MODEL HR-10B Basic Amateur Band Receiver

HEATHKIT®

ASSEMBLY MANUAL

Model HR-10B Basic Amateur Band Receiver

HEATHKIT®

PRICE $2.00

595-945-03

Dear Customer:

The Heathkit electronic product you have purchased is one of the best performing electronic products in the world.

Here's how we aim to keep it that way:

Your Heathkit Warranty

During your first 90 days of ownership, any parts which we find are defective, either in materials or workmanship, will be replaced or repaired free of charge. And we'll pay shipping charges to get those parts to you — anywhere in the world.

If we determine a defective part has caused your Heathkit electronic product to need other repair, through no fault of yours, we will service it free — at the factory, at any retail Heathkit Electronic Center, or through any of our authorized overseas distributors.

This protection is exclusively yours as the original purchaser. Naturally, it doesn't cover damage by use of acid-core solder, incorrect assembly, misuse, fire, flood or acts of God. But, it does insure the performance of your Heathkit electronic product anywhere in the world — for most any other reason.

After-Warranty Service

What happens after warranty? We won't let you down. If your Heathkit electronic product needs repairs or you need a part, just write or call the factory, your nearest retail Heathkit Electronic Center, or any Heath authorized overseas distributor. We maintain an inventory of replacement parts for each Heathkit model at most locations — even for many models that no longer appear in our current product line-up. Repair service and technical consultation are available through all locations.

We hope you'll never need our repair or replacement services, but it's nice to know you're protected anyway — and that cheerful help is nearby.

Sincerely,

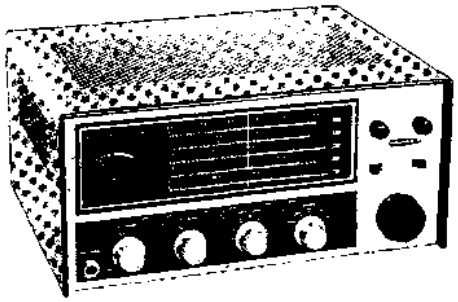
HEATH COMPANY
Benton Harbor, Michigan 49022

Assembly
and
Operation
of the

HEATHKIT

BASIC AMATEUR BAND RECEIVER

MODEL HR-10B



HEATH COMPANY
BENTON HARBOR,
MICHIGAN 49022

TABLE OF CONTENTS

SPECIFICATIONS

Frequency Coverage-	
80 Meter Band.	3.5 to 4.0 mc.
40 Meter Band.	7.0 to 7.3 mc.
20 Meter Band.	14.0 to 14.35 mc.
15 Meter Band.	21.0 to 21.5 mc.
10 Meter Band.	28.0 to 29.7 mc.
Intermediate Frequency (IF).	1681.0 kc.
Sensitivity.	1 microvolt for a 10 db signal plus noise-to-noise ratio.
Selectivity	3 kc at 6 db down, 9 kc at 40 db down.
Image Rejection.	40 db or better.
Input Impedance.	50 to 75 Ω, coaxial.
Audio Output Impedance	8 Ω, or 500 Ω.
Panel Controls.	AF GAIN, AC OFF-ON. RF GAIN. BFO TUNE. BAND Switch. MAIN TUNING. CALibrate. ANTenna TRIMmer. REC-STBY Switch. CALibrate ON-OFF. BFO On-OFF. AVC On-OFF. ANL On-OFF.
Tube Complement.	6BZ6 RF Amplifier. 6EA8 Mixer Oscillator. 6BA6 1st IF Amplifier. 6EA8 2nd IF Amplifier-BFO. 6BJ7 Detector-AVC-ANL. 6GN8/6EB8 1st Audio-Audio output. 6X4 Rectifier.
Power Requirements.	105-125 or 210-250 volts AC, 50/60 cps, 50 watts.
Cabinet Size.	13-3/4" wide x 11-1/2" deep x 6-1/2" high.
Net Weight.	18 lbs.

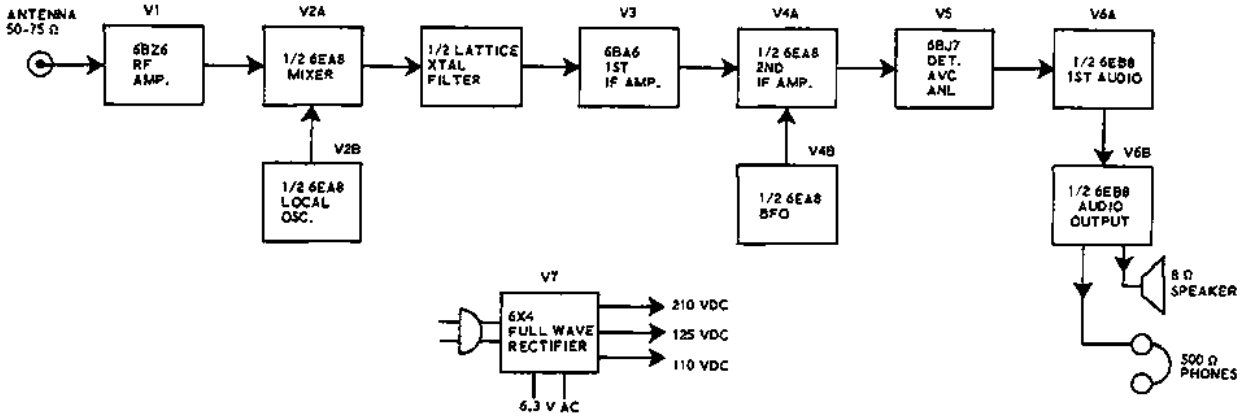
INTRODUCTION

Your HEATHKIT Model HR-10B Basic Amateur Band Receiver is designed for use as a high-performance economical station receiver. Frequency coverage of the Receiver includes the amateur bands, 80 through 10 meters, only. Each band is separately calibrated on a large easy-to-read slide-rule dial. The dial is illuminated and provides approximately 6 inches of band-spread for each band.

The Receiver features a signal strength "S" meter, a front panel dial calibration control that operates in conjunction with the 100 kc crystal calibrator provisions, a tuned RF amplifier stage, a crystal filter, an automatic noise limiter circuit, plus many other features desirable on an Amateur Receiver. The low-silhouette styling and the green-gray color combination will prove an attractive addition to any surroundings.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

CIRCUIT DESCRIPTION



To assist you in understanding the following Circuit Description, we suggest that you refer frequently to the Schematic and Block Diagrams. As the BAND switch is quite complex, the circuit will be discussed with the switch in the 80 meter position.

RF AMPLIFIER - MIXER OSCILLATOR

Assuming that the BAND switch is in the 80 meter position, the signal from the antenna is applied through coil L1, through the BAND switch, and through capacitor C7 and resistor R1 to the grid of the RF amplifier tube, V1.

V1 amplifies the RF signal which is then applied through capacitor C18 and resistor R10 to the grid in the pentode section of tube V2. Tube V2 is a combination mixer and oscillator.

This tube heterodynes or mixes the incoming signal frequency with the oscillator frequency to obtain a difference frequency of 1681 kc. The position of the BAND switch determines which coils and capacitors are used in conjunction with V2B in the oscillator circuit. These coils and capacitors, including the MAIN TUNING capacitor, are used to set the oscillator frequency 1681 kc higher than the desired radio station frequency. The difference frequency of 1681 kc is called the intermediate frequency or IF signal.

When the Receiver is used on 10 and 15 meters, the oscillator operates at 1/2 the incoming frequency plus the intermediate frequency. The difference frequency, or IF, is obtained by beating the second harmonic of the oscillator frequency against the incoming signal.

IF AMPLIFIER

From the plate of V2A, the signal is coupled through IF transformer T1 to the grid of the first IF amplifier tube, V3.

A crystal filter is used in the secondary circuit of the IF transformer to provide a narrow bandpass for suppression of unwanted adjacent signals. This provides the Receiver

with exceptionally good selectivity.

Amplified IF signal from the plate of V3 is coupled through second IF transformer T2 to the grid of IF amplifier tube V4A. Tube V4A again amplifies the IF signal. At this point in the circuit the Beat Frequency Oscillator (BFO) signal from V4B may be beat with the IF signal by turning the BFO switch to BFO. The introduction of the BFO signal produces an audible signal for Continuous Wave (CW) or Single Sideband (SSB) reception. The output from V4A is coupled through IF transformer T3 to tube V5.

DETECTOR-AUDIO OUTPUT

Tube V5 is the detector stage. This tube detects the audio signal from the IF signal. This audio signal is then coupled through capacitor C35 and the AF GAIN control to the grid of the first audio stage V6A. The amount of audio signal applied to the grid of V6A can be regulated by the AF GAIN control. This in turn regulates the amount of audio signal that will be amplified by V6A. From tube V6A, the audio signal is coupled by capacitor C38 to the grid of tube V6B. Tube V6B further amplifies this audio signal and feeds it through audio output transformer T4 to the Speaker jack.

POWER SUPPLY

The power supply uses tube V7 as a full-wave rectifier with power transformer T6. Filtering of the DC voltage is provided by resistors R44 and R43, and capacitors C55, C56, and C57.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be highly stable and dependable performance. We suggest that you retain the manual in your files for future reference, both in the use of the equipment and for its maintenance.

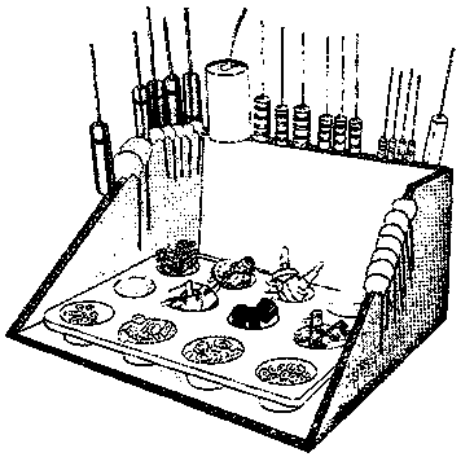
UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the Replacements section and supply the information called for therein.

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

Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

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

1. Lay out all parts so that they are readily available.
2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a penknife or a tool for stripping insulation from wires; a soldering iron (or gun) and rosin core solder. A set of nut drivers and a nut starter, while not necessary, will aid extensively in construction of the kit.

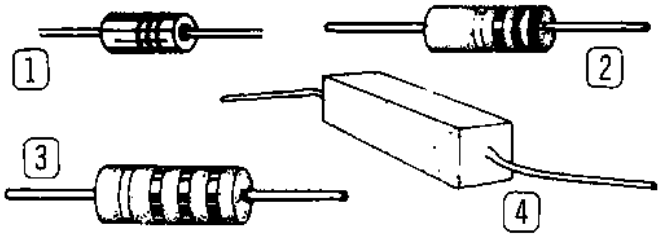


PARTS LIST

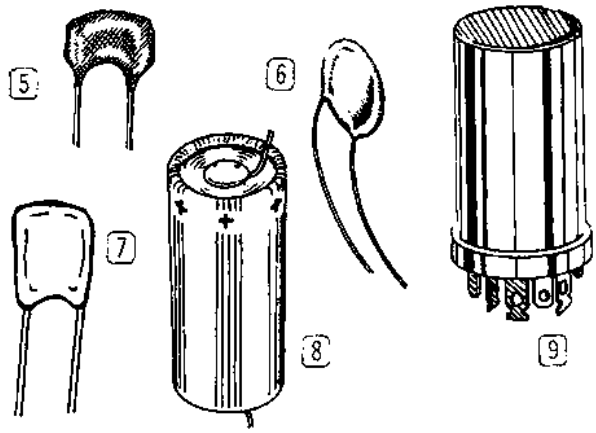
The circled numbers in the Parts List are keyed to the circled numbers on the parts drawings to aid in parts identification.

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual.

PART No.	PARTS Per Kit	DESCRIPTION
Resistors		
1-41	1	10 Ω 1/2 watt (brown-black-black)
1-3	2	100 Ω 1/2 watt (brown-black-brown)
1-66	1	150 Ω 1/2 watt (brown-green-brown)
1-6	2	470 Ω 1/2 watt (yellow-violet-brown)
1-9	2	1000 Ω 1/2 watt (brown-black-red)
1-44	2	2200 Ω 1/2 watt (red-red-red)
1-46	1	3900 Ω 1/2 watt (orange-white-red)
1-19	1	6800 Ω 1/2 watt (blue-gray-red)
1-20	2	10 KΩ 1/2 watt (brown-black-orange)
1-22	1	22 KΩ 1/2 watt (red-red-orange)
1-25	4	47 KΩ 1/2 watt (yellow-violet-orange)
1-60	1	68 KΩ 1/2 watt (blue-gray-orange)
1-26	5	100 KΩ 1/2 watt (brown-black-yellow)
1-121	3	120 KΩ 1/2 watt (brown-red-yellow)
1-30	1	270 KΩ 1/2 watt (red-violet-yellow)
1-34	1	680 KΩ 1/2 watt (blue-gray-yellow)
1-68	1	820 KΩ 1/2 watt (gray-red-yellow)
1-35	3	1 megohm 1/2 watt (brown-black-green)
1-37	1	2.2 megohm 1/2 watt (red-red-green)
Resistors (Cont'd.)		
1-5-1	1	22 KΩ 1 watt (red-red-orange)
1-14-2	1	1500 Ω 2 watt (brown-green-red)
1-11-10	1	1500 Ω 10 watt wire-wound



Capacitors		
20-100	3	30 μμf resin dipped
21-3	1	10 μμf disc ceramic
21-33	1	3.3 μμf disc ceramic
21-22	3	220 μμf disc ceramic
21-48	2	.05 μfd disc ceramic
21-27	23	.005 μfd disc ceramic
21-72	3	.005 μfd 1.4 KV disc ceramic
27-47	2	.1 μfd Mylar*
25-4	1	10 μfd 25 V electrolytic
25-9	1	20-20-20 μfd 300 V twist-prong electrolytic
26-84	1	15-15-15 μμf 3-gang variable
26-64	3	21 μμf single-section variable



*Registered Trademark, DuPont Corporation.

PART No.	PARTS Per Kit	DESCRIPTION
Coil-Transformers-Choke		
40-429	1	1682 kc BFO coil
45-43	1	Parasitic choke wound on 47 Ω resistor
51-84	1	Audio output transformer
52-17	2	Interstage IF transformer
52-50	1	Input IF transformer
54-122-24	1	Power transformer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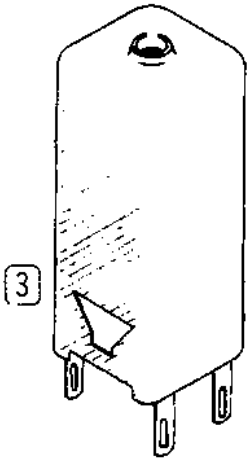
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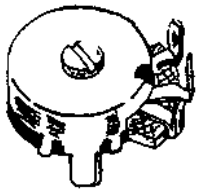
PART No.	PARTS Per Kit	DESCRIPTION
Switches-Controls		
10-57	1	10 KΩ tab-mount control
10-131	1	10 KΩ control
19-72	1	500 KΩ control w/SPST switch
60-18	4	SPST slide switch
60-36	1	DPDT slide switch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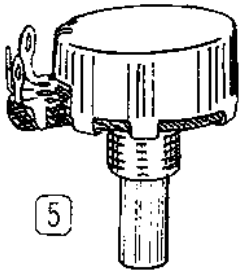
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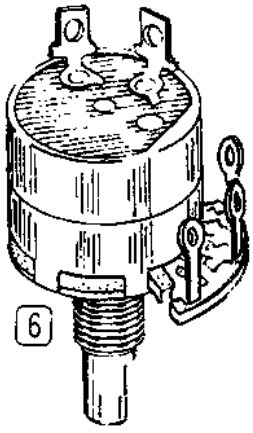
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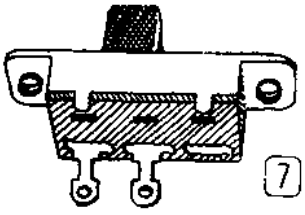
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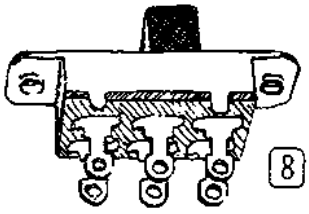
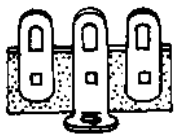

8

PART No.	PARTS Per Kit	DESCRIPTION
Terminal Strips-Sockets-Jack-Plugs		
431-10	1	3-lug terminal strip
431-12	1	4-lug terminal strip
431-15	1	1-lug terminal strip
431-16	2	2-lug terminal strip
431-45	1	6-lug terminal strip
431-40	2	4-lug terminal strip
434-34	2	7-pin phenolic tube socket
434-35	1	7-pin ceramic tube socket
434-36	1	9-pin ceramic tube socket
434-39	2	Octal socket
434-42	2	Phono socket
434-43	1	9-pin molded tube socket
434-56	2	9-pin phenolic tube socket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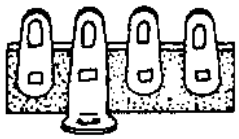
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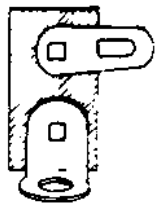
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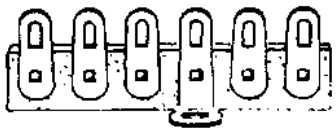
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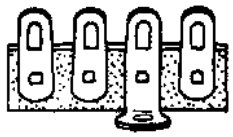
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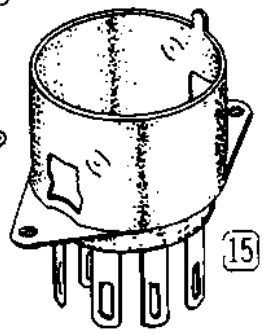
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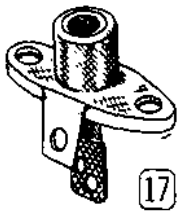
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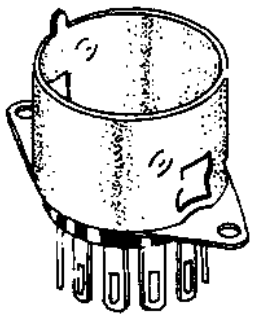
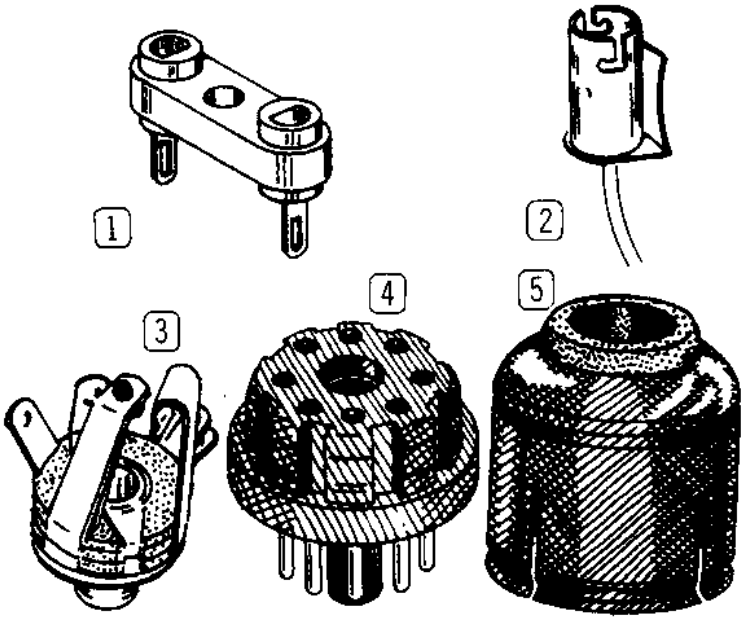
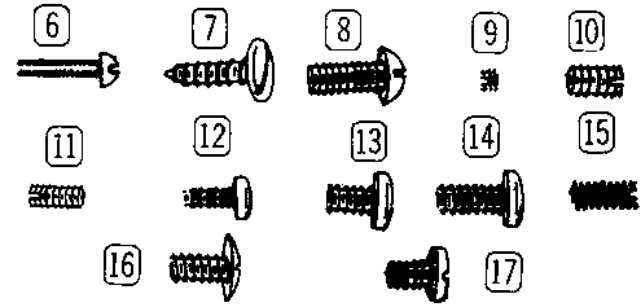

18

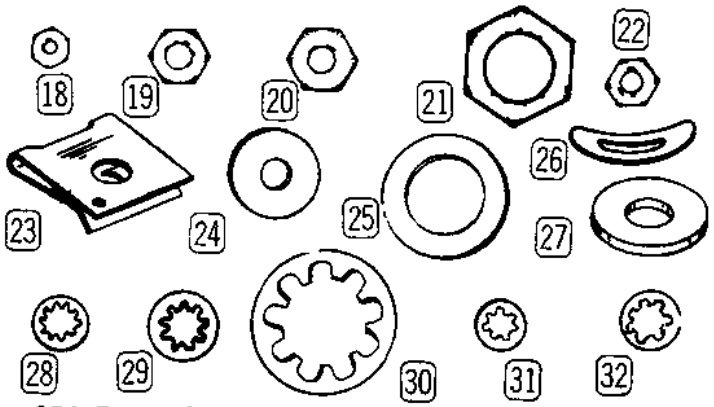
PART No.	PARTS Per Kit	DESCRIPTION
Terminal Strips-Sockets-Jack-Plugs (cont'd.)		
434-74	2	Crystal socket
434-85	2	Pilot lamp socket
436-21	1	Phone jack
438-6	1	Octal plug
438-4	2	Phono plug
440-1	1	Octal plug cap



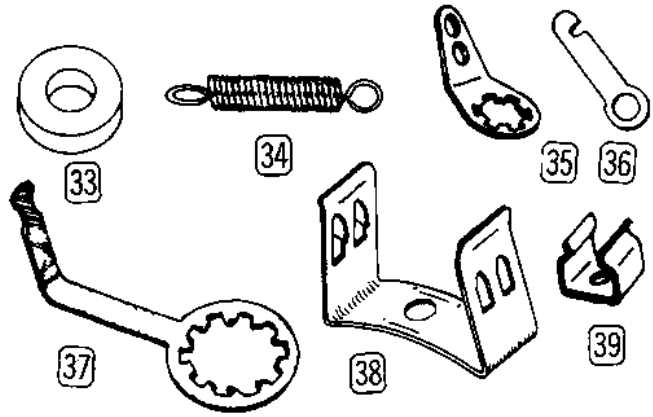
Hardware		
250-4	2	4-40 x 3/8" round head machine screw
250-8	10	#6 x 3/8" sheet metal screw
250-18	4	8-32 x 3/8" round head machine screw
250-33	2	6-32 x 1/8" setscrew
250-43	5	8-32 x 1/4" setscrew
250-1193	1	8-32 x 3/8" setscrew
250-49	14	3-48 x 1/4" screw
250-56	29	6-32 x 1/4" screw
250-70	3	6-32 x 3/16" flat head screw
250-89	7	6-32 x 3/8" screw
250-100	3	6-32 x 5/16" setscrew



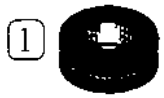
PART No.	PARTS Per Kit	DESCRIPTION
Hardware (cont'd.)		
250-116	6	6-32 x 1/4" truss head machine screw (black)
250-138	9	6-32 x 3/16" screw
252-1	14	3-48 nut
252-3	50	6-32 nut
252-4	4	8-32 nut
252-7	4	Control nut
252-15	12	4-40 nut
252-22	4	6-32 speednut
253-9	4	#8 flat steel washer
253-10	4	Control flat washer
253-36	2	Formed spring brass washer
253-49	1	Flat nylon washer
254-1	64	#6 lockwasher
254-2	4	#8 lockwasher
254-4	4	Control lockwasher



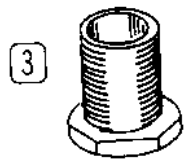
254-7	20	#3 lockwasher
254-9	12	#4 lockwasher
255-30	1	Spacer
258-1	1	Dial cord spring
259-1	4	#6 solder lug
259-6	5	#6 small solder lug
259-10	1	Control solder lug
260-7	4	IF transformer clip
260-29	2	Crystal holding clip



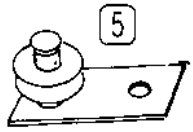
PART No.	PARTS Per Kit	DESCRIPTION
Grommets-Wire		
73-1	2	3/8" rubber grommet
73-4	4	5/16" rubber grommet
89-1	1	Line cord with plug
134-40	1	Wiring harness
206-4	1	Length spiral shield
340-8	1	Length #22 bare wire
343-2	1	Length coax cable
344-51	1	Length brown hookup wire
344-52	1	Length red hookup wire
344-54	1	Length yellow hookup wire
346-4	1	Length sleeving 1/16" diameter
346-2	1	Length sleeving 3/16" diameter

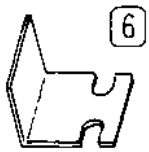


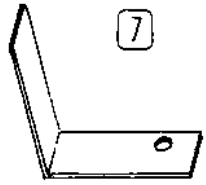
Tubes-Crystals-Pilot Lamps-Fuse		
404-184	1	1680.70 kc ±.005% tolerance crystal
404-185	1	1682.40 kc ± .005% tolerance crystal
407-90	1	Meter
411-64	1	6X4 tube
411-90	1	6BA6 tube
411-113	1	6BJ7 tube
411-124	2	6EA8 tube
411-126	1	6BZ6 tube
411-161	1	6GN8/6EB8 tube
412-20	2	#47 pilot lamp
421-20	1	1/2 ampere slow-blow fuse
Shafts-Flywheel-Bushings-Knobs		
453-35	1	1/4" diameter x 4-3/8" long shaft
453-90	1	1/4" x 1-7/8" shaft
453-114	1	1/4" x 2-1/2" dial cord drive shaft
454-12	1	Flywheel
455-9	1	3/8" x 3/8" bushing
455-15	1	1/4" x 1/4" collar
456-7	2	Metal coupling
462-257	1	1-9/16" diameter green knob
462-122	4	Gray knob with skirt and pointer
462-258	2	9/16" diameter green knob with white pointer mark



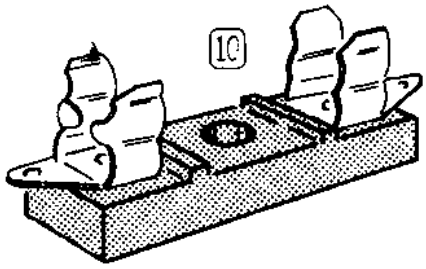
PART No.	PARTS Per Kit	DESCRIPTION
Metal Parts		
90-358	1	Top cover
100-362	1	Dial drum
100-369-1	1	Dial back plate assembly
100-370	1	Pulley bracket assembly
100-640	1	Front panel
110-8	1	Front end tuner assembly
200-332-1	1	Chassis
204-449	2	Variable capacitor mounting bracket
204-450	1	Pilot lamp bracket
204-451	1	Pilot lamp bracket
205-260	1	Chassis bottom plate
205-337	2	Dial spacer plate
205-350-1	1	Meter spacer plate



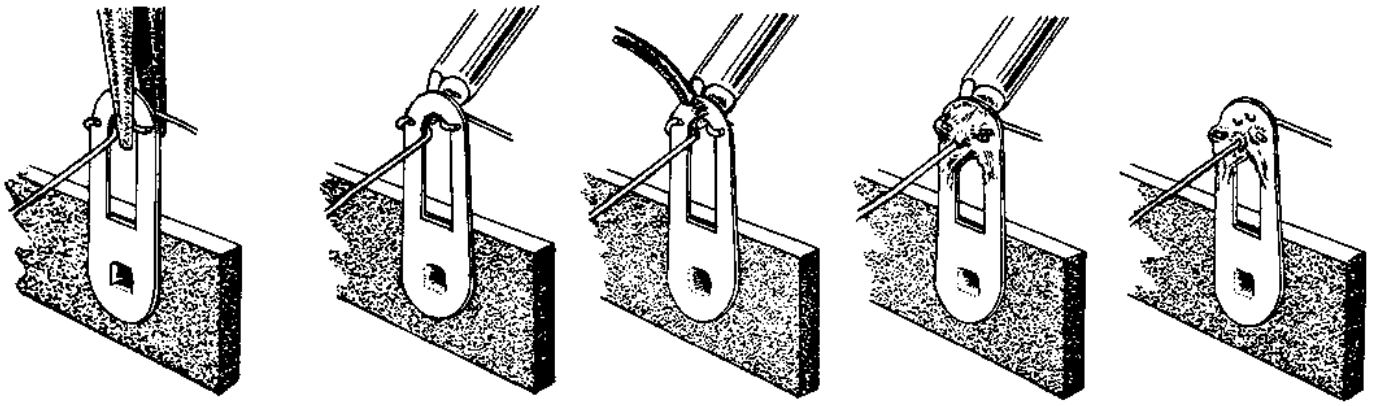




Miscellaneous		
75-24	1	Line cord strain relief
206-3	2	9-pin tube shield
206-25	1	7-pin tube shield
261-9	4	Rubber foot
349-3	1	Length dial cord
422-1	1	Fuse block
463-31	1	Dial pointer
481-2	1	Capacitor mounting wafer
490-1	1	Alignment tool
490-5	1	Nut starter
464-23-2	1	Dial plate (plastic)
391-34	1	Blue and white identification label
597-260	1	Parts Order Form
597-308	1	Kit Builders Guide
	1	Manual (see front cover for part number)
		Solder



PROPER SOLDERING TECHNIQUES



CRIMP WIRES | HEAT CONNECTION | APPLY SOLDER | ALLOW SOLDER TO FLOW | PROPER SOLDER CONNECTION

Only a small percentage of customers find it necessary to return equipment for factory service. By far the largest portion of malfunctions in this equipment are due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For most wiring, a 25 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly. Keep the iron tip clean by wiping it from time to time with a cloth.

CHASSIS WIRING AND SOLDERING

1. Unless otherwise indicated, all wire used is the type with colored insulation (hookup wire). In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the assembly step.

2. To avoid breaking internal connections when stripping insulation from the leads of transformers or similar components, care should be taken not to pull directly on the lead. Instead, hold the lead with pliers while it is being stripped.

3. Leads on resistors, capacitors, and similar components are generally much longer than need be to make the required connections. In these cases, the leads should be cut to proper length before the part is installed. In general, the leads should be just long enough to reach their terminating points.

4. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving. Where the use of sleeving is specifically intended, the phrase "use sleeving" is included in the associated assembly step. In any case where there is the possibility of an unintentional short circuit, sleeving should be used. Extra sleeving is provided for this purpose.

5. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the lead is too large to allow bending or if the step states that it is not to be crimped, position it so that a good solder connection can still be made.

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

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

8. Then place the solder and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not

necessary to fill the entire hole in the terminal with solder.

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

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

ROSIN CORE SOLDER HAS BEEN SUPPLIED WITH THIS KIT. THIS TYPE OF SOLDER MUST BE USED FOR ALL SOLDERING IN THIS KIT. ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. IF ADDITIONAL SOLDER IS NEEDED, BE SURE TO PURCHASE ROSIN CORE (60:40 or 50:50 TIN-LEAD CONTENT) RADIO TYPE SOLDER.

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each wire and part in colored pencil on the Pictorial as it is added.

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a wire to lug 1 (S-2)," it will be understood that there will be two wires connected to the terminal at the time it is soldered. (In cases where a wire passes through a terminal or lug and then connects to another point, it will count as two wires, one entering and one leaving the terminal.)

The steps directing the installation of resistors include color codes to help identify the parts. Also, if a part is identified by a letter-number designation (R1, C1, etc.) on the Schematic, its designation will appear at the beginning of the assembly step which directs its installation.

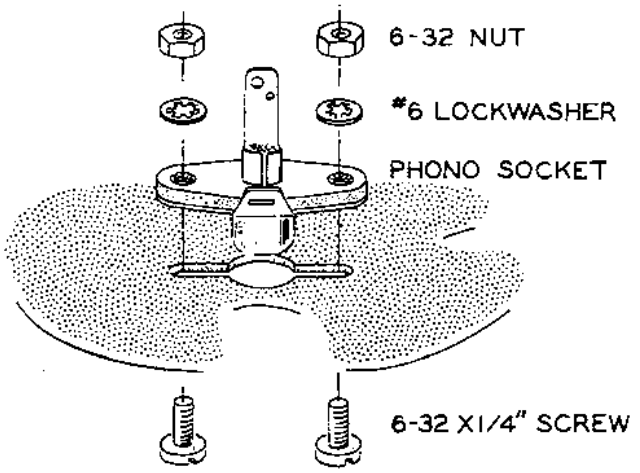
STEP-BY-STEP ASSEMBLY

PARTS MOUNTING

NOTE: Lockwashers will be used with all screws and nuts when mounting parts, unless otherwise stated; the following steps will only call out the size and type of hardware to be used. For parts identification refer to the Parts Pictures which are located on Pages 5 to 8.

Refer to Pictorial 1 (fold-out from Page 15) for the following steps.

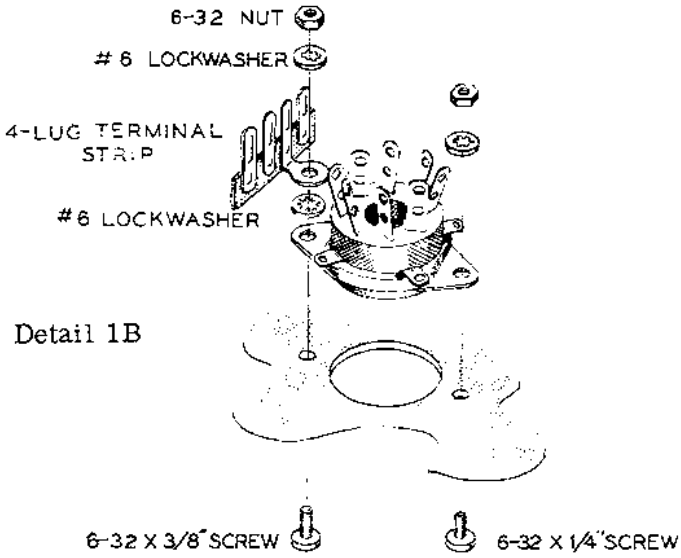
( ) Referring to Detail 1A, mount a phono socket at locations BA and BF on the rear apron. Use 6-32 x 1/4" hardware.



Detail 1A

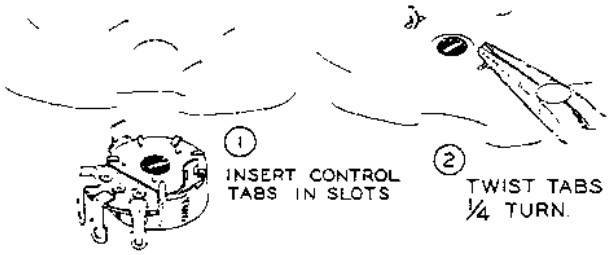
NOTE: There are two kinds of 4-lug terminal strips supplied in your kit. In the next step, be sure to use the one shown in Detail 1B. The mounting foot must come from the proper lug.

( ) Referring to Detail 1B, mount an octal tube socket at location BD and 4-lug terminal strip at BC. Use 6-32 x 3/8" hardware for the double mounting, and use 6-32 x 1/4" hardware for the other mounting. Be sure to place the keyway of the socket as shown in Pictorial 1.



Detail 1B

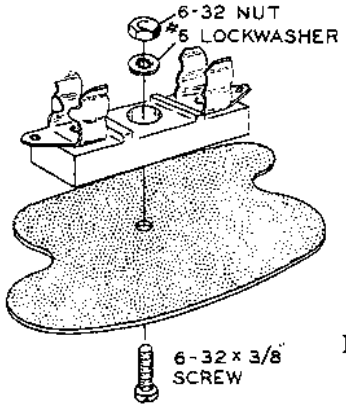
( ) R23. Mount the 10 KΩ twist-tab control (#10-57) at location BE on the rear apron. Refer to Detail 1C for the proper procedure. Positon the control lugs as shown.



Detail 1C

( ) Referring to Detail 1D, mount the fuse block at location T. Use 6-32 x 3/8" hardware. Position the fuse block as shown.

( ) Mount an octal socket at location CC. Use 6-32 x 1/4" hardware. Position the keyway as shown.



Detail 1D