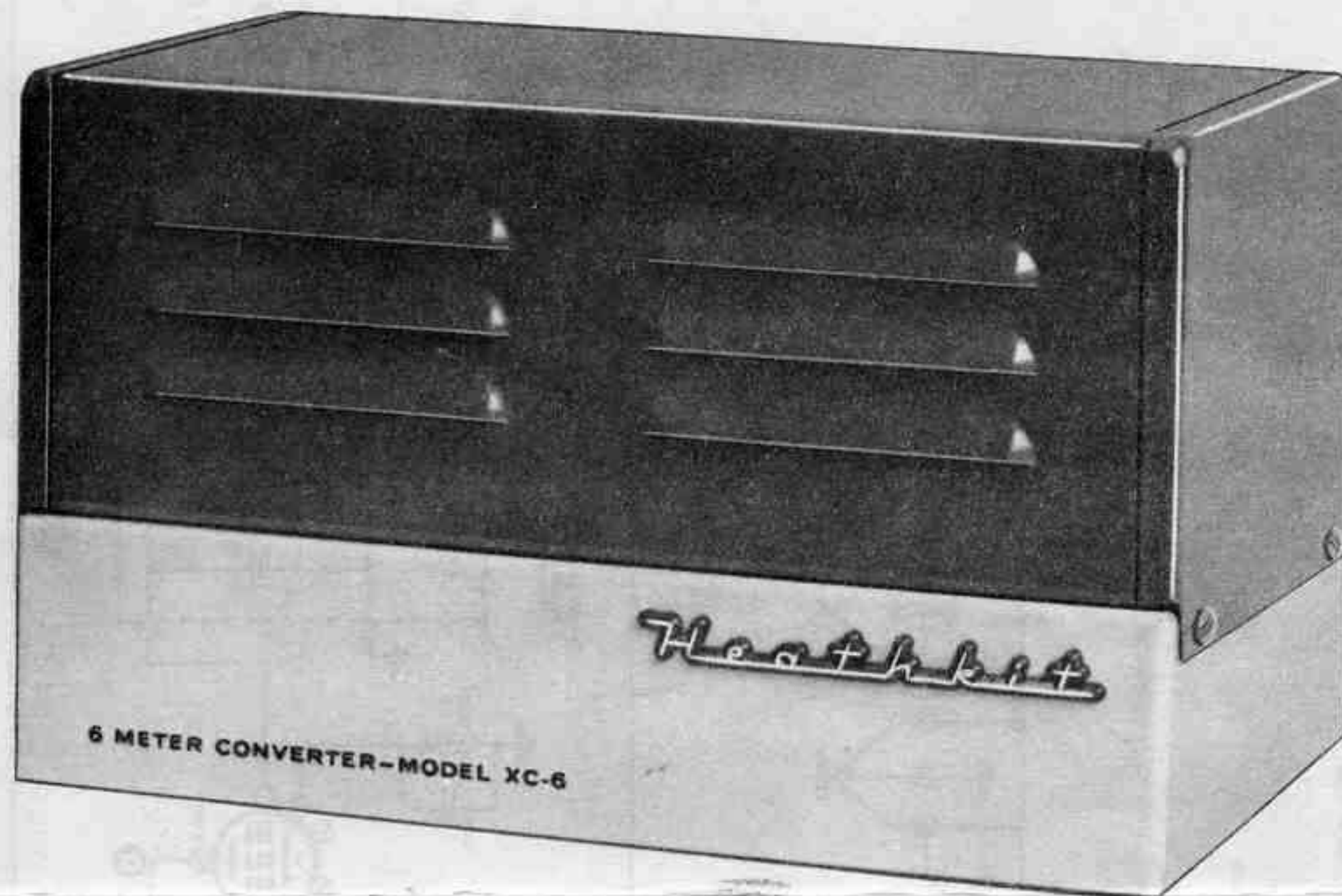


CONSTRUCTION MANUAL NO LONGER AVAILABLE

# HEATHKIT 6-METER CRYSTAL CONVERTER

## MODEL XC-6



### SPECIFICATIONS

3 tube 6-Meter Crystal Controlled Converter with provisions for remote or manual RF gain control.

Frequency:

Input:..... 50 to 54 mc.

Output:..... 22 to 26 mc with crystal supplied.

Tube Complement:..... 6AK5 1st RF amp.

6AK5 2nd RF amp.

12AT7 osc-mixer.

Signal to Noise Ratio:..... 8 db at 1 microvolt input, with the Model RX-1 "Mohawk" Receiver.

Input Impedance:..... 52  $\Omega$  nominal.

Output Impedance:..... 52  $\Omega$  nominal.

Power Requirements:..... 210 volts DC at 35 ma. (Approx.)

6.3 volts AC/DC at 650 ma. (Approx.)

Weight:..... 4 lbs.

Shipping Weight:..... 6 lbs.

Size:..... 9" wide x 5 1/2" high x 4 3/4" deep.



To the average Amateur, the frequencies above 50 megacycles have been a dormant and mysterious world until the last few years. Many contend that the future of amateur radio lies in this portion of the spectrum. This contention has been substantiated in part by the ever increasing amateur activity in the VHF bands.

The Heathkit 6-Meter Crystal Converter, Model XC-6, although primarily designed to be used with the RX-1 Receiver, may be used to extend the frequency coverage of most receivers capable of tuning 22 to 26 megacycles.

The circuit consists of two RF amplifier stages, an oscillator, and a mixer. An external RF gain control circuit, to prevent overload or cross modulation from extremely strong signals, has been provided. When used with the RX-1 "Mohawk" Receiver, the Converter is powered and controlled by the Receiver.

## CIRCUIT DESCRIPTION

### 1st RF AMPLIFIER

A 6AK5 is used for the first radio frequency amplifier. This stage utilizes an air wound input coil to provide a high Q circuit. The purpose of a high Q input coil is to provide as much signal as possible at the grid. In most converters, the noise figure of the first stage governs the overall performance of the unit, and with a high Q input circuit, the signal is increased while the tube noise remains constant. The input coil is tapped slightly above the 52  $\Omega$  impedance point to provide a broad-banding effect. The tube is operated as a straight pentode amplifier, cathode-biased. Feed-through of the signals whose frequencies are in the receiver tuning range, 22 to 26 megacycles, has been virtually eliminated by using transformer coupling between the two RF stages.

### 2nd RF AMPLIFIER

A 6AK5 is used for the second radio frequency amplifier. This stage also operates as a straight pentode amplifier, cathode biased. The input grid is inductively coupled through the interstage transformer. The output stage is a high Q, double tuned tank circuit, utilizing a butterfly capacitor and an air wound coil. Double tuned circuits of this type tend to eliminate VHF images.

### OSCILLATOR

One half of a 12AT7 is used as an oscillator. The oscillator is a tuned plate type, operating on the third overtone of an approximately 9.333 megacycle crystal to obtain an output frequency of 28 megacycles. The output of the oscillator is coupled to the mixer half of the tube through inter-electrode capacity.

### MIXER

One half of the 12AT7 is used as a shunt fed triode mixer. The RF signal at this point is high enough to permit low noise triode mixing. The series tuned output network is designed to match the standard 52  $\Omega$  impedance input of most receivers.







NOTE: A signal generator or 6 meter transmitter which is capable of operating at a very low power output level, will be required to complete the alignment of the Model XC-6 Crystal Converter. If the VHF-1 "Seneca" Transmitter is available, alignment can be accomplished very readily. Connect equipment as shown in Figure 10.

NOTE: DO NOT TURN ON FINAL;  
USE SPOTTING SIGNAL.

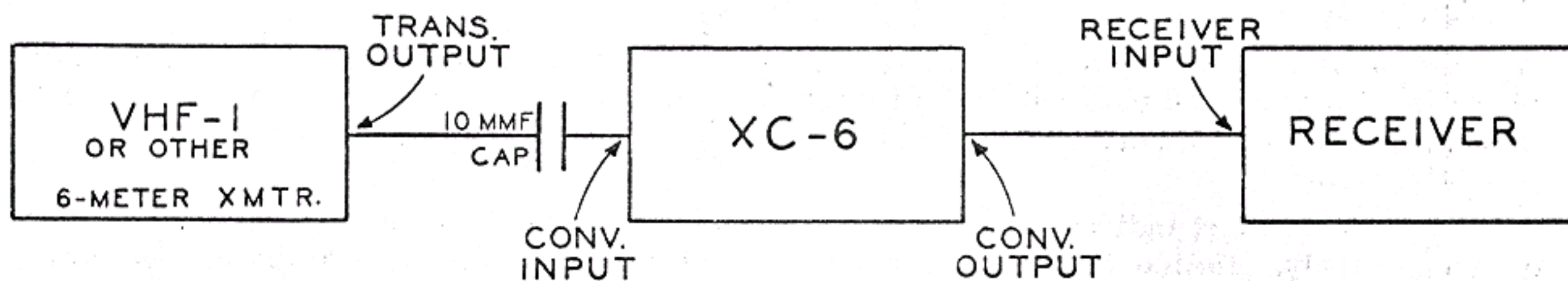
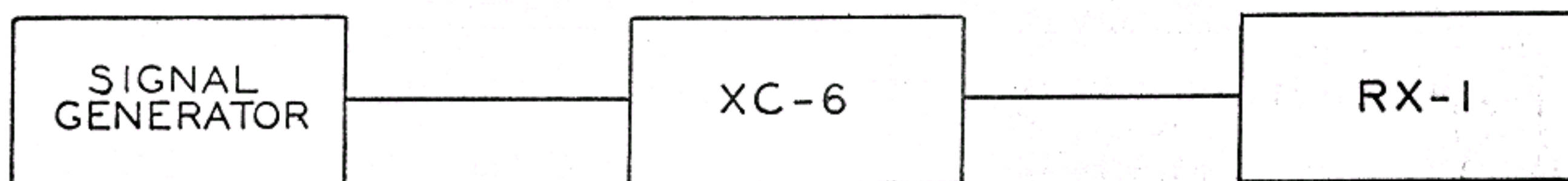


Figure 10

NOTE: DO NOT TURN ON FINAL; USE SPOTTING SIGNAL ONLY.

To use a signal generator, connect equipment as shown in Figure 11.



( ) See top view, Figure 4, for location of adjustments.

Figure 11

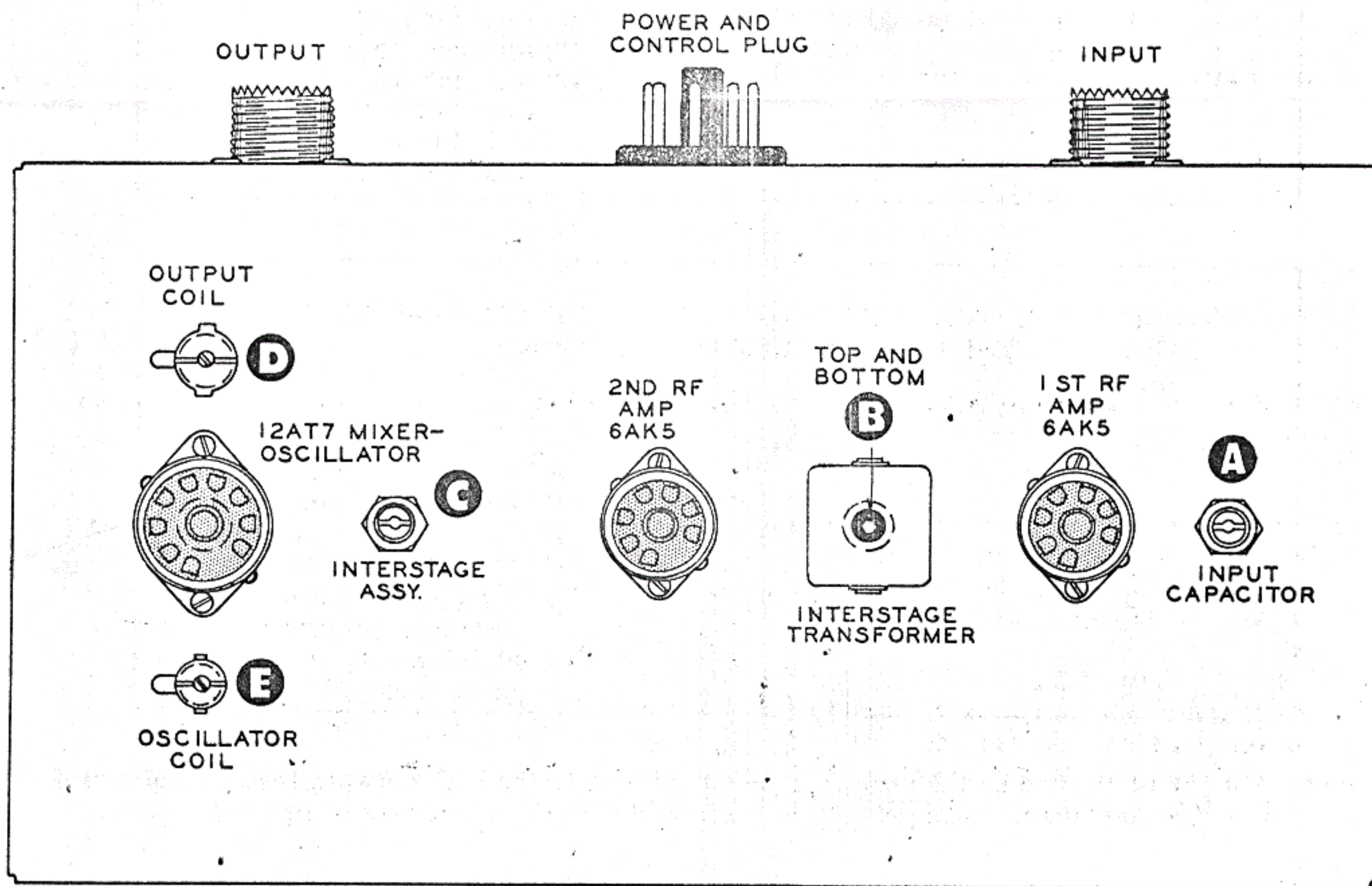


Figure 4



- ( ) Tune the RX-1 "Mohawk" Receiver to 52.66 mc. A beat note from the 28 mc ocs. should be evident at this point on the dial.

NOTE: If the XC-6 Converter is used with a general coverage receiver, the receiver should be tuned to approximately 28 mc. Then proceed with the next step.

- ( ) Preset the adjustment screw "E" so that approximately 9/16" protrudes above the tinner-man cap.
- ( ) Using the S-meter, peak this signal by turning adjustment "E". Note the places where the peak falls. Now back adjustment "E" off counterclockwise slightly below the peak S-meter indication. This will insure oscillator stability.

NOTE: The following chart indicates the frequency at which each stage should be adjusted. Follow each step closely. Notice that the interstage transformer "B" has two adjustments; both can be reached from the top of the can. The bottom adjustment is reached by, carefully inserting the long end of the plastic alignment tool through the hexagonal hole in the top slug and on down into the hole in the bottom slug.

FOR 6-METER OPERATION IN THE 50 TO 52 MC PORTION OF THE BAND

<u>Input Frequency</u>	<u>Adjustment</u>
( ) 50.2 mc	"A" for peak output
( ) 50.5 mc	"B" (bottom) for peak output
( ) 51. mc	"B" (top) for peak output
( ) 50.6 mc	"C" for peak output
( ) 50.5 mc	"D" for peak output with Receiver antenna capacitor at 1/2 mesh, if Receiver is so equipped.

TO OPERATE IN THE 52 TO 54 MC PORTION OF THE 6-METER BAND, USE THE FOLLOWING ALIGNMENT INSTRUCTIONS:

<u>Input Frequency</u>	<u>Adjustment</u>
( ) 52.2 mc	"A" for peak output
( ) 52.5 mc	"B" (bottom) for peak output
( ) 53. mc	"B" (top) for peak output
( ) 52.6 mc	"C" for peak output
( ) 52.5 mc	"D" for peak output with Receiver antenna capacitor at 1/2 mesh, if Receiver is so equipped.

Adjustment "D" is peaked by the screwdriver adjustment in the coil and with the antenna tuning capacitor in the Receiver. This peak is very slight due to the broadness of the coil.

This completes the XC-6 alignment procedure.



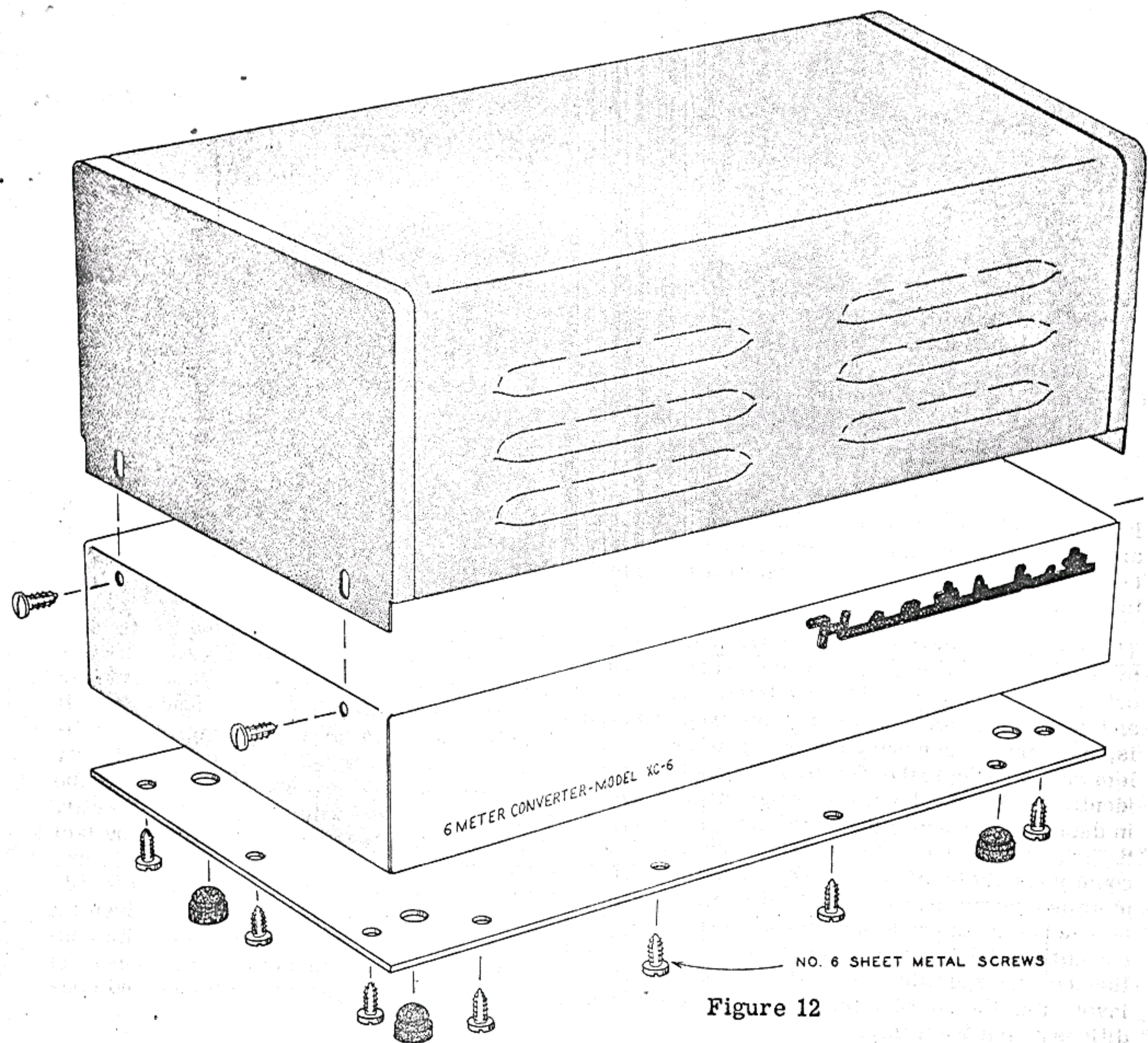


Figure 12

### FINAL ASSEMBLY

- ( ) Remove the protective paper and place the label on the chassis bottom plate.
- ( ) Slide the cover on the main chassis and fasten in place with four #6 sheet metal screws.

This completes the assembly of the Model XC-6 6-Meter Converter.

### IN CASE OF DIFFICULTY

1. Recheck the wiring. Trace each lead in colored pencil on the pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.
2. It is interesting to note that about 90% of the kits that are returned for repair are defective due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as illustrated in the Figures found in the SOLDERING TECHNIQUES section of this manual.



3. Check the values of the component parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagram and as called out in the wiring instructions.
4. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring beneath the chassis.
5. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those found on the schematic diagram. NOTE: All voltage readings were taken with a Heathkit Vacuum Tube Voltmeter. Voltages may vary 10% due to line voltage variations.
6. If oscillation occurs in the Converter, check the Converter alignment. All adjustments must be made at frequencies specified in the alignment table on Page 24.

## 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 Crystal Converter, 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 Converter 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 consultants 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 Converter to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a fixed fee of \$4.00, plus the price of any additional parts or material required. However, if the Converter 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.



# PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
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## Resistors

1-9	1	1 K $\Omega$ 1/2 watt (brown-black-red)
1-25	1	47 K $\Omega$ 1/2 watt (yellow-violet-orange)
1-33	1	470 K $\Omega$ 1/2 watt (yellow-violet-yellow)
1-45	1	220 $\Omega$ 1/2 watt (red-red-brown)
1-69	1	18 K $\Omega$ 1/2 watt (brown-gray-orange)
1-88	2	36 K $\Omega$ 1/2 watt (orange-blue-orange)
1-111	2	150 $\Omega$ 1/2 watt (brown-green-brown)
1B-22	2	12 K $\Omega$ 2 watt (brown-red-orange)

## Capacitors

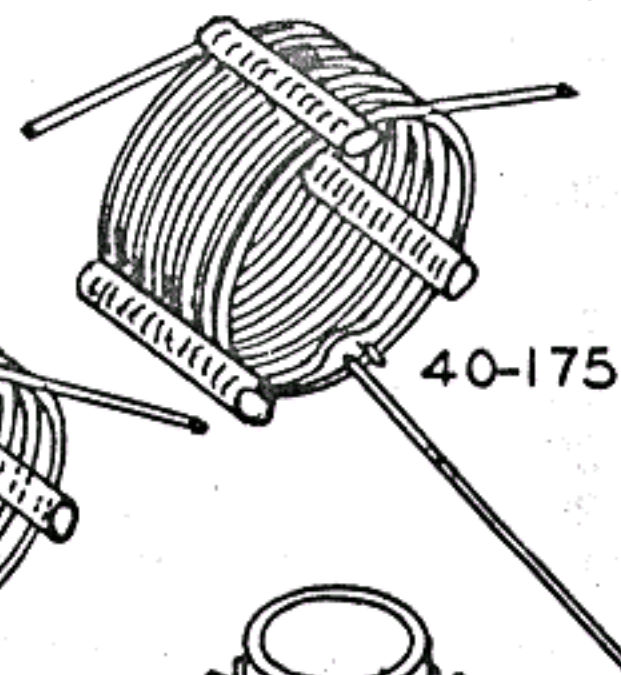
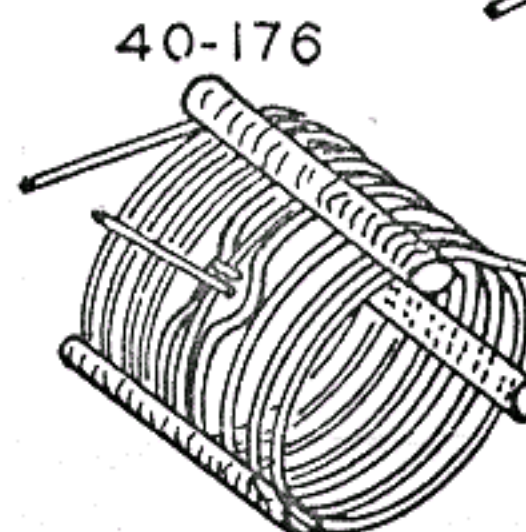
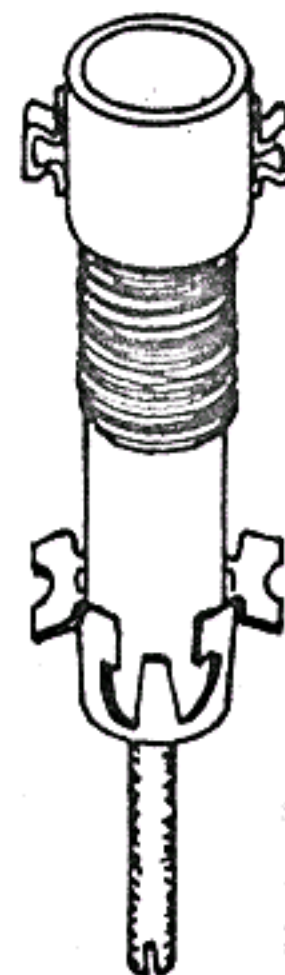
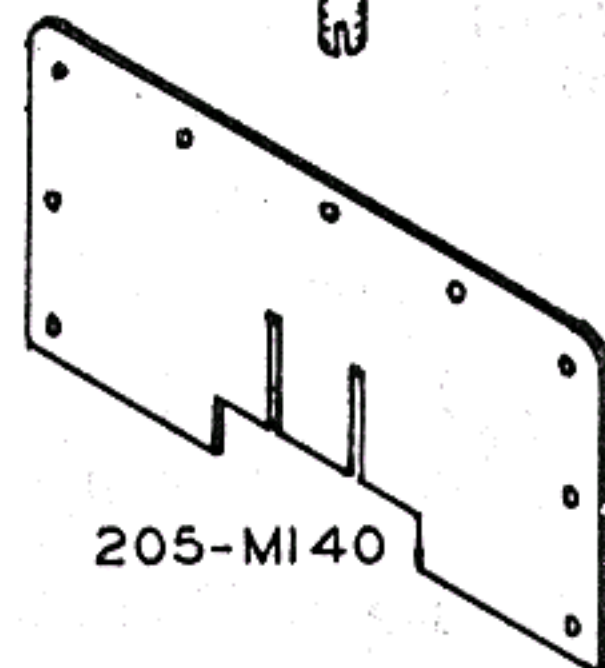
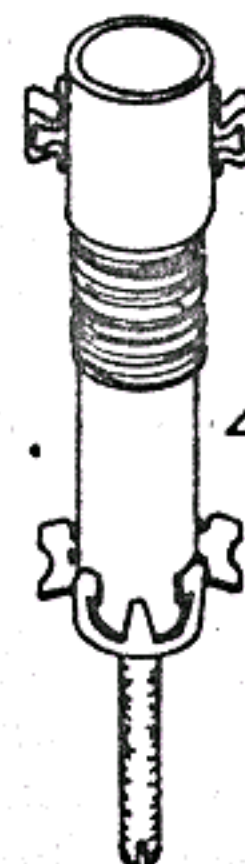
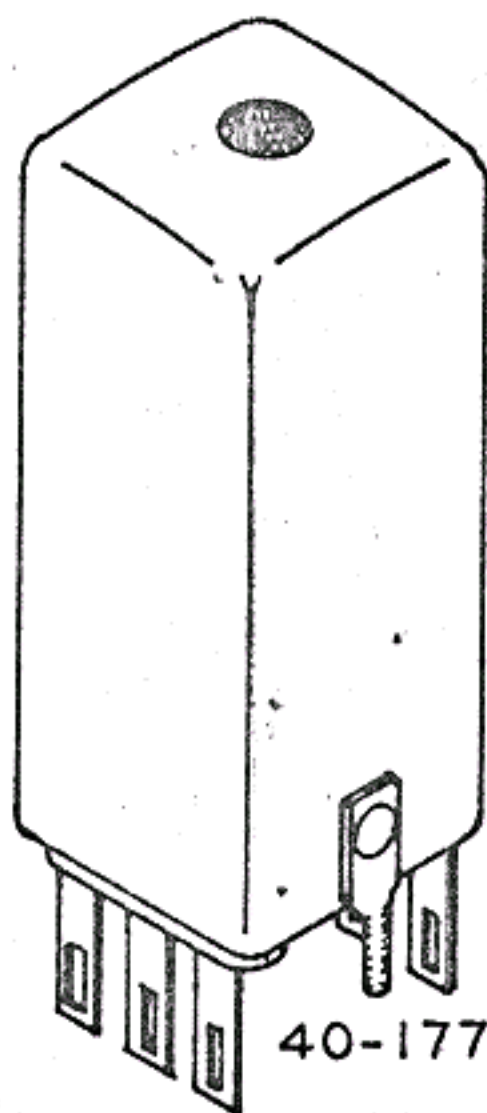
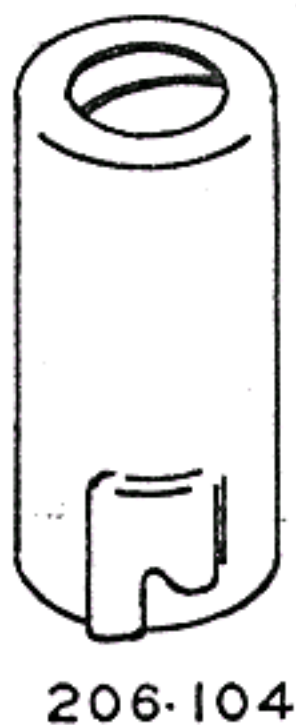
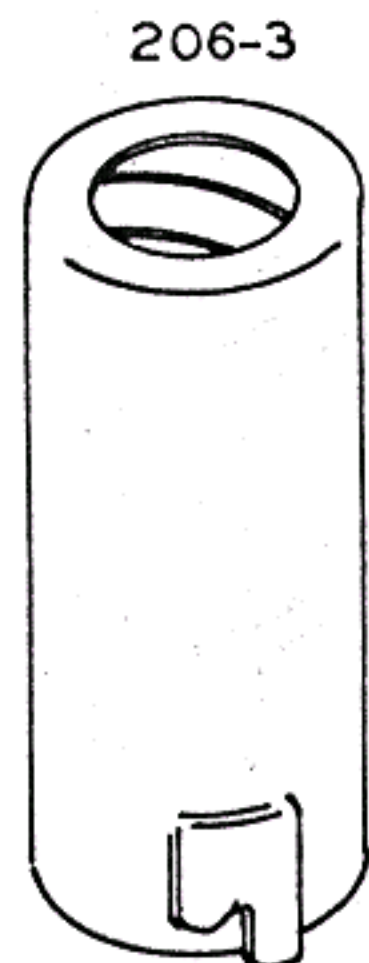
20-38	1	100 mmf silver mica
20-69	1	500 mmf 300 V 5%
B-21-57	10	.005 mfd GMV 500 V disc ceramic
26-23	1	9 mmf variable
26-39	1	3.2 to 11 mmf variable dual

## Coils-Shields

40-175	1	6-meter input coil, air-wound
40-176	1	6-meter interstage coil, air-wound
40-177	1	6-meter interstage coil, slug tuned and shielded
40-178	1	6-meter output coil, slug tuned
40-179	1	6-meter oscillator coil, 28 to 33 mc slug tuned
205-M140	2	7-pin tube shield (flat)
206-3	1	9-pin miniature tube shield
206-104	2	7-pin miniature tube shield
206-M113	1	Interstage shield

## Tubes

411-24	1	12AT7
411-125	1	6AK5



MICA CAPACITOR

2 WATT RESISTOR

1/2 WATT RESISTOR

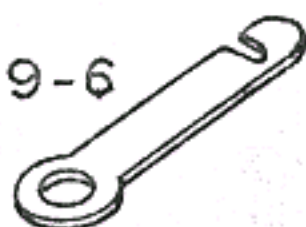


PART No.	PARTS Per Kit	DESCRIPTION
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#### Hardware

250-8	20	#6 x 3/8" BH self-tapping machine screw
250-49	14	3-48 x 1/4" BHMS
250-56	4	6-32 x 1/4" BHMS
252-1	14	3-48 x 7/32" nut
252-3	2	6-32 x 1/4" nut
252-15	2	4-40 x 3/16" nut
254-1	2	#6 lockwasher
254-7	20	#3 lockwasher
254-9	2	#4 lockwasher
259-6	5	#6 solder lug

259-6



250-49



254-7



252-1



250-8



254-9

252-15



250-56



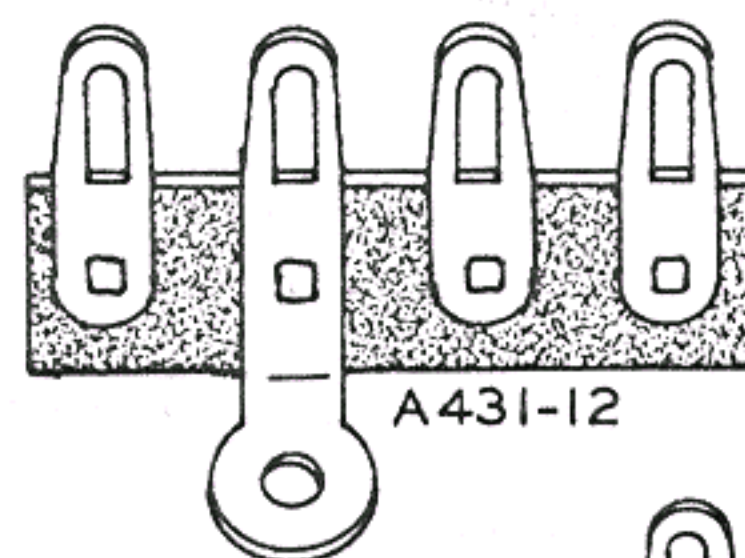
254-1



252-3

#### Terminal Strips - Sockets

A431-12	2	A1-G-A1 terminal strip
A431-16	1	G-A1 terminal strip
434-35	2	7-prong miniature ceramic shielded tube socket
434-36	1	9-prong miniature ceramic shielded tube socket



A431-12

#### Sheet Metal Parts

200-M205F-256

1

Chassis shell

205-M145F

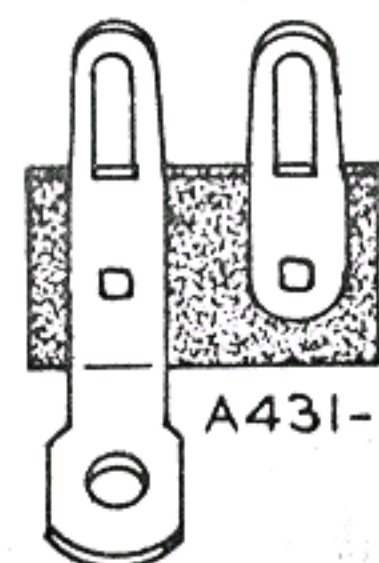
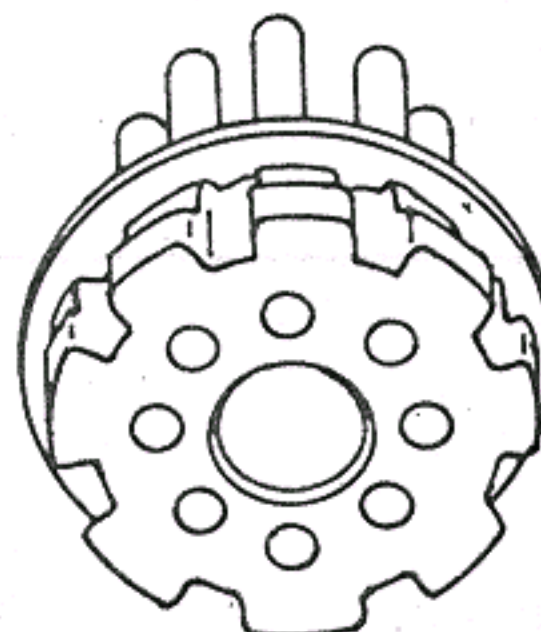
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Chassis bottom plate

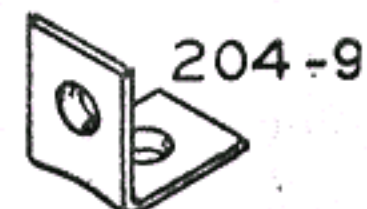
#### Miscellaneous

90-101	1	Cover with louvres
204-9	2	Angle clip
261-4	4	Rubber feet
340-2	1	Length #20 bare wire
343-2	1	Length RG58/AU coax
343-3	1	Length shielded wire
344-1	1	Length yellow hookup wire
346-1	1	Length insulated sleeving
390-61	1	Label
391-7	1	Heathkit nameplate
404-13	1	28 mc 3rd overtone crystal
434-4	1	Octal socket ring mount
435-1	1	Octal socket ring
436-5	2	Coaxial jack
438-6	2	Octal plug
438-9	2	Coaxial plug
438-12	2	Coaxial insert
440-1	2	Octal plug cap
490-1	1	Plastic alignment tool
595-247	1	Instruction manual

438-6



A431-16



204-9

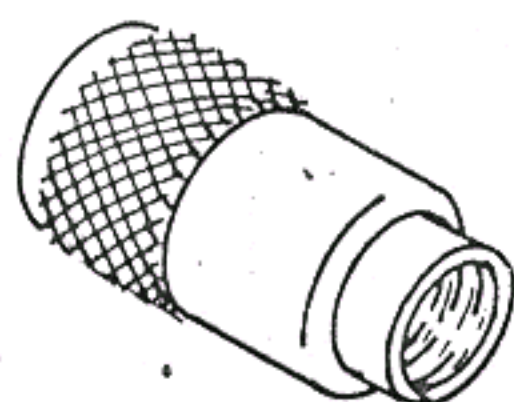
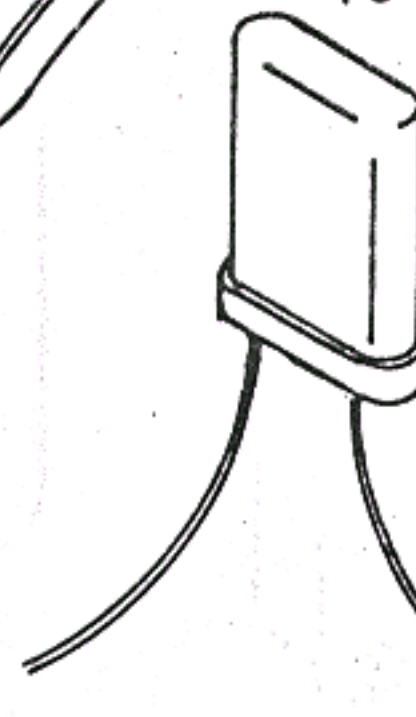
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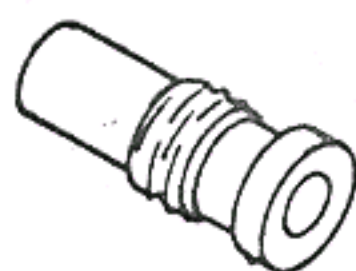
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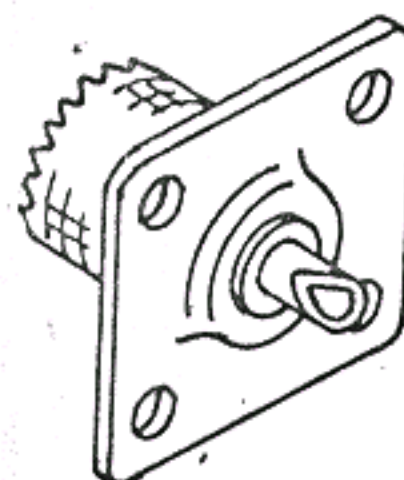
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438-9

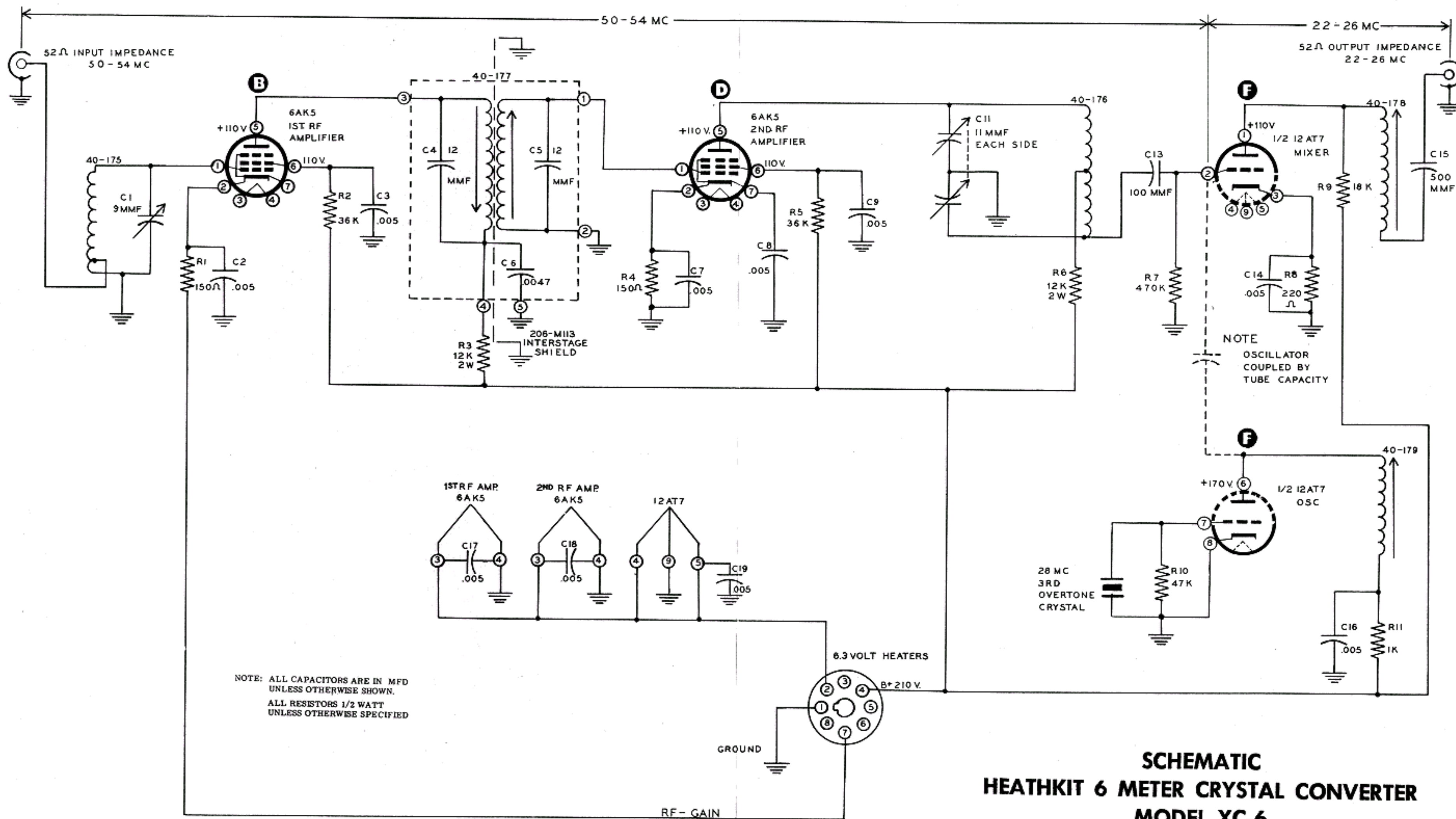


438-12



436-5





**SCHEMATIC  
HEATHKIT 6 METER CRYSTAL CONVERTER  
MODEL XC-6**