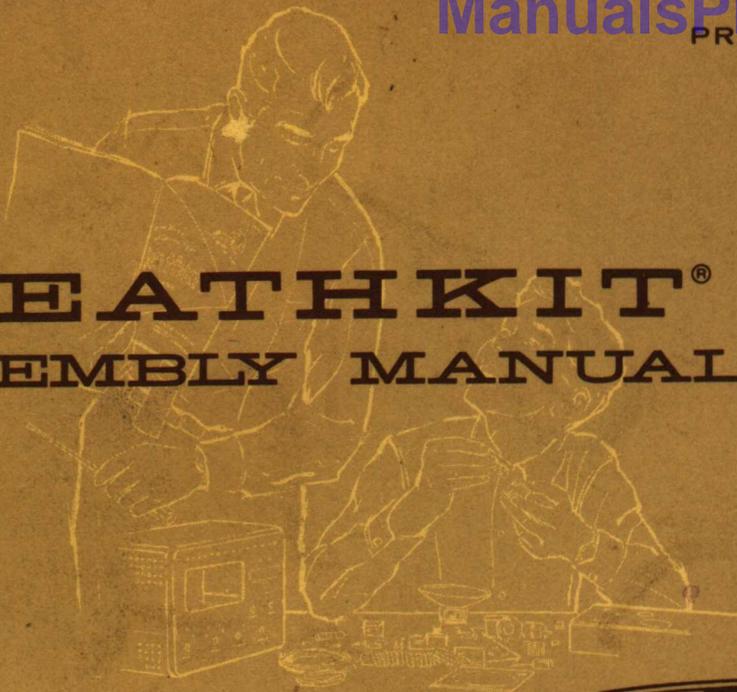


ManualsPlus.com

PRICE \$2.00

HEATH COMPANY  
BENTON HARBOR, MICHIGAN



# HEATHKIT® ASSEMBLY MANUAL



Copyright © 1962  
Heath Company  
All rights reserved

## CRYSTAL CALIBRATOR

MODEL HRA-10-1

595-525

2-6-70

## HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information .....	(616) 982-3411
Credit .....	(616) 982-3561
Replacement Parts .....	(616) 982-3571
<i>Technical Assistance:</i>	
R/C, Audio, and Electronic Organs .....	(616) 982-3310
Amateur Radio .....	(616) 982-3296
Test Equipment, Strobe Lights, Calculators,	
Clocks, Weather Instruments .....	(616) 982-3315
Television .....	(616) 982-3307
Automotive, Marine, Appliances,	
Security, General Products .....	(616) 982-3496

## YOUR HEATHKIT 90-DAY FULL WARRANTY

During your first ninety (90) days of ownership, Heath Company will replace or repair free of charge — as soon as practical — any parts which are defective, either in materials or workmanship. You can obtain parts directly from Heath Company by writing us or telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that, during the first ninety (90) days of ownership, our products, when correctly assembled, calibrated, adjusted, and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period, through no fault of yours, we will service it free upon delivery at your expense to the Heath factory, Benton Harbor, Michigan, or to any Heathkit Electronic Center (units of Schlumberger Products Corporation), or through any of our authorized overseas distributors.

You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

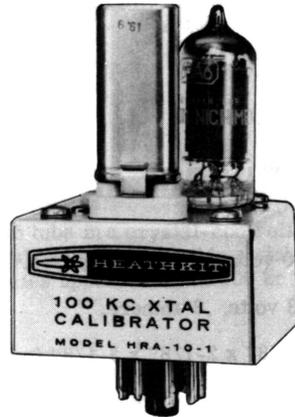
Our warranty, both express and implied, does not cover damage caused by use of corrosive solder, defective tools, incorrect assembly, misuse, fire, customer-made modifications, flood or acts of God, nor does it include re-imbursment for customer assembly or set-up time. The warranty covers only Heath products and is not extended to non-Heath allied equipment or components used in conjunction with our products or uses of our products for purposes other than as advertised.

And if you are dissatisfied with our service — warranty or otherwise — or our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan, 49022. Telephone (616) 982-3524. He'll make certain your problems receive immediate, personal attention.

HEATH COMPANY  
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice

Assembly  
and  
Operation  
of the  
**CRYSTAL  
CALIBRATOR**  
MODEL HRA-10-1



## TABLE OF CONTENTS

Specifications . . . . .	2
Introduction . . . . .	3
Circuit Description . . . . .	3
Schematic . . . . .	4
Parts List . . . . .	5
Construction Notes . . . . .	6
Step-By-Step Assembly . . . . .	8
Adjustment . . . . .	12
Operation . . . . .	12
In Case Of Difficulty . . . . .	14
Factory Repair Service. . . . .	15
Replacement Parts Price List. . . . .	16

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.



## SPECIFICATIONS

Frequency Coverage. . . . .	100 kc to at least 30 mc, in harmonics of 100 kc.
Crystal -	
Type. . . . .	Quartz, fundamental frequency.
Frequency. . . . .	100 kc $\pm$ .005%.
Pin Spacing. . . . .	.486".
Pin Size. . . . .	.050".
Tube. . . . .	6BA6
Power Requirements -	
B+ Voltage. . . . .	150 volts, 1.7 milliamperes.
Filament Voltage. . . . .	6.3 volts, .3 ampere.
Dimensions. . . . .	2-1/8" x 2-1/8" x 3-1/8" from chassis.
Net Weight. . . . .	5 oz.

## INTRODUCTION

Your HEATHKIT Model HRA-10-1 Crystal Calibrator is an accurate signal source which provides output signals at 100 kc intervals up to 30 mc.

The HRA-10-1 can be used for many purposes such as checking receiver dial calibration, checking band limits, and receiver

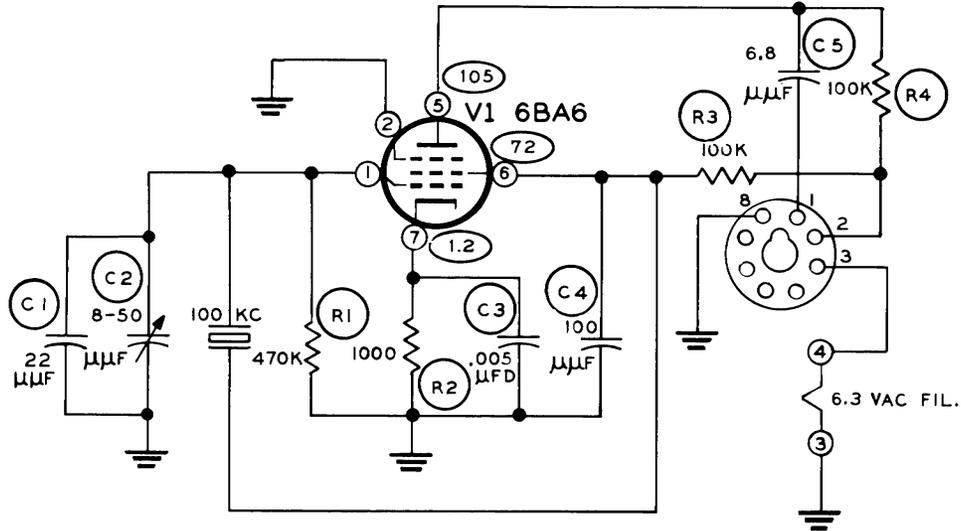
RF alignment.

The Calibrator was designed primarily to be used with the HEATHKIT HR-10 Amateur-Band Receiver, however, it can be used with most any other amateur receiver that provides the necessary operating voltages as listed in the Specifications.

## CIRCUIT DESCRIPTION

The Crystal Calibrator uses a 6BA6 tube in a crystal-controlled oscillator circuit. A 100 kc crystal is used to provide a stable 100 kc signal. Harmonic frequencies appear at each 100 kc up to 30 mc.

Ceramic trimmer capacitor C2 is used in series with the crystal to adjust the fundamental crystal frequency to exactly 100 kc. The output signal of the Calibrator is coupled through capacitor C3 to the antenna circuit of the receiver.



SCHEMATIC OF THE  
HEATHKIT®  
CRYSTAL CALIBRATOR  
MODEL HRA-10-1

ALL VOLTAGES MEASURED FROM POINT  
SHOWN TO CIRCUIT GROUND, WITH 11  
MEGOHM INPUT VTVM.  
ALL RESISTOR VALUES IN OHMS,  
K = 1,000, M = 1,000,000.

## PARTS LIST

Unpack the kit carefully and check each part against the Parts List. The numbers in front of the Part Number correspond to the picture of that part for quick and positive identification.

<u>PART No.</u>	<u>PARTS Per Kit</u>	<u>DESCRIPTION</u>
<u>Resistors</u>		
1-9	1	1000 $\Omega$ 1/2 watt (brown-black-red)
1-26	2	100 K $\Omega$ 1/2 watt (brown-black-yellow)
1-33	1	470 K $\Omega$ 1/2 watt (yellow-violet-yellow)

1



### Capacitors

20-99	1	22 $\mu\text{mf}$ resin dipped mica
20-102	1	100 $\mu\text{mf}$ resin dipped mica
21-61	1	6.8 $\mu\text{mf}$ disc ceramic
21-27	1	.005 $\mu\text{fd}$ disc ceramic
31-27	1	8-50 $\mu\text{mf}$ ceramic trimmer

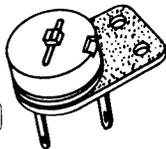
2



3



4



To order replacement parts, refer to the "Replacement Parts Price List" and use the Parts Order Form furnished with this kit.

<u>PART No.</u>	<u>PARTS Per Kit</u>	<u>DESCRIPTION</u>
<u>Hardware</u>		
250-4	1	4-40 x 3/8" screw
250-49	5	3-48 x 1/4" screw
250-56	8	6-32 x 1/4" screw

5



6



7



252-1	5	3-48 nut
252-15	1	4-40 nut
254-1	8	#6 lockwasher
254-7	7	#3 lockwasher
254-9	1	#4 lockwasher

8



9



10



11

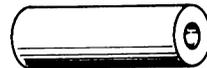


12

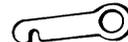


255-21	4	Tapped spacer
259-6	1	#6 small solder lug
260-29	1	Crystal holding clip
435-1	1	Octal socket mounting ring

13



14



15

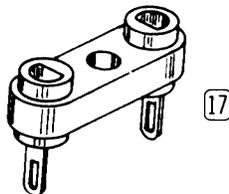
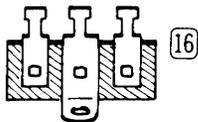


15

PART No.	PARTS Per Kit	DESCRIPTION
----------	---------------	-------------

#### Terminal Strips-Sockets-Plugs

<sup>16</sup> 431-38	1	3-lug miniature terminal strip
434-34	1	7-pin tube socket
<sup>17</sup> 434-74	1	Crystal socket
438-6	1	Octal plug



PART No.	PARTS Per Kit	DESCRIPTION
----------	---------------	-------------

#### Miscellaneous

200-487-1	1	Chassis
205-346	1	Bottom plate
404-43	1	100 kc .005% tolerance crystal
411-90	1	6BA6 tube
344-59	1	Length hookup wire
	1	Manual (see front cover for part number)
		Solder

## CONSTRUCTION NOTES

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 particu-

larly important as it may prevent errors or omissions, especially if your work is interrupted.

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 lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered.

Position the work, if possible, so that gravity will help to keep the solder where you want it. The joint to be soldered should be heated with the flat side of the soldering iron tip sufficiently to melt the solder. Apply only enough solder to the heated terminal to thoroughly wet the junction. Remove the solder and then the iron when a smooth soldered junction appears. Do not move the leads until the solder is solidified.

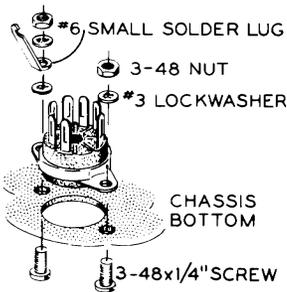
ROSIN CORE SOLDER HAS BEEN SUPPLIED WITH THIS KIT. THIS TYPE OF SOLDER MUST BE USED FOR ALL SOLDERING IN THIS KIT. ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. IF ADDITIONAL SOLDER IS NEEDED, BE SURE TO PURCHASE ROSIN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

## STEP-BY-STEP ASSEMBLY

Refer to Pictorial 1 for the following steps.

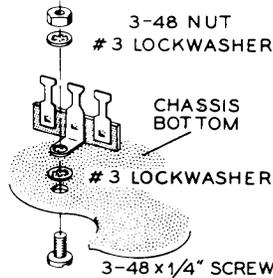
- ( ) Locate the chassis and position it as shown in Pictorial 1.

- ( ) Referring to Detail 1A, mount the 3-lug miniature terminal strip at location A. Use a 3-48 x 1/4" screw, #3 lockwashers, and a 3-48 nut.



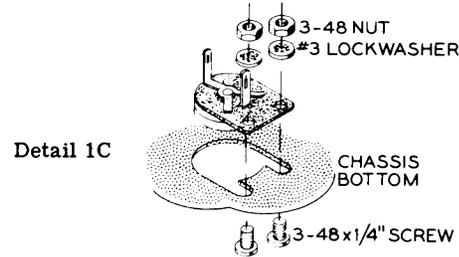
Detail 1B

- ( ) Mount the 7-pin tube socket at location V1 with a #6 small solder lug on one mounting screw. Use 3-48 x 1/4" screws, #3 lockwashers, and 3-48 nuts. See Detail 1B. Position the blank space as shown.



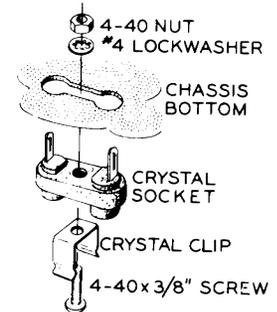
Detail 1A

- ( ) C2. Referring to Detail 1C, mount the ceramic trimmer capacitor at location B. Use 3-48 x 1/4" screws, #3 lockwashers and 3-48 nuts.

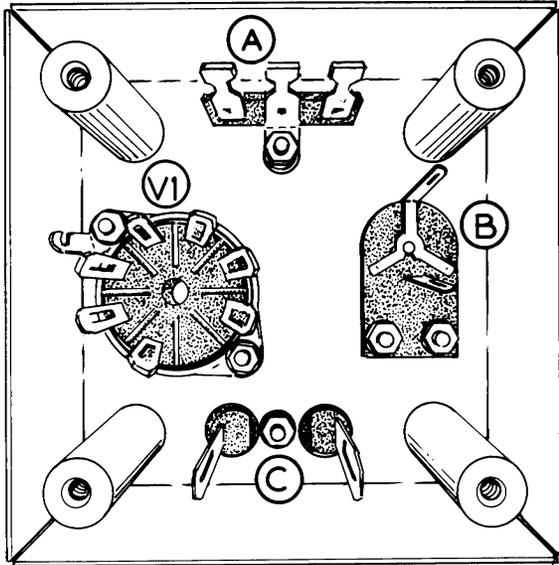


Detail 1C

- ( ) Mount the crystal socket and crystal clip at location C. Use a 4-40 x 3/8" screw, #4 lockwasher, and a 4-40 nut. See Detail 1D. Do not overtighten the hardware or you may crack the crystal socket.

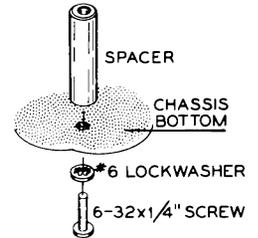


Detail 1D



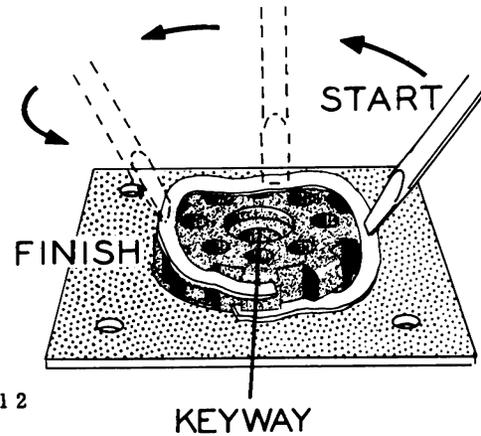
Pictorial 1

- ( ) Referring to Detail 1E, mount a tapped spacer in each corner of the chassis. Use 6-32 x 1/4" screws and #6 lockwashers.



Detail 1E

- ( ) Locate the bottom plate and referring to Pictorial 2, mount the octal plug. Secure the plug with the octal plug retaining ring. Position the keyway as shown in Pictorial 2.

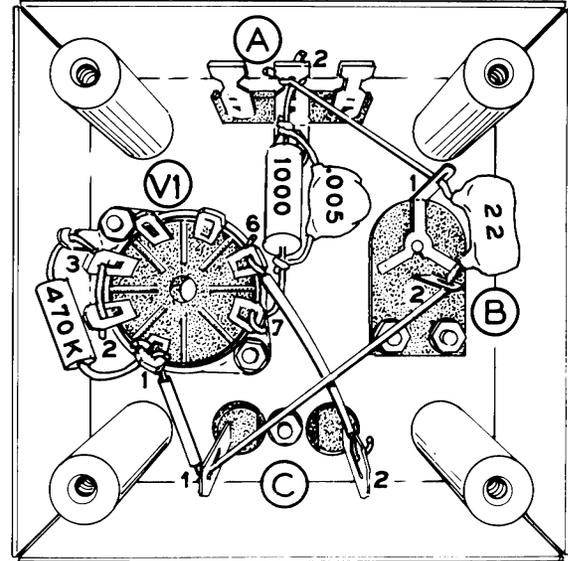


Pictorial 2

Refer to Pictorial 3 for the following steps.

**NOTE:** Where a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the solder instruction (S-2), one entering and one leaving the connection.

- ( ) C1. Place one lead of a 22  $\mu\text{mf}$  resin dipped capacitor through lug 1 of trimmer capacitor B (NS) and connect it to lug 2 of terminal strip A (NS). Now solder lug 1 of B (S-2).
- ( ) Connect the other lead of this capacitor through lug 2 of B (S-2) to lug 1 of socket C (NS).
- ( ) Connect a 1-1/4" wire from lug 1 of socket C (S-2) to lug 1 tube socket V1 (NS).
- ( ) Connect a 2" hookup wire from lug 6 of tube socket V1 (NS) to lug 2 of crystal socket C (S-1).
- ( ) R1. Connect a 470 K $\Omega$  (yellow-violet-yellow) 1/2 watt resistor from lug 1 of tube socket V1 (S-2) to the solder lug nearest lug 3 of V1 (NS).
- ( ) Place one end of a length of bare wire through lug 3 (NS) to lug 2 (S-1) of tube socket V1. Connect the other end of this wire to the solder lug nearest lug 3 of V1 (S-2).
- ( ) R2, C3. Referring to Detail 3A, prepare a 1000  $\Omega$  (brown-black-red) 1/2 watt resistor and a .005  $\mu\text{fd}$  disc ceramic capacitor combination.
- ( ) Connect this resistor capacitor combination from lug 2 of terminal strip A (NS) to lug 7 of tube socket V1 (S-1).



Pictorial 3



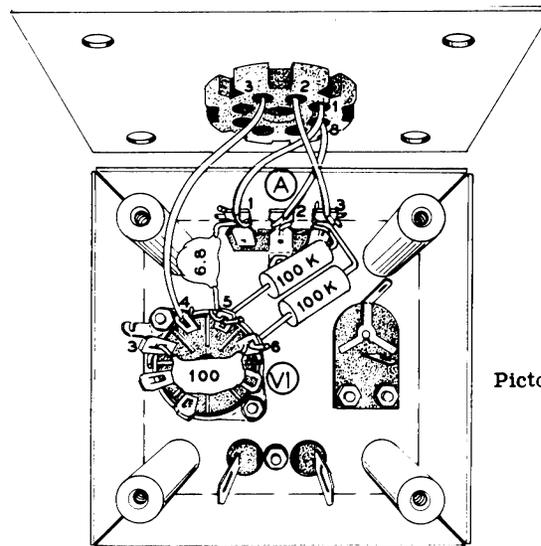
Detail 3A

Refer to Pictorial 4 for the following steps.

- ( ) R4. Connect a 100 K $\Omega$  (brown-black-yellow) 1/2 watt resistor from lug 3 of terminal strip A (NS) to lug 5 of tube socket V1 (NS).
- ( ) R3. Connect a 100 K $\Omega$  (brown-black-yellow) 1/2 watt resistor from lug 3 of terminal strip A (NS) to lug 6 of tube socket V1 (NS).
- ( ) C5. Connect a 6.8  $\mu$ f disc ceramic capacitor from lug 5 of tube socket V1 (S-2) to lug 1 of terminal strip A (NS).
- ( ) C4. Connect a 100  $\mu$ f resin dipped mica capacitor between lugs 3 (S-3) and 6 (S-3) of tube socket V1.

NOTE: In the following four steps, remove 1/4" of insulation from one end of each wire and 1/2" of insulation from the other end. Connect the ends stripped 1/2" to the octal plug as directed.

- ( ) Connect a 2" wire from lug 2 of terminal strip A (S-3) to lug 8 of the octal plug (S-1).
- ( ) Connect a 2-1/2" wire from lug 1 of terminal strip A (S-2) to lug 1 of the octal plug (S-1).
- ( ) Connect a 3" wire from lug 3 of terminal strip A (S-3) to lug 2 of the octal plug (S-1).
- ( ) Connect a 3" wire from lug 4 of tube socket V1 (S-1) to lug 3 of the octal plug (S-1).
- ( ) Fold the bottom plate over the bottom of the chassis and secure each corner with a 6-32 x 1/4" screw and #6 lock-washer.
- ( ) Install the 6BA6 in tube socket V1.



Pictorial 4

- ( ) Install the 100 kc crystal in the crystal socket.
- ( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the rear of the cabinet (or chassis). Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.

This completes the assembly of the Crystal Calibrator.

## ADJUSTMENT

### USING THE HEATHKIT HRA-10-1 100 KC CRYSTAL CALIBRATOR

- ( ) Plug the calibrator into the Calibrator socket in the HR-10 Receiver.
- ( ) Couple the antenna connector of the HR-10 Receiver to the antenna connector of another receiver capable of receiving WWV at 2.5 mc, 5 mc, 10 mc, or 15 mc. If this is not possible, a receiver tuned to a standard Broadcast station, operating at an even multiple of 100 kc can be used.
- ( ) Turn on the HR-10 and the other receiver. Set the CAL switch of the HR-10 Receiver in the CAL position.
- ( ) Adjust the ceramic trimmer capacitor in the Calibrator

with an insulated screwdriver for "zero beat" during the period when no tone modulation is applied to the WWV carrier. (Zero beat will be recognized as the point at which a harmonic of 100 kc corresponds to the frequency of the station that is tuned in on the receiver. As zero beat is approached, a tone, decreasing in frequency until it finally stops, will be heard from the receiver speaker.) To be sure you have zero beat, set the CAL switch to OFF and then back to CAL.

If a receiver other than the HR-10 is used for adjustment, the above procedure should still be followed.

This completes the adjustment of the HRA-10-1 Crystal Calibrator.

## OPERATION

Use with the HEATHKIT HR-10 Basic Amateur Band Receiver.

- ( ) Install the Crystal Calibrator in the Calibrator socket on the top of the Receiver chassis.
- ( ) Turn the Receiver on and allow it to warm up.
- ( ) Place the CAL switch in the CAL position. Set the BFO switch to BFO.

- ( ) Turn the MAIN TUNING control to a 100 kc point on the Receiver dial. A heterodyne should be heard in the speaker if the Receiver is in calibration. If the heterodyne is not heard, calibrate the Receiver by adjusting the CAL RESET control until the heterodyne is heard at the 100 kc points on the dial.

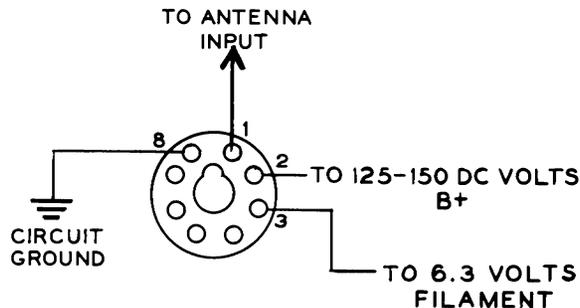
There are many other uses for a crystal calibrator, such as checking RF alignment, checking transmitter VFO accuracy, etc.

It would not be possible to cover all of these functions in detail here. Information concerning other uses of a crystal calibrator can be found in the ARRL Handbook (American Radio Relay League, West Hartford, Connecticut).

### USE WITH OTHER AMATEUR RECEIVERS

The HRA-10-1 Calibrator does not contain its own power supply,

therefore, it will be necessary for you to connect the B+ and filament circuits of the Calibrator to the appropriate points in your receiver. Also, it will be necessary for you to connect the output of the Calibrator to the antenna input of the receiver for signal injection. These connections are shown in the following Schematic Diagram. Notice that the B+ voltage is connected through a SPST switch so that the Calibrator can be turned On and Off independently of your receiver.



## 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, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.
  3. Make sure that the tube lights up properly.
  4. Check the tube with a tube tester or by substitution of a tube of the same type and known to be good.
  5. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.
  6. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.
  7. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10%.
  8. A review of the Circuit Description will prove helpful in indicating where to look for trouble.
- NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the Service and Warranty sections of the "Kit Builders Guide", and to the "Factory Repair Service" information on Page 15 of this Manual.

## FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) If you wish, you can deliver your kit to a nearby Heath Authorized Service Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heath Authorized Service Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heath Authorized Service Center, please ship it to the factory at Benton Harbor, Michigan and follow the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan.

Check the equipment to see that all parts and screws are in place. (Do not include wooden cabinets when shipping receivers, tuners, amplifiers, or TV sets, as these are easily damaged in shipment.) Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least **THREE INCHES** of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company  
Service Department  
Benton Harbor, Michigan 49022

## REPLACEMENT PARTS PRICE LIST

To order parts, use the Parts Order Form furnished with this kit. If this Form is not available, refer to "Replacement Parts" in the "Kit Builders Guide."

<u>PART No.</u>	<u>PRICE Each</u>	<u>DESCRIPTION</u>
<b>RESISTORS</b>		
1-9	.10	1000 $\Omega$ 1/2 watt
1-26	.10	100 K $\Omega$ 1/2 watt
1-33	.10	470 K $\Omega$ 1/2 watt
<b>CAPACITORS</b>		
20-99	.15	22 $\mu$ f resin dipped mica
20-102	.15	100 $\mu$ f resin dipped mica
21-61	.10	6,8 $\mu$ f disc ceramic
21-27	.10	.005 $\mu$ f disc ceramic
31-27	.85	8-50 $\mu$ f ceramic trimmer
<b>HARDWARE</b>		
250-4	.05	4-40 x 3/8" screw
250-49	.05	3-48 x 1/4" screw
250-56	.05	6-32 x 1/4" screw
252-1	.05	3-48 nut
252-15	.05	4-40 nut
254-1	.05	#6 lockwasher
254-7	.05	#3 lockwasher
254-9	.05	#4 lockwasher
255-21	.20	Tapped spacer
259-6	.05	#6 small solder lug
260-29	.25	Crystal holding clip
435-1	.10	Octal socket mounting ring

<u>PART No.</u>	<u>PRICE Each</u>	<u>DESCRIPTION</u>
<b>TERMINAL STRIPS-SOCKETS-PLUGS</b>		
431-38	.10	3-lug miniature terminal strip
434-34	.15	7-pin tube socket
434-74	.15	Crystal socket
438-6	.35	Octal plug
<b>MISCELLANEOUS</b>		
200-487-1	.50	Chassis
205-346	.20	Bottom plate
404-43	5.00	100 kc .005% tolerance crystal
411-90	.95	6BA6 tube
344-59	.05/ft	Hookup wire
331-6	.15	Solder
	2.00	Manual (See front cover for part number.)

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from an authorized Service Center or Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

## CUSTOMER SERVICE

### REPLACEMENT PARTS

If you need a replacement part, please fill in the Parts Order Form that is furnished and mail it to the Heath Company. Or, if you write a letter, include the:

- Part number and description as shown in the Parts List.
- Model number and Series number from the blue and white label.
- Date of purchase.
- Nature of the defect.

Please do not return parts to the factory unless they are requested. Parts that are damaged through carelessness or misuse by the kit builder will not be replaced without cost, and will not be considered in warranty.

Parts are also available at the Heathkit Electronic Centers listed in your catalog. Be sure to provide the Heath part number. Bring in the original part when you request a warranty replacement from a Heathkit Electronic Center.

NOTE: Replacement parts are maintained specifically to repair Heathkit products. Parts sales for other reasons will be declined.

### TECHNICAL CONSULTATION

Need help with your kit? . . . . Self-Service? . . . . Construction? . . . . Operation? . . . . Call or write for assistance. You'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek. . . please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

### REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit C.O.D. for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by preferred express, United Parcel Service, or insured Parcel Post to:

Heath Company  
Service Department  
Benton Harbor, Michigan 49022

# HEATH COMPANY

BENTON HARBOR, MICHIGAN

**THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM**