

# Instructions

for the



## UNIVERSAL 425/850 HZ FILTER CIRCUIT BOARD ACCESSORY

Model HDA-3030-2

### Table Of Contents

Introduction .....	2
Parts List .....	3
Step-By-Step Assembly .....	5
Installation And Alignment .....	9
Operation .....	11
Circuit Description .....	12
X-Ray View .....	13
Service Information .....	14
Schematic .....	Illustration Booklet, Page 6

## INTRODUCTION

The Universal 425/850 Hz Filter Circuit Board Accessory, Model HDA-3030-2, consists of three very stable, high Q, low gain stages of two-pole active bandpass filters. You can assemble the circuit board to provide either 425 Hz frequency shift, or 850 Hz frequency shift. If you desire both frequencies, you will need two HDA-3030-2 kits. The circuit board plugs easily into the HD-3030 Terminal Interface with no required circuit modifications.

## PARTS LIST

Remove the parts from Universal 425/850 Hz Filter Pack and check each part against the following list. Do not remove components that are supplied on a tape from the tape until you use them in a step. Return any part that is in an individual envelope back into the envelope after you have identified it until that part is called for in a step. Do not throw away any packing material until you account for all the parts.

To order a replacement part, always include the PART NUMBER. 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 this Manual. For prices, refer to the separate "Heath Parts Price List."

### TAPED COMPONENTS

Refer to the enclosed "Taped Component Chart" and follow the instructions at the top of that chart to check the components. The taped parts are in assembly sequence. It is not necessary to check them against the Parts List.

HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
-------------------	------	-------------	----------------------

HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
-------------------	------	-------------	----------------------

### RESISTORS

All 5% resistors have four color bands (last band gold). The last band (gold) will not be called out.

All resistors are 1/4-watt.

6-621-12	3	620 Ω (blu-red-brn)	R5, R8, R12
6-103-12	1	10 kΩ (brn-blk-org)	R10
6-363-12	3	36 kΩ (org-blu-org)	R1, R7, R11
6-433-12	3	43 kΩ (yel-org-org)	R1, R7, R11
6-154-12	3	150 kΩ (brn-grn-yel)	R6, R9, R13
6-184-12	3	180 kΩ (brn-gry-yel)	R6, R9, R13
6-474-12	1	470 kΩ (yel-viol-yel)	R14

### DIODES

56-56	6	1N4149	D1 and select
-------	---	--------	---------------

**NONTAPED COMPONENTS**

The following parts are not taped on strips. The key numbers correspond to the numbers on the "Parts Pictorial (Illustration Booklet, Page 1)."

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

**CAPACITORS**

A1	21-176	2	.01 $\mu$ F ceramic	C9, C10
A2	27-227	6	.005 $\mu$ F Mylar	C3 - C8

**MISCELLANEOUS**

C1	10-1102	3	500 $\Omega$ control	P1, P2, P3
	85-2862-1	1	Filter circuit board	
C2	432-1111	1	5-hole right angle socket	
C3	432-1023	1	10-hole right angle socket	
C4	432-1039	1	15-pin plug	
C5	434-230	2	8-pin IC socket	
C6		1	Blue and white label	
	597-260	1	Parts Order Form	
	597-3378	1	Taped Component Chart	
		1	Instruction Booklet (See front page for part number)	
			Solder	

**TRANSISTOR - INTEGRATED CIRCUIT (IC)**

NOTE: The transistor and integrated circuit may be marked for identification in any one of the following four ways:

1. Part number.
2. Type number. (For the integrated circuits, this refers only to the numbers and letters shown in **BOLD** print in the Parts List. Disregard any other numbers or letters shown on the IC.)
3. Part number and type number.
4. Part number with a type number other than the one shown.

B1	417-987	1	MPF111 transistor	Q1
B2	442-21	2	<b>MC1458</b> integrated circuit	IC1, IC2

## STEP-BY-STEP ASSEMBLY

You can assemble either a 425 Hz filter or an 850 Hz filter from the parts that are supplied. Refer to the "Taped Component Chart" supplied with this Manual and prepare the component strip for the frequency of the filter you wish to assemble. Then return to the appropriate steps that follow.

### 425 (2550) Hz FILTER

If you have prepared the component strip by removing all "850" components, those remaining on the strip should be in the correct sequence for use in the following steps.

Refer to Pictorial 1 (Illustration Booklet, Page 1) for the following steps.

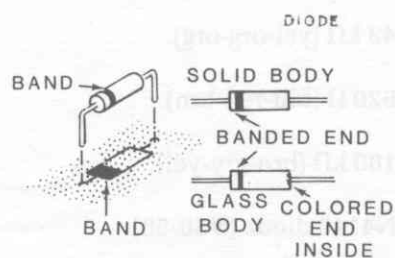
**NOTE:** The circuit board drawings for the resistor and diode installation, as shown in Pictorial 1, are divided into two sections. These sections show you which area you will be working in for a specific series of steps. The sequence is from top-to-bottom and from left-to-right.

- ( ) Position the circuit board with the component side facing up and install the following components.

Refer to Section 1 of the Pictorial for the following steps.

- ( ) R1: 43 k $\Omega$  (yel-org-org).

Install five 1N4149 diodes (#56-56) as follows. Position the banded ends as shown with the diodes over their callouts. Make sure you use the correct circuit board holes.



**CAUTION:** ALWAYS POSITION THE BANDED END OF A DIODE AS SHOWN ON THE CIRCUIT BOARD.

- ( ) Diode at 0.  
 ( ) Diode at 3.  
 ( ) Diode at 4.  
 ( ) Diode at 5.  
 ( ) Diode at 6.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

Refer to Section 2 of the Pictorial and install the following components.

- ( ) R5: 620  $\Omega$  (blu-red-brn).
- ( ) R6: 180 k $\Omega$  (brn-gry-yel).
- ( ) R7: 43 k $\Omega$  (yel-org-org).
- ( ) R8: 620  $\Omega$  (blu-red-brn).
- ( ) R9: 180 k $\Omega$  (brn-gry-yel).
- ( ) R10: 10 k $\Omega$  (brn-blk-org).
- ( ) R11: 43 k $\Omega$  (yel-org-org).
- ( ) R12: 620  $\Omega$  (blu-red-brn).
- ( ) R13: 180 k $\Omega$  (brn-gry-yel).
- ( ) D1: 1N4149 diode (#56-56).
- ( ) R14: 470 k $\Omega$  (yel-viol-yel).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

This completes the installation of resistors and diodes from the Taped Component Chart. Proceed to "General Assembly".

### 850 (2975) Hz FILTER

If you have prepared the component strip by removing all "425" components, those remaining on the strip should be in the correct sequence for use in the following steps.

Refer to Pictorial 2 (Illustration Booklet, Page 2) for the following note and steps.

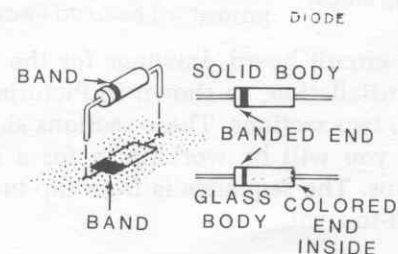
NOTE: The circuit board drawings for the resistor and diode installation, as shown in Pictorial 2, are divided into two sections. These sections show you which area you will be working in for a specific series of steps. As before, the sequence is from top-to-bottom and from left-to-right.

- (✓) Position the circuit board with the component side facing up.

Refer to Section 1 of the Pictorial and install the following components.

- (✓) R1: 36 k $\Omega$  (org-blu-org).

Install three 1N4149 diodes (#56-56) as follows. Position the banded ends as shown with the diodes over their callouts. Make sure to use the correct circuit board holes.



CAUTION: ALWAYS POSITION THE BANDED END OF A DIODE AS SHOWN ON THE CIRCUIT BOARD.

- (✓) Diode at 2.
- (✓) Diode at 3.
- (✓) Diode at 7.
- (✓) Solder the leads to the foil and cut off the excess lead lengths.

# Heathkit®

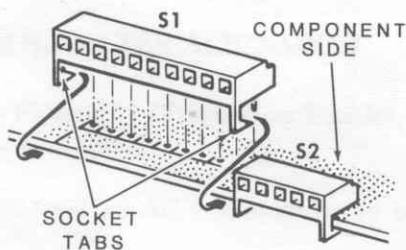
Refer to Section 2 of the Pictorial and install the following components.

- (✓) R5: 620 Ω (blu-red-brn).
- (✓) R6: 150 kΩ (brn-grn-yel).
- (✓) R7: 36 kΩ (org-blu-org).
- (✓) R8: 620 Ω (blu-red-brn).
- (✓) R9: 150 kΩ (brn-grn-yel).
- (✓) R10: 10 kΩ (brn-blk-org).
- (✓) R11: 36 kΩ (org-blu-org).
- (✓) R12: 620 Ω (blu-red-brn).
- (✓) R13: 150 kΩ (brn-grn-yel).
- (✓) D1: 1N4149 diode (#56-56).
- (✓) R14: 470 kΩ (yel-viol-yel).
- (✓) Solder the leads to the foil and cut off the excess lead lengths.

## GENERAL ASSEMBLY

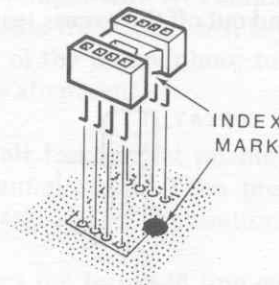
Refer to Pictorial 3 (Illustration Booklet, Page 2) for the following steps.

- (✓) Install a 10-hole right angle connector at S1 on the component side of the circuit board.



- (✓) Install a 5-hole right angle connector at S2.
- (✓) Solder the 15 socket pins to the foil.

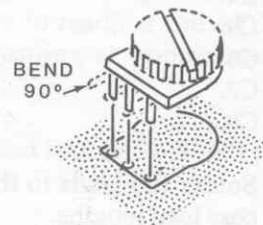
Install two 8-pin IC sockets as follows. Make sure you match the socket identification mark with the index mark on the circuit board. Solder the pins to the foil after you install each socket.



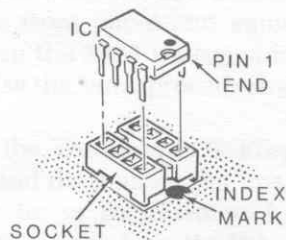
- (✓) IC1.
- (✓) IC2.

Bend the leads of the 500 Ω controls 90°. Then install the 500 Ω controls as follows. Keep the controls flat against the circuit board. Solder the pins to the foil and cut off the excess pin lengths.

- (✓) P1.
- (✓) P2.
- (✓) P3.



Install two MC1458 ICs (#442-21) as follows. Remember to position the pin 1 end as shown.

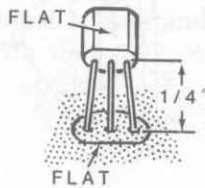


- (✓) IC1.
- (✓) IC2.



Refer to Pictorial 4 (Illustration Booklet, Page 2) for the following steps.

- (✓) Q1: MPF111 transistor (417-987). Remember to position the flat of the transistor over the flat on the circuit board. Solder the leads to the foil and cut off the excess lead lengths.



Install two .01  $\mu$ F ceramic capacitors as follows:

- (✓) C9.
- (✓) C10.

Install six .005  $\mu$ F Mylar capacitors as follows:

- (✓) C3.
- (✓) C4.
- (✓) C5.
- (✓) C6.
- (✓) C7.
- (✓) C8.

- (✓) Solder the leads to the foil and cut off the excess lead lengths.

- (✓) Use a permanent marker and write "2550" for the 425 Hz Filter, or "2975" for the 850 Hz Filter in the indicated circuit board rectangle.

NOTE: You may discard the alternate components that you removed from the strip.

**CIRCUIT BOARD CHECKOUT**

Carefully inspect the circuit board for the following problems.

- (✓) Unsoldered connections.
- (✓) Poor solder connections.
- (✓) Solder bridges between foil patterns.
- (✓) Protruding leads which could touch together.
- (✓) Check the transistor and IC's for proper installation.
- (✓) Check each diode for the proper positioning of the banded end.

This completes the circuit board assembly. Proceed to "Installation And Alignment."



## INSTALLATION AND ALIGNMENT

NOTE: If you are assembling this accessory along with the HD-3030 Terminal, skip the following two cabinet disassembly steps.

Refer to Pictorial 5 (Illustration Booklet, Page 3) for the following step.

- ( ) Remove the cabinet top and bottom from the Terminal Interface and set them aside.

Refer to Pictorial 6 (Illustration Booklet, Page 4) for the following steps.

- ( ) Remove the circuit board support from the chassis and set it and the hardware aside.

NOTE: If you have purchased filter circuit boards for both 2250 Hz and 2975 Hz, install the 15-pin plugs at both of the main circuit board locations in the following step. Otherwise, use the plug location which applies to your circuit board.

- ( ) Install the 15-pin plug on the main circuit board of the Terminal Interface at 2250 HZ or 2975 Hz. Insert the shorter plug pins into the circuit board holes and solder them to the foil. Keep the plug body against the circuit board.
- ( ) Mount the 425/850 HZ filter over the 15-pin plug(s) at 2550 Hz or 2975 Hz as shown. Make sure you insert the circuit board socket over all of the plug pins.

### 425/850 HZ FILTER ALIGNMENT

Refer to Pictorial 7 (Illustration Booklet, Page 5) for the following steps.

You will need an AC voltmeter or an oscilloscope to align the Filter.

NOTE: Do not connect the line cord plug until you are told to do so.

- ( ) Bend a 1" length of solid wire (use a cutoff resistor lead) into a "U" shape. Then refer to the inset drawing of the Pictorial and insert the wire into pins 12 and 13 of the I/O connector on the rear panel.

NOTE: This jumper wire will connect the audio output of the audio frequency shift keyer (AFSK) to the audio input of the demodulator to provide a signal for use in the alignment.

- ( ) Press all front panel pushbutton switches to their out position. Then press in the Power, Send, and 170 Hz pushbuttons.
- ( ) Connect the Interface line cord plug to a 120 volt AC receptacle.
- ( ) Connect your AC voltmeter (or oscilloscope) common lead to the chassis. Be sure the instrument is turned on and set to measure 10 volts.

NOTE: As you align the filter(s) in the following steps, connect the test probe of your meter (or oscilloscope) to test point TP of the filter board(s) you are tuning. As you peak the adjustments on the board(s), you may have to readjust the AFSK **Level** control to keep the reading at approximately 0.5 volts.

- ( ) Press the SEND and REVERSE SEND pushbuttons.
- ( ) 2550 Hz filter for 425 Hz shift: Press the 425 Hz pushbutton and adjust the three controls on the 2550 Hz board for maximum reading. Readjust AFSK **Level** control as before.
- ( ) 2975 Hz filter for 850 Hz shift: Select 850 Hz on the front panel and adjust the three trimmers on the 2975 Hz board for maximum reading. Use the same procedure as necessary.
- ( ) Press the Terminal POWER pushbutton to off (out) and disconnect the line cord. Disconnect the meter or oscilloscope from the Terminal and the jumper from the I/O connector.
- ( ) Remove the backing from the blue and white label and press the label onto the side of the HD-3030 chassis.

This completes the alignment of the 425/850 Hz Filter Accessory. If you are installing the 170 Hz Pre-selector Accessory in your Terminal, proceed to that Manual at this time. If not, proceed to the following steps.

Refer back to Pictorials 5 and 6 (Illustration Booklet, Pages 3 and 4) for the following steps.

- ( ) Position the circuit board support bracket over the top rear corners of the circuit boards and align the bracket slots with the holes in the chassis sides. Secure the bracket with two 6-32  $\times$  1/4" screws.
- ( ) Mount the cabinet bottom and cabinet top to the chassis with four 6-32  $\times$  1/4" flat head screws.

This completes the "Installation And Alignment." If you are assembling the HA-3030 Terminal Interface with this accessory, return to "Operation" in that Manual at this time, or, you may finish reading the information in this Manual first.

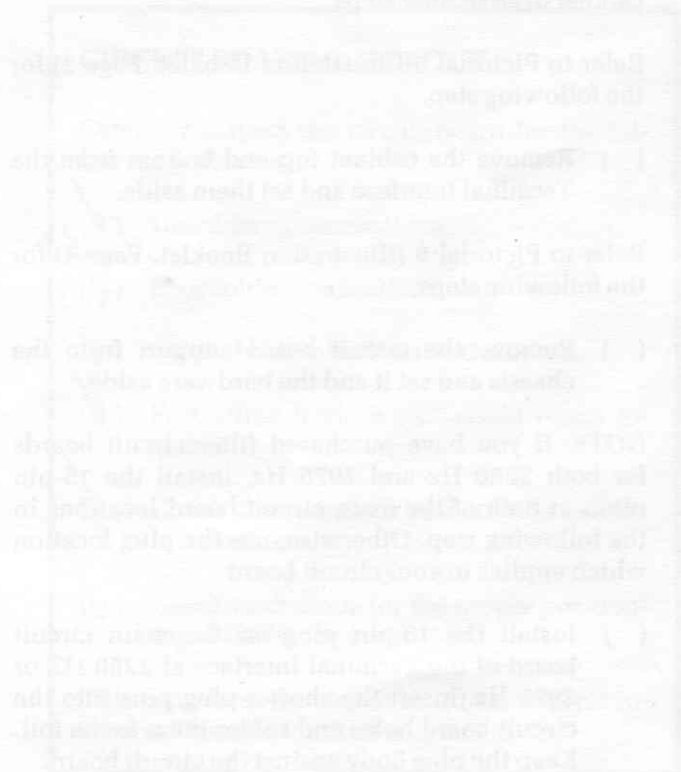


Fig. 1. Mount the 6-32  $\times$  1/4" flat head screws over the 250H HZ board in chassis. Mount the circuit board over the 250H HZ board.

ASSEMBLY ALIGNMENT

Refer to Pictorial 7 (Illustration Booklet, Page 7) for the following steps.

You will need an AC voltmeter or an oscilloscope to check the power.

1. Check the power supply. The line cord plug will not fit into a 1/2" hole of 250H HZ, use a 1/4" hole. Insert the 1/4" plug into the 1/4" hole and insert the line cord into the 1/2" hole. The line cord plug is shown in Pictorial 7.

## OPERATION

The Universal 425/850 Hz Filter provides a narrow bandpass filter for 425 (2250) Hz or 850 (2975) Hz shift operation. The center frequency is not compatible with the CW demodulator. The filter band width allows reliable operation up to 300 baud ASCII. To activate this filter, press the 425 Hz or 850 Hz pushbutton so it remains in and an orange flag appears in the pushbutton window. This places the filter in series with the HD-3030 Terminal Interface limiter circuit.

## CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (Illustration Booklet, Page 6) while you read this "Circuit Description."

### 425 HZ FILTER

The 425 Hz filter circuit consists of three stages of two-pole active bandpass filters. The first and second filter stages consist of IC1, while the third stage consists of the first half of IC2. Resistor R1 is the input resistor. (Resistors R2, R3, R4, and capacitors C1 and C2 are not used in this circuit.) Each stage is independently tuned with a variable control at P1, P2, and P3. IC2B is a comparator that switches the bias voltage for the gate of FET (field effect transistor) Q1. This switches the audio output from the third filter stage to the output connection at pin 15 of the circuit board. Transistor Q1 is switched off when the output at pin 7 of IC2B is approximately -10 volts DC. Q1 switches on when the output of

IC2B changes to +10 volts DC. Pin 7 of IC2B is at -10 volts when the inverting input at pin 6 is at a higher voltage level than the noninverting input at pin 5.

The frequency select diodes 0 through 7 select the output frequency of the audio frequency shift keyer.

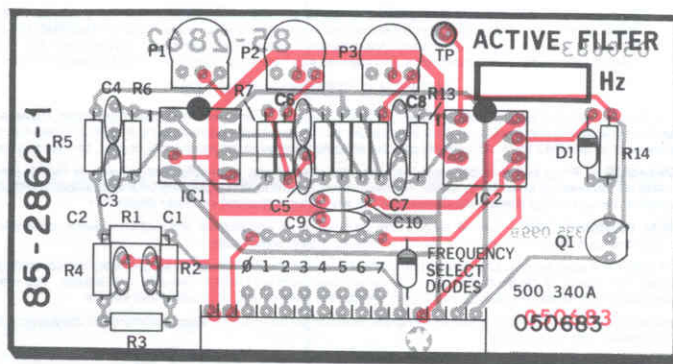
### 850 HZ FILTER

In addition to the above, the 850 Hz filter uses additional phase shift network which is formed by resistors R2, R3, R4, and capacitors C1 and C2. This phase shift network provides an additional delay to the signal which passes through the filter, to provide the proper phase relationship between the main and space signals and give the proper oscilloscope pattern which may be used for tuning.

# CIRCUIT BOARD X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

- A. Find the circuit component number (R5, C3, etc.) on the "X-Ray View."
- B. Locate this same number in the "Circuit Component Number" column of the "Parts List."
- C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



(Shown from the component side.  
The foil on the component side is shown in red.)



# SERVICE INFORMATION

The following Heath Company services are available if you need them: Replacement Parts, Technical Consultation, and Factory Service. Address all correspondence to:

HEATH COMPANY  
Benton Harbor, Michigan 49022

For prompt service, use a separate letter for each department you write to.

Replacement parts and carry in repair service are also available at your nearest Heathkit Electronic Center. These Centers are listed in your Heath Catalogs.

## REPLACEMENT PARTS

If a replacement part is needed, use the warranty parts order form or a letter including the following information.

1. Part number and description.
2. Model Number of the equipment.

If your equipment is in the Warranty period, add:

3. Date, location and invoice number of purchase.
4. Nature of defect.

Heath Company will fill your order promptly. Save but DO NOT RETURN PARTS unless they are requested. Parts that are damaged through carelessness or misuse by the customer are not replaced without cost.

## TECHNICAL CONSULTATION

You can write or call our Technical Consultants for help with any Heath equipment, or for answers to any questions about the use of this equipment.

The completeness and accuracy of the advice mailed back to you depends entirely on the information in your letter. Be sure to include:

1. The Model Number and Series Number of the equipment (on blue and white identification label).
2. Date of purchase.

3. An exact description of the difficulty. Include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.
4. List everything you have done in attempting to correct the difficulty.

## FACTORY SERVICE

If you do not have qualified repair services at your disposal, you can return your equipment to the Heath Company Service Department to have it repaired for a minimum service fee. (Equipment that has been modified will not be accepted for repair.) Refer to Shipping Instructions for details on how to package and ship the equipment.

To be eligible for replacement parts under the terms of the Warranty, equipment returned for factory service 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.)

## SHIPPING INSTRUCTIONS

Check the equipment to see that all parts are in place. 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. Ship it by prepaid UPS or insured Parcel Post to:

HEATH COMPANY  
SERVICE DEPARTMENT  
Benton Harbor, Michigan 49022

Include a letter, containing the following information:

1. Your name and return address.
2. Date of purchase.
3. Complete description of the difficulty.
4. 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.

## YOUR HEATH FACTORY ASSEMBLED PRODUCT ONE-YEAR LIMITED WARRANTY

Welcome to the Heath family. We believe you will be pleased with the performance of your new Heath assembled product. Please read this consumer protection plan carefully. It is a "LIMITED WARRANTY" as defined in the U.S. Consumer Product Warranty and Federal Trade Commission Improvement Act. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

### HEATH'S RESPONSIBILITY

**PARTS** — Replacement for factory defective parts will be supplied free for one year from date of purchase. Replacement parts are warranted for the remaining portion of the original warranty period. You can obtain warranty parts direct from Heath Company by writing or telephoning us at (616)982-3571. And we will pay the shipping charges to get those parts to you...anywhere in the world.

**SERVICE LABOR** — For a period of one year from the date of purchase, any malfunction caused by factory defective parts or workmanship will be corrected at no charge to you. You must deliver the unit at your expense to the Heath factory, any Heathkit Electronic Center (units of Veritechnology Electronics Corporation) or any of our authorized overseas distributors.

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

**NOT COVERED** — Repair service, adjustments and calibration due to misuse, abuse or negligence are not covered by this warranty. Unauthorized modification of the product or of any furnished component will void this warranty in its entirety. This warranty does not include reimbursement for inconvenience, installation, set-up time, loss of use, or unauthorized service.

This warranty covers only Heath factory assembled products and is not extended to other equipment and components that a customer uses in conjunction with our products.

SUCH REPAIR AND/OR PARTS REPLACEMENT SHALL BE THE SOLE REMEDY OF THE CUSTOMER AND THERE SHALL BE NO LIABILITY ON THE PART OF HEATH FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY LOSS OF BUSINESS OR PROFITS, WHETHER OR NOT FORESEEABLE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

### OWNER'S RESPONSIBILITY

**EFFECTIVE WARRANTY DATE** — Warranty begins on the date of first consumer purchase. You must supply a copy of your proof of purchase when you request warranty service or parts.

**OPERATING MANUAL** — Read your operating instructions carefully so that you will fully understand the proper operation and function of your unit.

**ACCESSORY EQUIPMENT** — Performance malfunctions involving connections to (or interfacing with) other non-Heath equipment are not covered by this warranty and are the owner's responsibility.

**SHIPPING UNITS** — Follow the packing instructions published in your manual. Damage due to inadequate packing cannot be repaired under warranty.

If you are not satisfied with our service (warranty or otherwise) or our products, write directly to our Director of Customer Service, Heath Company, Benton Harbor MI 49022. He will make certain your problems receive immediate, personal attention.

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.