cam rider shaft
455-6	4	1/4" x 3/8" shaft bushing
455-10	4	17/64" ID x 3/8" OD bushing
455-15	1	1/2" OD x 1/4" ID x 1/4" long bushing (thrust sleeve)
455-18	3	3/8" - 32 bushing 1/4" ID x 9/16" long
456-1	5	Flexible coupling
456-9	1	1/4" to 3/8" coupling
456-10	1	Flexible coupling

#### Miscellaneous

89-1	1	Line cord
90-82	1	Cabinet
100-115	1	Cable assembly

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (Cont.)		
100-139	1	Main tuning assembly
206-3	3	9 pin 2" tube shield
206-25	6	7 pin 1 3/4" tube shield
206-54	1	9 pin 2 3/8" tube shield
258-1	1	Dial cord spring
258-4	1	Dial stop spring
258-10	1	Dial drum spring
340-2	1	10' length #20 bare tinned copper wire
344-1	1	length #22 solid hookup wire - gray
344-1	1	length #22 solid hookup wire - green
344-1	1	length #22 solid hookup wire - red
344-1	1	length #22 solid hookup wire - orange
344-1	1	length #22 solid hookup wire - yellow

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (Cont.)		
344-1	1	length #22 solid hookup wire - blue
344-1	1	length #22 solid hookup wire - white
344-6	1	length #18 solid hookup wire - red
346-1	1	length small insulated sleeving
346-2	1	length 3/16" insulated tubing
346-5	1	length 1/4" plastic tubing
347-11	1	RF cable w/connector each end
349-3	1	length dial cord
390-38	1	Rear apron label adhesive
391-3	1	Logo "Heathkit" silver
463-15	1	Dial pointer
464-7	1	Plexiglass drum printed
466-7	1	Plastic pulley
485-7	1	1 1/4" Plug button punched 1/4"
490-1	1	Plastic alignment tool
490-6	1	5/64" Allen wrench

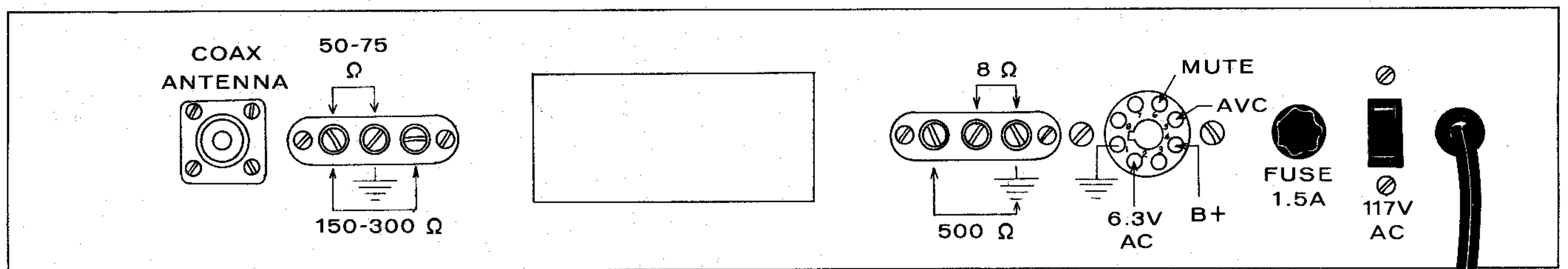
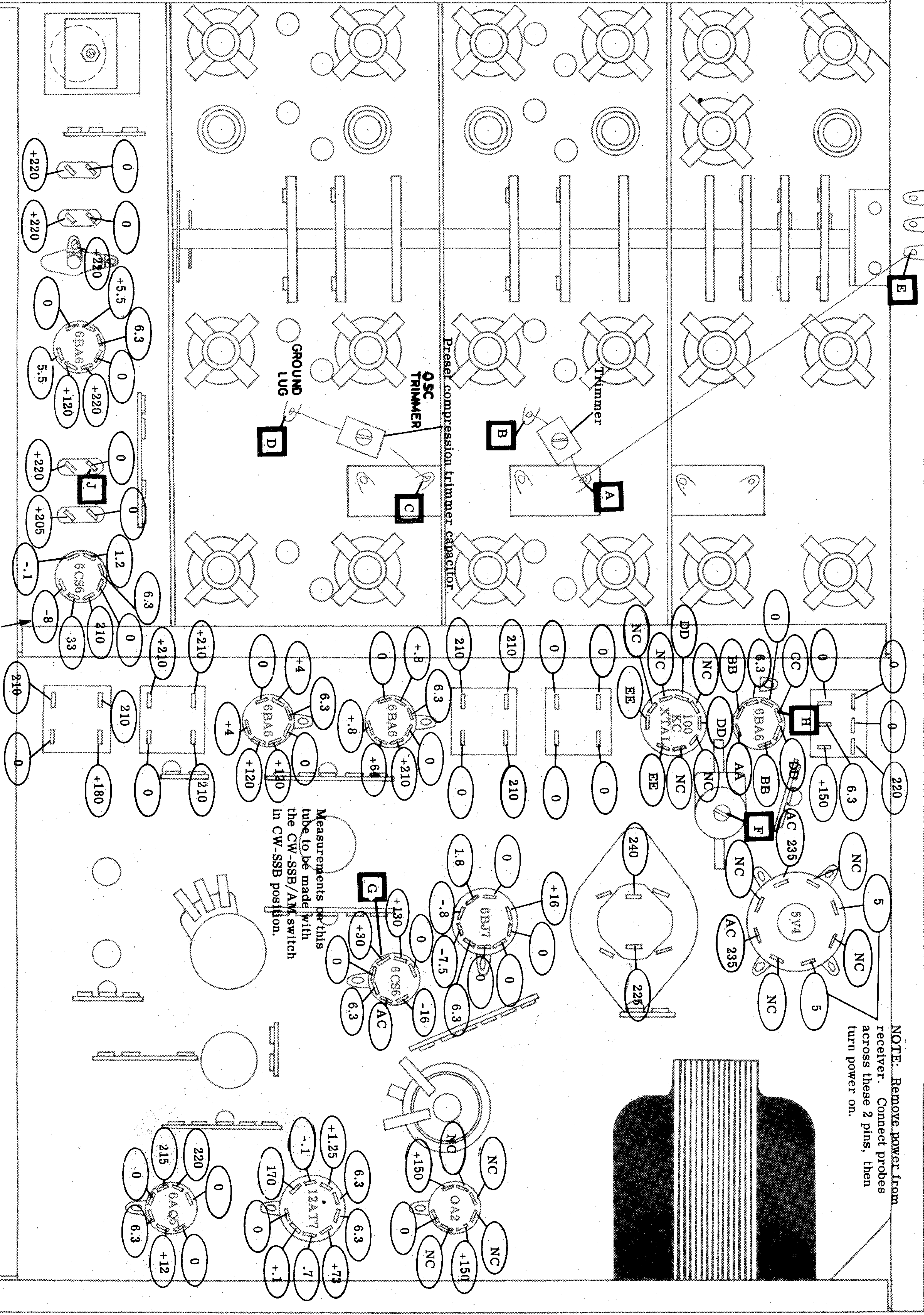


Figure 16

DEPRESS CALIBRATE BUTTON FOR THESE MEASUREMENTS

- AA -47 Volts
- BB +4.2 Volts
- CC +90 Volts
- DD +65 Volts
- EE -47 Volts

ALL VOLTAGE MEASUREMENT MADE WITH A HEATHKIT V-7 VACUUM TUBE VOLTMETER  
 CONSTANT VOLTAGE SOURCE -117 VOLTS. SEL. POS. 5 KC. ALL OTHER CONTROLS  
 CLOCKWISE.



Depends on individual crystal activity.

Figure 17

ALL RESISTANCE MEASUREMENTS MADE WITH THE AC LINE CORD REMOVED FROM ELECTRIC OUTLET  
 RESISTANCE MEASUREMENTS MADE WITH HEATHKIT MULTIMETER.  
 NOTE: MEASUREMENTS DENOTED (100 K) ETC., IN OVAL OUTLINES, MADE FROM PIN TO CHASSIS.  
 MEASUREMENTS DENOTED (100 K) ETC., IN CIRCULAR OUTLINES MADE TO TERMINAL ▲ OF  
 THE FILTER CAPACITOR.

