

# Heathkit®

Mail Order Catalog No. 865 SPRING 1984



Helping you make things better

## GC-1195 Digital Floor Clock — a stylish timepiece



Add elegance to any room in your home with this distinctive clock. Housed in five feet of handsome simulated walnut veneer cabinet with anodized corner pieces, the bright, 3/4"-high digital readout adjusts to surrounding light for a subtle amber display.

An excellent first-kit project, the GC-1195 displays hours and minutes with the center colon pulsing once each second. Set the correct time with two easy-to-use time advance switches on the bottom of the clock chassis.

Show off your knick-knacks, plants or books on the four 1/4"-thick smoked glass shelves. And for Old World ambiance, add the electronically synthesized "Westminster Chimes" below. Operates on 120/240 VAC. 60 1/2" H x 14" W x 9 1/2" D.

Kit GC-1195, Shpg. wt. 58 lbs. .... 239.95



### Shelf-top version of Digital Floor Clock

In walnut veneer cabinet. Add chimes below. 120/240 VAC. 6 1/2" H x 12 1/2" W x 6 1/4" D.

GC-1197, Shpg. wt. 18 lbs. .... 129.95

### Westminster Chimes for Clocks above

Sounds 4 notes on the 1/4-hour, 8 on the 1/2-hour, 12 on 3/4-hour and 16-note passage on the hour.

Kit GCA-1195-1, Shpg. wt. 3 lbs. .... 99.95

## HAVE THE NATIONAL BUREAU OF STANDARDS (NBS) TIME

**\$249<sup>95</sup>**

- Synchronized with the NBS cesium-atomic clock
- Accuracy of  $\pm 10$  mS when Hi Spec LED lights
- ASCII computer output with RS-232C Accessory

NBS provides the definitive time standard for the USA. Lock onto this standard with the GC-1000 Most Accurate Clock for unparalleled accuracy. The GC-1000 even sets itself to the correct time when first plugged in, or after a power failure.

It's the first affordable, microprocessor-based time machine guaranteed accurate to within  $\pm 10$  milliseconds. The National Bureau of Standards radio station WWV transmits a one-minute stream of time-code data containing day of year, hour, minute, and second date in Universal Coordinated Time (UTC) with a correction factor for UTC1 time, which compensates for earth's rotational wobble.

The RF receiver circuit board is preassembled and factory-aligned. The receiver scans the 5, 10 and 15 MHz frequencies of WWV and locks onto the strongest signal. A mutable audio monitor permits listening to the audio broadcasts on these frequencies. An outdoor antenna is recommended but may not be required in your area.

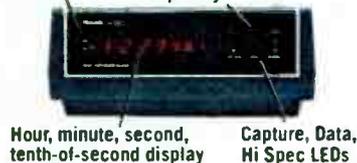
**Ultimate accuracy:** The front panel provides a bright digital readout in hours, minutes, seconds and tenth-of-seconds (RS-232C Accessory feeds this data and the date to your computer). LED's show which WWV frequency is being sampled, when "capture" of the time-encoded NBS carrier occurs, when data is being received, and when the Clock is in "Hi Spec" accuracy. During noisy reception conditions, the GC-1000 keeps time with its own crystal oscillator.

**Propagation delay** can be set for up to 18 75 milliseconds (3600 miles from WWV). Internal 3.6 MHz oscillator signal is available at rear panel. Includes a connector and seven feet of cable for connection to an external antenna.

### These are some of the features you get

AM and PM indicators    Telescoping antenna

5, 10, 15 MHz  
WWV frequency LEDs



Hour, minute, second, tenth-of-second display    Capture, Data, Hi Spec LEDs

12 VDC input    3.6 MHz oscillator output



External antenna BNC connector    Accessory RS-232C port for computer output at 110 to 9600 baud    Volume control

Dip switches on the chassis bottom set Clock operational modes

Clearly marked dip switches permit selecting: time zone, propagation delay, 12/24 hour mode, Daylight Savings function, GMT display, UTC1 correction and lockout of channels with strong interference.

Kit GC-1000, Shpg. wt. 7 lbs. .... 249.95

GCA-1000-1, RS-232C Output Accessory, Shpg. wt. 1 lb. .... 49.95

GCW-1000, Assembled and tested Most accurate Clock with RS-232C Output. Shpg. wt. 6 lbs. 425.00

GRA-72 75-ft SWL Antenna. Provides insulators and enough copper wire for a 10 or 15 MHz antenna for GC-1000 Clock, Shpg. wt. 2 lbs. .... 9.95

**GC/GCW-1000 SPECIFICATIONS:** Receiver AM heterodyne, single conversion with tuned RF amplifier. **Sensitivity:** 1 $\mu$ V or less for 10 dB s + n/n. **Audio Output:** 250 mW into 8 ohms. **Clock Accuracy:** Within  $\pm 10$ mS when Hi Spec LED is on. **Internal Oscillator Output:** 3.6 MHz. **Power Requirements:** 120-240  $\pm$  15 VAC, 50/60 Hz @ 100 mA or 11 to 16 VDC @ 750 mA (150 mA with display tuned off). **Dimensions:** 3 7/8" H x 9" W x 6 1/4" D (9.8 x 22.9 x 15.9 cm) less antenna.



## Heath Digital Wall Clock for quartz-precision time

**\$49<sup>95</sup>**

- Quartz-crystal accuracy of  $\pm 1$  minute per year
- Runs up to two years on a single 1.5 AA alkaline cell
- 1" high LCD digits provide a clear, legible display
- Display time in 12- or 24-hour format with "set it and forget it" convenience; it's portable, too.

Have the accuracy you'd expect from an expensive quartz watch. A crystal oscillator and large-scale integrated circuit ensure split-second precision and reliability. The dual-format wiring option for 12- or 24-hour timekeeping is a valuable feature we find to be increasing popular among our customers. And the Heathkit Digital Wall Clock is a one-evening project, ideal for the first-time kitbuilder. Now is the time to discover the unique and satisfying experience of kitbuilding.

**Battery powered operation** eliminates worries about power outages and accidental disconnection. Put a GC-1720 in a cabin, RV, boat or just about any place. Since the case measures a slim 5¼" high x 7⅞" wide x 1½" deep, it fits in places where many other clocks won't. The large one-inch liquid crystal display makes reading time easy, and the simulated oak case blends with almost every decor.

**The GC-1720 is a beginner's kit that takes just one evening to assemble.** Be sure to see our full line of tested kitbuilding tools on page 87.

Kit GC-1720, Shpg. wt. 2 lbs. **49.95**

**GC-1720 SPECIFICATIONS:** Accuracy:  $\pm 1$  minute per year, after adjustment according to instructions. Display: 4-digit and pulsing colon LCD, 1" digit height. Time Format: 12-hour or 24-hour. Power Requirement: One type AA 1.5 volt penlight battery (not included). Battery Life: One year with carbon-zinc cell; two years with alkaline cell. Dimensions: 5¼" H x 7⅞" W x 1½" D.

## Heathkit Digital Alarm Clock is fun, practical



**\$29<sup>95</sup>**

- Display time in 12- or 24-hour format
- Snooze alarm, plus flashing display when power has been disrupted

**Blue-green fluorescent display automatically adjusts** to ambient light conditions. Displays hours and minutes (with AM/PM indicators in the 12-hour mode), and lets you know if the alarm is set or power has been disrupted.

**Space-age accuracy** is provided by a metal-oxide semiconductor (MOS) integrated circuit. Fast and slow setting switches make it easy to accurately set the time. And rear panel switches make it easy to turn off the alarm or set the alarm for an extra 9-minutes of sleep. *What makes it tick?* You'll know its innermost secrets when you finish this one-evening-to-build kit. Get started in kitbuilding today — and have an attractive, accurate clock you can enjoy for years.

Kit GC-1107, Shpg. wt. 3 lbs. **29.95**



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## Find buried valuables on dry land or at the beach with Heathkit's Metal Locator

**Built-in speaker provides clear signals**

With the Groundtrack Metal Locator you can punch through ground clutter to uncover rare coins, artifacts, old trinkets and treasure. The Groundtrack is a professional model — able to pinpoint even tiny metal objects in any kind of soil, even in ground submerged under two feet of water.

**Pushbutton tuning and ON-OFF volume control**

**Headphone jack**

**Toggle switch selects Discrimination or Ground Balance modes**

**Battery test switch to monitor condition**

**Easy-grip handle for fatigue-free use**

**Easy-to-read meter installs for right- or left-handed users**

**Telescoping shaft collapses to 22"**

**Search head folds flat for easy storage, waterproof and submersible to 2 feet.**

**Reading controlled by discrimination setting. Needle deflects upscale and sound increases when object is within search field. Downscale deflection indicates a ferrous object.**

- Find valuable objects where conventional locators are almost useless
- On/off with volume, meter, speaker, phonejack, discrimination, ground balance, tuning controls, battery test, charging jack and mode switch
- Uses 6 AA cells

**\$219<sup>95</sup>**

**Fully Adjustable Discrimination Circuit** filters background signals — screening out pulltabs, metal foil, bottle caps, ferrous and alloyed items. The Groundtrack can be used in high "junk" locations where the use of other locators is all but impossible. Have the sensitive pushbutton tuning of our best metal locator at a price far below the competition.

**A Ground Balance Mode** pinpoints treasures even in high-mineral soil. A Very-Low-Frequency induction balance system provides silent operation until that coin or artifact enters the 6-inch diameter search head field of detection. Then a clear tone sounds that grows louder as you approach vertical center.

**Use the Groundtrack anywhere.** It's lightweight and portable, with a telescoping shaft that collapses for storage. Operates on 6 AA cells (not included) or the optional Rechargeable Battery Pack, which includes AC outlet and DC lighter socket chargers for use at home or in-the-field.

Kit GD-1290, Shpg. wt. 5 lbs. **219.95**

GDA-1190-1, AC/DC Rechargeable Battery Pack, Shpg. wt. 2 lbs. **24.95**

GDA-1190-2, Superex Headphones, Shpg. wt. 2 lbs. **14.95**

**GD-1290 SPECIFICATIONS:** Sensitivity: Locates dime at 4" to 6" typical, may be less depending on soil conditions, mode of operation and amount of discrimination selected. Method of Detection: Induction-balance circuit. Detector Output: Meter, speaker, phone jack. Power Requirement: Six AA cells or Rechargeable Battery Pack. Dimensions: Extended height, 45½" Net Weight: 3.4 lbs.

## This computerized weather station provides instant meteorological readouts

**\$399<sup>95</sup>**

- Displays time/date, indoor/outdoor temperatures, wind speed/direction and barometric pressure
- Microprocessor accuracy and memory stores past weather data so you can see trends
- Dependable windcup/weathervane transmitter mounts on a 1" to 1½" mast for trouble-free service
- Styled to match any decor, and designed to provide weather information not available from others

The **Heathkit Digital Weather Computer** monitors current weather data, computes significant changes and stores data in its memory for your personal planning. A microprocessor puts ALL the information at your fingertips.

**More memory stores more data.** Store high/low temperatures, maximum/minimum barometric pressures, peak wind speeds – and when they occurred. Have them at the touch of your finger, and erase them when you wish. Interface with a computer for even more sophisticated weather charting and forecasting. Keep on top of the weather changes that affect your business and personal life.

**Compare the ID-4001 Desktop Weather Station** to others: Ours gives you the time in 12- or 24-hour format, plus the date; both indoor and outdoor temperatures, in Fahrenheit or Celsius scales; outdoor wind chill factor, plus maximum and minimum indoor/outdoor temperatures since last memory clearance; instantaneous wind velocity with 16-point compass resolution, in mph, kph or knots; barometric pressure with four-digit accuracy, in inches or millibars, rising or falling. Look at the others, then look at prices.

**Technical sophistication unequaled at this low price.** The ID-4001 uses a remote transmitter (with anemometer and weathervane) to relay data to the computerized console indoors. Solid-state infra-red sensors and optically-encoded transmission provide higher accuracy than conventional electro-mechanical devices. For example, the wind speed sensor is sensitive to changes as small as one-tenth of a mile per hour. Barometric readings are taken from a newly-developed piezo-resistive silicon bridge transducer that senses minute changes in atmospheric pressure. A 25-bit parallel interface bus is provided for connection to a computer for more sophisticated weather charting.

**Beautiful styling and digital display:** The readout panel is trimmed in brushed aluminum and features large bright-red ½" LED segment displays, on a black background. The handsome, solid oiled-walnut cabinet has clearly marked buttons.

## Monitor the moisture of your air



**\$99<sup>95</sup>**

- Save heating dollars at home and working time on the job
- Comparable units usually cost twice as much, offer less

**Two remote sensors** let you monitor relative humidity levels at two different locations, on a conveniently located console. A bright-red, ½" digital readout eliminates reading errors.

**Set the alternating cycle you need** – 1.5 or 5 seconds. Measures 10 to 90% relative humidity from 32° to 135° Fahrenheit, with an accuracy of ± 20 counts, with a more rapid response time to humidity changes than others offer.

Kit ID-2295, Shpg. wt. 6 lbs. .... **99.95**  
4/WEATHER



If you want the fun of kitbuilding and the savings, you'll find the Heathkit Digital Weather Computer surprisingly easy to build. Uncrowded circuit boards allow for easy parts placement, and wiring harnesses minimize point-to-point wiring. Our easy-to-understand manual leads you through assembly, step by step. Order (below) the length of cable you'll need. Or you can order the IDW-4001 factory assembled and tested, ready to install and use the very first day. The IDW-4001 comes with 100 feet of 8-wire cable.



Remote transmitter assembly attaches firmly and easily to TV antenna mast

Kit ID-4001, Shpg. wt. 15 lbs. .... **399.95**

Assembled and Tested IDW-4001, Shpg. wt. 25 lbs. .... **649.95**

### 8-Wire Cable for the ID-4001

IDA-1290-1, 50' cable, 2 lbs. .... **9.95**

IDA-1290-2, 100' cable, 4 lbs. .... **16.95**

IDA-1290-3, 150' cable, 6 lbs. .... **23.95**

**ID-4001 SPECIFICATIONS: DIGITAL CLOCK/4-YEAR CALENDAR: Time Accuracy:** Determined by accuracy of AC line. No accumulative error. **WIND VECTOR: Accuracy:** ± 5% or better. **DIRECTION DISPLAY: Accuracy:** ± 11.26% degrees. **THERMOMETER: Temperature Range:** -40° to 70°C; -40° to 158°F. **Accuracy:** ± 1° on Celsius readings; ± 2° on Fahrenheit readings. **BAROMETER: Pressure Range:** 28.00 to 32.00 in. Hg (inches of mercury), 981.9 to 1050 millibars. **Accuracy:** ± 0.075 in. Hg plus ± 0.01 in. Hg/C. **Operating Temperatures:** Outdoor assemblies, -40° to +70°C (-40° to 158°F). Unit, 10° to 35°C (59° to 95°F). **Power Requirement:** 120/240 VAC. Provision for external battery connection for memory backup during power failures. **Dimensions:** 7¼" H x 16" W x 6" D.

## Digital Barometer with mercury-column accuracy



**\$99<sup>95</sup>**

- Have barometric pressure, change, direction, time and date, at your fingertips: in inches, millibars or kiloPascals
- Memories recall past minimum and maximum pressure readings for tracking storms and recording weather changes

**Sensor intelligence** is collected by a unique, highly efficient pressure transducer using a piezo-resistive silicon bridge electromechanism. Sealed in a temperature-stable oven, this newly developed pressure probe is far superior in ambient accuracy to mechanically-transferred aneroid diaphragms. Have the barometric data you need to forecast weather trends, with greater accuracy and minimum/maximum memories not available in other barometers. With Heath's ID-1990 Digital Barometer, you'll have access to all the vital barometric information you need to forecast severe or pleasant weather – on an easy-to-read digital display.

Kit ID-1990, Shpg. wt. 10 lbs. .... **99.95**



## Accurate Digital Wind Speed/Direction Indicator

**\$99<sup>95</sup>**

- Non-corroding outdoor transmitter
- Read wind speeds in mph, kph or knots, from 0 to 99
- Resolve wind direction to 16 different points



This ID-1590 Digital Wind Indicator skimps on price, but certainly not on accuracy or reliability. The outdoor transmitting unit is one of the best around. It's designed to give you precise wind speed and direction, year after year. The anemometer and weather vane are constructed from non-corroding, waterproof materials for errorless readings under any condition. Reed switches are hermetically sealed to prevent weathering that could cause inaccurate readings.

The indoor console features an easy-to-read seven-segment digital display and can be wired to report in two of three scales: mph, kph and knots. The readout displays wind speeds on these three scales from 0 to 99. Incandescent bulbs mark the 8 principal compass points, providing 16-point resolution by temporarily lighting two adjacent bulbs simultaneously. Uses the same transmitter boom as the ID-1290 (shown on this page). 120 VAC operation. Requires 8-wire cable (order below).

Enjoy the fun and savings of kitbuilding and have an excellent and useful weather instrument when you finish. The receiver is housed in an attractive Cyclac cabinet with simulated teakwood trim.

Kit ID-1590, Shpg. wt. 7 lbs. .... 99.95

## Practical Digital Indoor/Outdoor Thermometer

**\$84<sup>95</sup>**

- Monitor indoor and outdoor temperatures
- F°/C° temperatures, continuous monitor or alternating



When you compare the advantages this Digital Indoor/Outdoor Thermometer has over a conventional mercury bulb "sun-or-snow" thermometer, you'll wonder how you did without one for so long. The big, red ½" display digits can be seen easily from across the room, at night and in bright daylight.

The ID-1390B Thermometer monitors temperature readings from two sensors for accurate indoor/outdoor readings. Measure temperatures from -30°F to 120°F outdoors and indoors. This Thermometer has an accuracy of ±1" from 20°F to 120°F, ±2" from -40°F to 120°F. The 2½ digit display has plus and minus indicators for quick identification of above- and below-zero readings. Select Fahrenheit or Celsius temperature scales, with a continuous reading of indoor or outdoor temperatures, or alternate readings of both. The 10' indoor and 75' outdoor cables (included) let you place the sensors anywhere (freezer, sauna, basement, etc.).

Step-by-step instructions make this kit easy to assemble and calibrate, and it is a practical gift that gives year-round value. Operates at 120 VAC, 60 Hz (order model ID-1390BE for 240 VAC, 50/60 Hz operation). Small size (2½" H x 7" W x 5" D) and an attractive black Cyclac cabinet with teakwood trim make this Thermometer a handsome addition almost anywhere in your home. Styling is the same as for the ID-1590 Digital Wind Speed/Direction Indicator. Display the pair together, and have weather instruments you'll come to depend upon.

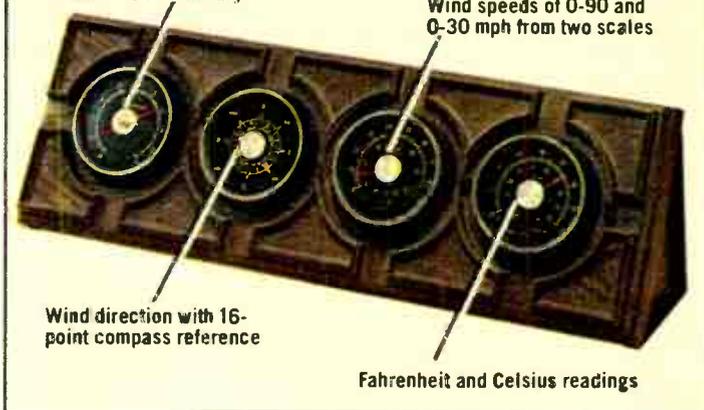
Kit ID-1390B, Shpg. wt. 4 lbs. .... 84.95

### B-Wire Cable for the ID-4001, ID-1290 and ID-1590 Instruments

IDA-1290-1, 50' cable, Shpg. wt. 2 lbs. ....	9.95
IDA-1290-2, 100' cable, Shpg. wt. 4 lbs. ....	16.95
IDA-1290-3, 150' cable, Shpg. wt. 6 lbs. ....	23.95

Aneroid barometer accurate to within 0.05 in. mercury

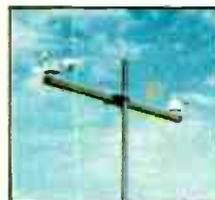
Wind speeds of 0-90 and 0-30 mph from two scales



Wind direction with 16-point compass reference

Fahrenheit and Celsius readings

## Weather station provides accurate information



Transmitter assembly mounts on 1" to 1½" mast

**\$159<sup>95</sup>**

This five function weather station provides the data you need to keep on top of weather changes and trends.

- Monitors barometric pressure, indoor/outdoor temperatures, wind speed and direction
- Temperature-compensated barometer may be used at altitudes to 10,000 feet
- All solid-state circuitry requires a minimum of power consumption
- Anemometer/weather vane transmitter



Versatile desk-top or wall mounting

For the price, you can't beat the features or the accuracy of the ID-1290. It contains professional-grade instruments, plus a quality non-corroding remote transmitter assembly for super dependability—all for less than \$160.

Heathkit's ID-1290 provides instant and accurate weather information: True indoor/outdoor temperatures, in both Fahrenheit and Celsius; thermometer calibration from -40°F to +120°F (-40°C to +49°C), with a switch to select indoor/outdoor readings. A sensitive barometer helps

you keep abreast of the most significant meteorological parameter—changing pressure conditions—by indicating movements as small as 0.05 inches of mercury. Wind speeds can be read from 0 to 90 mph in two ranges. Eight wind direction indicators provide 16-point compass resolution when two adjacent indicators are lighted.

Remote, windtunnel-tested anemometer/weather vane assembly has long-life Teflon bearings that require no lubrication, to provide accurate readings year after year. Well-insulated 8-wire cables provide excellent weather resistance (cable not included, order from this page).

The ID-1290's walnut grained, sturdy indoor console can be placed at a comfortable viewing height on a wall, or used as a handsome desk set with the included triangular stands. The black instrument dials have easy-to-read gold graphics to minimize reading errors. Easy and enjoyable to build, the ID-1290 makes a rewarding project for first-time kitbuilders. Operates on 120 VAC. Measures 7" H x 20½" W x 2" D. Improve your knowledge of weather—order the ID-1290 five-function Weather Station today.

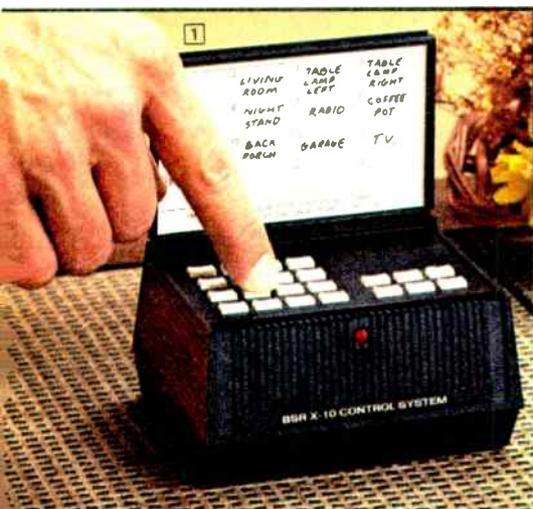
Kit ID-1290, Shpg. wt. 8 lbs. .... 159.95

**ID-1290 SPECIFICATIONS** Wind Speed: 0-30 mph, ±2 mph; 0-90 mph, ±5 mph. Direction: 8-point readout over 350°. Temperature: 0° to +120°F, ±2°F (typ. INDOOR); -40° to +120°F, ±2°F (typ. OUTDOOR). Barometric Pressure: 29-31 inches of mercury within .05 inches, accurate up to altitudes of 10,000 feet. Operating Temperature: Receiver, -32 to +100°F; Transmitter, -40 to +120°F. Wind Direction: 16-point resolution by lighting two adjacent lights.



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

# BSR X-10 Home Control System now offers battery backup, security and RS-232C interfacing



• Control up to 16 groups of lights or appliances from one central, portable location

**1** The **Controller Command Console** is one of the most ingenious and useful home conveniences ever devised! Now, with a fingertip touch, you're in complete control by remote control, from beside the bed or wherever you plug it in. Console signals are transmitted over existing house wiring to the module of your choice. Just plug lights and appliances into the appropriate module. Use as many modules on the same code as you wish. Dim or brighten lights. Two "all lights on" and "system off" buttons provide extra security and savings.

**GDP-1510**, Assembled, Shpg. wt. 2 lbs. .... **24.95**

**2** The **Ultrasonic Cordless Commander** transmits signals to the Controller Command Console from up to 30 feet away, using identical pushbuttons.

**GDP-1511**, Assembled, Shpg. wt. 1 lb. .... **14.95**

**3** **Telephone Responder Console** is the remotest control of all. It lets you enjoy the freedom of calling from anywhere to control up to 8 groups of 120 VAC items. Includes modular phone cable.

**GDP-1515**, Assembled, Shpg. wt. 6 lbs. .... **B9.95**

**4** **Timer Command Console** runs everything on time. *Automatically!* Used with the modules, your home can run like clockwork, setting lights and appliances to go on and off up to twice a day, according to your family's needs and lifestyle. The possibilities are virtually unlimited! Away for the weekend? The Timer is on guard, giving 24-hour



**RS-232C to BSR X-10 Interface offers computer-programmed BSR control**

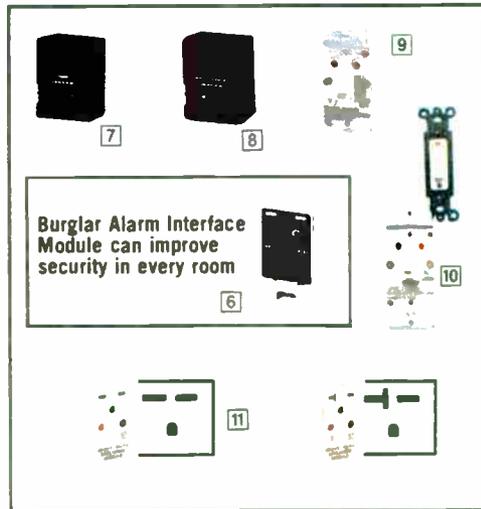
control with a lived-in look and sound when you're gone – even simulates movement from room to room – so *nobody knows that nobody's home*. Features digital clock with two levels of display brightness, Fast and Slow set keys for easy setting and programming; Daily, Once, and a random Security code; Clear to erase a setting; All Lights On and Now for immediate security and control. No dimming feature. Now has full battery backup (four AA cells, not included) to protect your program in case of power failure while you're away. You'll save time, save steps and save energy!

**GDP-1520A**, Assembled, Shpg. wt. 3 lbs. ... **69.95**

**5** The dream of a computer-operated home or office is now a reality thanks to Heath's new 'universal' RS-232C to BSR X-10 Interface kit! Connected between your present Heath or other computer and existing electrical wiring, it enables you to control up to 256 groups of modules with unlimited timing patterns. 110 to 2400 baud. Programming syntax and simple BASIC program examples included. Requires 120 VAC.

**Kt GD-1530**, Shpg. wt. 3 lbs. .... **129.95**

**6** **New Burglar Alarm Interface Module** increases the effectiveness of your security system by controlling other BSR modules on your circuit. Has selectable low-voltage or contact closure trigger inputs. If alarm is triggered, module can turn on either selected lights and appliances (such as siren), or selected lights can flash on and off, or only selected lights can turn on. Lights will remain on after alarm system resets to indicate there has been an alarm



**Burglar Alarm Interface Module can improve security in every room**

condition. Test button verifies your setup.

**GDP-1519**, Assembled, Shpg. wt. 1 lb. .... **44.95**

**7** **Lamp Module** receives signals to turn incandescent lamps On and Off, and Dim or Brighten them in 16 steps. Handles up to 300 watts max.

**GDP-1512**, Assembled, Shpg. wt. 1 lb. .... **16.95**

**8** **Appliance Module** controls most other devices like TV, heaters, etc. Operates lights and self-starting fluorescents, but only turns them on and off. Max ratings: 15 amp resistive load; 1/3 HP motor; 500 watt lighting; 400 watt TV/stereo load.

**GDP-1514**, Assembled, Shpg. wt. 1 lb. .... **16.95**

**9** **Wall Switch Module** replaces existing switch. Operates inside or outside lights; dims them if controlled by GDP-1510. 500 W maximum load. Also has on/off pushbutton. Easy to install.

**GDP-1513**, Assembled, Shpg. wt. 1 lb. .... **17.95**

**10** **Three-Way Wall Switch Module and Companion** with independent on/off buttons replaces hallway and upstairs/downstairs 3-way switches, responding like a lamp module. 500 watt maximum load.

**GDP-1516**, Assembled, Shpg. wt. 1 lb. .... **24.95**

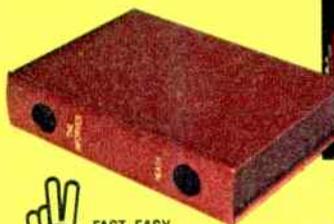
**11** **Air Conditioner Module** is sold in two different 240 VAC configurations. Order according to plug type. Standard Module (left) rated for 15 A load.

**GDP-1517A**, Assembled, Shpg. wt. 1 lb. ... **39.95**

**Perpendicular-pronged Module** rated for 20 A load.

**GDP-1517B**, Shpg. wt. 1 lb. .... **39.95**

## The *Informer*® Ultrasonic Intrusion Alarm provides effective protection against trespassers.



ONLY  
**\$69.95**

- "Sees" up to 25 feet away from unit
- Time delay lets you deactivate alarm
- No one but you will ever know it's there

Disguised to look like a fine hardcover book, the *Informer* will sit quietly on bookshelf or table...until something or someone enters its wide field of surveillance. Ultrasonic sound waves thwart intruders by sensing their movement during entry. Then it will activate indoor/outdoor buzzers or alarms, table or floor lamps to alert you to an unfamiliar presence within your home.

**Easy to set:** Simply flip a hidden, back panel switch to activate the system. Two AC outlets on the back panel control lights and alarms you have plugged in. Ten seconds after the first movement is detected, the lamp outlet is triggered, suddenly turning on any lights you have connected. Approximately 30 seconds later, the alarm outlet is triggered. Has switch-selectable auto or manual reset. Use it for security purposes or as an automatic light switch in garage, basement or attic. Solid-state circuitry. Requires 120/240 VAC.

**Kit GD-49**, Shpg. wt. 5 lbs. .... **69.95**

**FAST, EASY  
2-EVENING KIT**

## Heathkit RF Security System offers total, dependable home protection without wires

- Heath leads the way in wireless RF convenience with one of the most advanced and trustworthy, microprocessor-controlled systems available
- Alarm Processor receives signals from wireless transmitters and handheld command units
- The flexible power of an 8-channel receiver lets you design a unique system customized to fit your needs and everyday lifestyle

The GD-2800 system is easy to operate...installs in a day...protects interior/perimeter zones, entrances and 'high risk' variables...provides 24-hour security equal to systems installed by professionals which cost \$2000 or more...and is virtually immune to false triggering. Controlled by a handheld transmitter, it abolishes the hassle, the worry and the drawbacks of wired systems.

**1 RF Security Receiver/Processor Kit with Outdoor Alarm Horn and Annunciator Speaker** processes all incoming signals to provide appropriate alarm warning action. Four modes (OFF, Home, Away and Panic) control entire system operation. 'Home' monitors doors and windows while you're inside. 'Away' additionally arms indoor motion detectors. Five coded channels give separate alarms for door, windows, indoor motion, fire and emergency situations. Distinctly-patterned Auxiliary and Panic alarm channels alert you to special concerns like fire, breach of computer room, safe or gun cabinet, etc. —even if the system is OFF. Unique annunciator tone sounds from indoor speaker (top center, photo) whenever a protected door opens, telling you when a youngster left to play or your daughter returns from her date; also sounds to confirm receipt of mode-change signal from Control Transmitters. Other sophisticated features: time-delayed entry/exit, power to drive two alarm horns, internal 12-hour failsafe battery, highly visible security warning labels for house exterior, system test mode, key-locking master power switch, 32 user-selectable house codes, seven output triggering options for annunciator, alarms, lights, automatic dialing devices and more. Permits enforcement to be extended to nearby buildings, shed or garage within 200' receiving range. All mode operations controlled remotely by GDA-2800-4 or -9 Transmitters (at least one required).

Kit GDA-2800-1, Shpg. wt. 24 lbs. .... 299.95

**2 Passive Infrared Motion Detector/Transmitter.** Offers 25 x 35 ft. indoor space protection without interference to TV remotes. 9V battery required.

GDA-2800-2, Shpg. wt. 1 lb. .... 139.95

**3 Wired-Circuit Transmitter.** Easy to install. Uses magnetic/reed switches or 'window bug' glass-breakage sensors to protect doors and windows against entry. Inside mounting prevents tampering or disconnection. Includes one magnetic/reed switch set (7). Also connects to GD-1701 Flood Alarm on pg. 8.

GDA-2800-3, Shpg. wt. 1 lb. .... 39.95



**4 Command Transmitter.** Controls entire system remotely, within 200 ft. range.  
GDA-2800-4, Shpg. wt. 1 lb. .... 49.95

**5 Smoke Detector/Transmitter.** Best type—virtually eliminates nuisance alarms. Has own 85 dB internal alarm; also signals 2800-1 to sound main alarm.

GDA-2800-5, Shpg. wt. 2 lbs. .... 79.95

**6 Window Bug™ Sensors and take-off contacts.** Package of four. Used with 2800-3 Transmitter, each sensor protects up to 32 sq. feet of glass surface.

GDA-2800-6, Shpg. wt. 1 lb. .... 39.95

**7 Magnetic/Reed Switch Set.** Package of four (one set shown) for single or series connection to 2800-3 Wired-Circuit Transmitter and its applications.

GDA-2800-7, Shpg. wt. 1 lb. .... 9.95

**8 Passive Infrared Motion Detector** for hardwired systems. Requires 6-18 VDC.

GDA-2800-8, Shpg. wt. 1 lb. .... 99.95

**12-Button Digital Keypad Controller** (not shown). Operates in addition to or in place of 2800-4 command unit. Mounts near door for instant entry/exit control. Operates identically to 2800-4 after entry of user-secret numeric access code.

GDA-2800-9, Shpg. wt. 2 lbs. .... 109.95

GDA-1800-3, Additional Alarm Horn (like shown) Shpg. wt. 2 lbs. .... 24.95

**SAVER! GDS-2800-1 Starter Security System** consists of one 2800-1 Receiver kit with speakers, one 2800-2 IR Motion Detector/Transmitter, one 2800-3 Wired-Circuit Transmitter and one 2800-4 Command Transmitter. Install the basics now, add more components later! Shpg. wt. 20 lbs. .... 499.95

## Infra-red Security Light Control detects movement invisibly and deters criminal intruders

- Makes your home safer at night by "seeing" invisible infra-red waves and movement
- Automatically turns on lights, or a light/alarm combination (up to 500 watts), making a burglar think he has been observed
- Replaces expensive, all-night floodlights with dependable, automatic lighting control

**Security experts agree:** The most powerful deterrent to crime is LIGHT. Now you can have one of the most effective safeguards against criminal home violation ever devised—immediate surprise lighting!

**The Heathkit Security Light Control** uses a cluster of passive infra-red sensors to monitor an 875-square-foot area near your home and keep it safe from the danger of intrusion. These receptors are extremely sensitive to invisible waves of infra-red heat energy. The SLC will react instantly to changes in temperature with movement—activating up to 500 watts of inside-outside lighting and/or an alarm system to destroy the cover of darkness—before a predatory thief gets near your home and family.

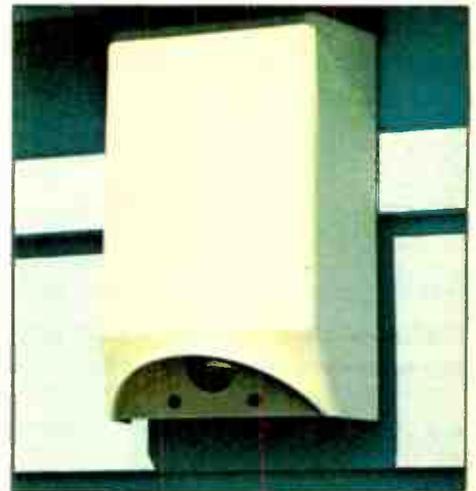
Lights remain on until four minutes after all move-

ment has ceased, then go off as the SLC resumes silent protection. Sensitivity is adjustable so pets or small animals won't cause accidental alarms. In cold weather, the infra-red rays from a person's exposed hands or face are enough to trigger it—but unintentional alarms are virtually impossible. A built-in phototransistor will deactivate the SLC in daylight hours, and reactivate it when surrounding light dims.

**There are dozens of imaginative ways** your GD-3510 can be put to use. It could easily provide automatic switching to illuminate dark stairways, walkways and driveways safely. No more stumbling over unseen hazards in garage or basement or fumbling up dark walkways with your arms full of packages! It can greet you when returning home after dark and be a warm, convenient welcome for visiting friends.

**Wire it yourself or consult an electrician** when connecting the rugged, weatherproof SLC to your 120 VAC/60 Hz lighting system. It's a simple procedure for any do-it-yourselfer and a rewarding, one-evening kit with high security value. Compact and easy to conceal, it measures only 8½" H x 5¼" W x 2½" D.

Kit GD-3510, Shpg. wt. 3 lbs. .... 149.95



SECURITY/7

Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## Rechargeable Portable Light makes it easy to see



**\$39.95**

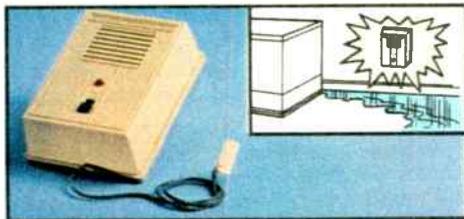
- Disperses greater illumination than harsh, narrow flashlights
- Recharges overnight – just plug it into AC outlet or car lighter

Indoors or out, the Heathkit Rechargeable Portable Light will bathe your working area with a bright, yet soft-on-the-eyes fluorescent light for a multitude of uses. Helps you to clearly see a wider area without sharp, eye-straining shadows. Safer to use than fire-hazardous candles and kerosene lamps in a power outage or while camping. And it saves money by recharging over and over for just pennies. "Soft start" feature extends tube life. 120 VAC and car lighter socket chargers included. A single charge lasts for several hours. Heavy-duty metal case with handle is 10 $\frac{1}{2}$ " H x 3 $\frac{3}{8}$ " W x 5" D. It's designed to survive rugged use – perfect for camping or night work, home and automotive emergencies – *always ready when you need light!*  
Kit GD-1246A, Shpg. wt. 6 lbs. . . . . 39.95

## Flood Alarm detects water, sounds loud warning

- Easy to install – monitors 24 hours a day in any location
- Prevents costly water damage

**\$24.95**



**Don't take chances!** Avoid expensive, messy water hazard in your home, office, boat, basement, RV, factory, garage – anywhere excess moisture threatens! The reliable Heathkit Flood Alarm will detect water when it first appears, giving you maximum time for corrective action *before it can do major damage.*

**Use it in a hundred places:** The water sensor sticks anywhere. When liquid touches the sensor foil, the Flood Alarm produces a loud, insistent beeping in time with a flashing red LED to get fast attention! Safeguard against water seepage in cellar, kitchen, bathroom, computer room; near dehumidifier, dish or clothes washer, leaky plumbing, sump pump – even place sensor on the edge of a windowsill to wake you if rain comes in an open breezeway. Size: 1 $\frac{1}{4}$ " H x 3 $\frac{3}{8}$ " W x 4 $\frac{7}{8}$ " D.

**Compact and quick to relocate,** the GD-1701 runs over a year on one 9V alkaline battery (not supplied), and has audible low-battery indication. Includes 25' of thin wire and two sensors. Ideal for hard-to-reach places and nautical applications. Has adjustable sensitivity and logic output to trigger GDA-2800-3 RF Security Transmitter on page 7.

Kit GD-1701, Shpg. wt. 2 lbs. . . . . 24.95

## Freezer Alarm prevents costly food loss

**Protect your meats and other frozen foods** from spoilage by installing an instant alarm that warns of a failure in your freezer's cooling system or a door left ajar. Two-speed alarm beeps and red LED flashes at a slow rate if inside temperature rises above +20°F; faster if door stays open too long. Requires 2 "C" batteries (not supplied). Slide switch shuts off alarm. Includes 20' of thin hookup wire, plus mechanical, temp and water sensors – with application ideas.

Kit GD-1183, Shpg. wt. 2 lbs. . . . . 19.95



## Photoelectric Light Switch fools prowlers

**Great low-cost insurance against break-ins:** Turns lights on in the evening, off at dawn – automatically. Gives your home a "lived-in" look to discourage unauthorized entry while you're away. Plug it into any outlet, adjust sensitivity and it controls lamps or other AC-operated devices up to 150 watts. Practical and beneficial security kit, 3 $\frac{1}{2}$ " H x 2 $\frac{3}{8}$ " W.

Kit GD-600, Shpg. wt. 2 lbs. . . . . 9.95



## The Heathkit® Pledge

Our instruction manuals are written with you, the builder, in mind. They begin with an introduction to the product and a soldering guide for the first-time builder. Step-by-step instructions and clearly-detailed illustrations take you through every phase of construction. In case of difficulty, there's a troubleshooting guide. You can even call or write the Heath Technical Consultants for prompt, courteous answers to any special questions. You can't go wrong, because our ever-growing popularity around the world is based on this one simple pledge:

**"We won't let you fail!"**



**Easy, one-evening kits** are practical, fun-filled introductions to the satisfying experience of kitbuilding. Average assembly time is just a few hours. They're perfect for gaining confidence before you tackle a big kit, birthday and holiday giving, sparking a new interest in young boys or girls, or sharing pride of accomplishment with the whole family!

## Battery Life Tester saves on replacement

**\$14.95**

- Ideal for hams with handi-talkies and plenty of portable accessories
- Includes adapter to test freshness of 9V batteries prior to purchase

Test all popular-sized batteries and end waste – be certain a battery is dead before you throw it away. Does more than just give a "good-?-bad" reading like other testers – actually indicates *how much useful life* remains on a 0-to-5 meter scale. Tests alkaline or carbon-zinc 9V or 1.5V AA, C & D-size batteries, plus rechargeable 1.2V NiCads. Indispensable for households with many independently-powered items – tape recorder/players, radios, cameras, toys, smoke or burglar alarms, flashlights, etc. Test eyelet snugs into front slot.

Kit GO-1703, Shpg. wt. 1 lb. . . . . 14.95



## Year 'round musical fun in this AM Portable Radio

- Heath's most popular kit for beginners – especially designed as an intro for the first-time builder
- Improved circuitry will prolong battery life – up to 60 hours!

**\$18.95**

**A perfect kit that will thrill any youngster!** Excellent AM sensitivity gives sensational reproduction of voice and music with a clear, even tone. Take this great little performer with you anywhere for extra fun. High-gain ferrite rod antenna delivers long-distance reception. Uses 9V battery (not included) or PS-2350 Battery Eliminator on page 91. Includes earphone for private listening.

Kit GR-1009, Shpg. wt. 2 lbs. . . . . 18.95



## Eye-Spy™ Photobeam Alarm Relay detects all



**Multi-purpose system:** Consists of mirror assembly and light source/photocell relay. Uses a narrow, reflected beam to catch intruders instantly, activating lights or any 120 VAC warning devices you have plugged in up to 300 watts total. **Businessmen!** – use it to activate intrusion alarms, signal the entrance of persons into a shop or room, or count objects passing a point. At home, a versatile sentry!

Kit GD-1021, Shpg. wt. 3 lbs. . . . . 19.95



# Hear all the audio detail in your collection with this unparalleled Four-Way Speaker System

- Capable of reproducing the vastly improved dynamic range of today's finest audiophile recordings; subwoofer extends deep-bass response down to 20 Hz auditory limit

If you want to enjoy the full impact of digitally-mastered and compact disc wide range recording breakthroughs, then Heath's nerve-tingling 4-Way Speaker Combination System will deliver amazingly high quality sound and pay back the utmost in listening pleasure for your money.

**1** The AS-1321 3-Way Speaker Module features a 6.5" polypropylene midbass speaker element in a special subenclosure, a 2" soft dome Ferro-Fluid midrange driver and a planar leaf tweeter with super high frequency linearity. A new computer-aided, combined 4th order crossover design in the Module utilizes the low frequency rolloff of each driver and a matched 2nd order LC filter to eliminate distortion-causing phase error 'dropouts' for the very finest and most natural response. Depth and lateral imaging will expand to enhance the realism, and an illusion of actually 'being there.' The rear panel has provisions for full range or bi-amplification, with drivers protected by an automatic circuit breaker which prevents thermal, excessive power input or transient signal damage.

Kit AS-1321, 3-Way Module, 31 lbs. . . . . 299.95

**SAVER!** Kit AS-1324, 4-Way Speaker System. Includes AS-1321 3-Way Module and AS-1320 Subwoofer described below.

Shpg. wt. 208 lbs., Motor Freight . . . . . 599.90

**SAVER!** Purchase a pair of AS-1324 Systems.

Kit AS-1324-2, 416 lbs., Motor Freight . . 1149.80

**2** The AS-1320 non-directional Subwoofer can be used singly or in pairs—and the cabinet can be expanded to a crowd-pleasing 4-Way System with the AS-1321 3-Way Module above. Heath's beautifully efficient Subwoofer vastly extends the low frequency range of your system. Its big 15" long-throw driver has a 2" four-layer aluminum voice coil to maintain a prolonged, *ultralow linear response*. The black cabinet—with a tuned, 6" floor-loaded vent and walnut stained decorative ash rails—uses high density materials to prevent annoying coloration of bass notes. Requires ASA-1320-1 Passive Crossover for optimum performance without a separate amplifier, or the Pro-Series AD-1702 Electronic Crossover when using a separate amp (see p. 13).

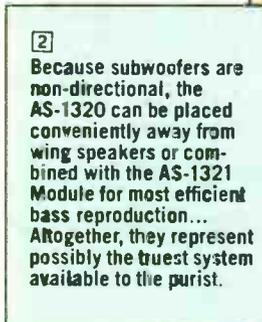
Kit AS-1320, Shpg. wt. 177 lbs., Motor Freight . . . . . 319.95

Kit ASA-1320-1, Passive Crossover, Shpg. wt. 6 lbs. . . . . 49.95

Kit AD-1702, Electronic Crossover, Shpg. wt. 15 lbs. . . . . 199.95



**1**  
The AS-1321 3-Way speaker module uses complimentary drivers to deliver coloration-free audio from 100-20,000 Hz for flat-spectrum sound reproduction, comparable in specifications to the very finest stereo music components available.



**2**  
Because subwoofers are non-directional, the AS-1320 can be placed conveniently away from wing speakers or combined with the AS-1321 Module for most efficient bass reproduction... Altogether, they represent possibly the truest system available to the purist.



**AS-1320 SPECIFICATIONS:** Freq. Range (-10 dB anechoic): 15-750 Hz. Freq. Response ( $\pm 3$  dB): 22-500 Hz. Impedance: 8 $\Omega$ . Minimum Amplifier Power: 30 W. Maximum Power: 250 W. Driver: High compliance, 15" long-throw design. Cabinet Type: Nine-cubic-foot vented box, tuned to 22 Hz using computer-aided modeling techniques. Cabinet Dimensions: 64 $\frac{1}{2}$ " H x 21 $\frac{1}{2}$ " W x 17" D.

**AS-1321 SPECIFICATIONS:** Frequency Range (-10 dB): 70 Hz to beyond 25,000 Hz, with AS-1320, 15 Hz to beyond 25,000 Hz. Frequency Response ( $\pm 3$  dB): 100-20,000 Hz, with AS-1320, 22-20,000 Hz. Midbass: Sealed in a baffle board sub-enclosure aligned at 100 Hz. Midrange: Ferro-Fluid damped voice coil for optimum transient response. Tweeter: Advanced-design planar leaf, optimally-damped for 4000 Hz resonance. Tweeter and Midrange Controls: Dual 2-position switches to provide -2 dB output boost or normal (flat) operation. Impedance: 6 $\Omega$  (4 ohms minimum). Recommended Amplifier Power: 30-250 watts per channel. Crossover Frequencies ( $\pm 6$  dB): 100, 600 and 4000 Hz. Sensitivity: 90 dB SPL. Module Dimensions: 17" H x 17 $\frac{1}{2}$ " W x 9" D.

## A 3-Way System to please the most critical ear

- Careful design delivers superb source accuracy and wide dynamic range; mirror-image driver mounting creates a sharply focused stereo image

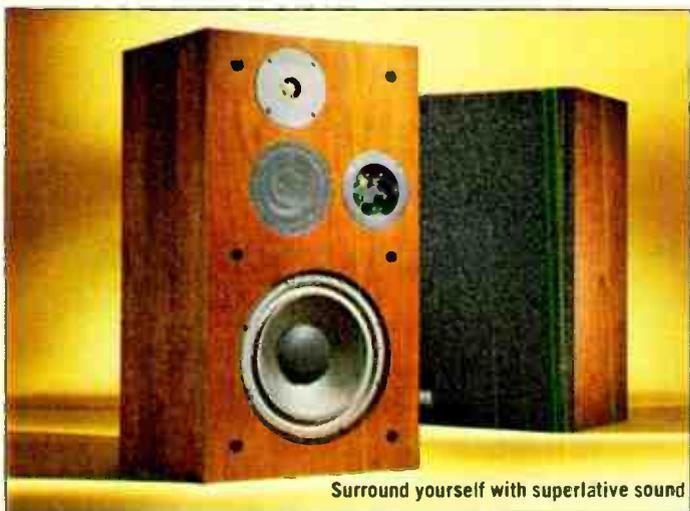
Compare the specs, and price of this outstanding floor/shelf system with any other — you'll see why this is our best selling pair. When you hear them you'll agree the stereo listening pleasure they offer is worth twice the price!

Designed for use with the best audio components, the 10" woofer provides gutsy, well-defined bass response, with a 500 Hz woofer/midrange crossover frequency to ensure smoothness and minimize intermodulation distortion. The 4 $\frac{1}{2}$ " midrange driver has a polyester-damped subenclosure to prevent woofer reflections, while a 1" dome tweeter exhibits excellent power handling.

Driven to sensational sound by as little as 10 watts, a higher-powered amplifier like the AA-1800 (p. 13) reveals their awesome dynamic range and three-dimensional clarity. *Music will take on a new feeling.* Two frequency controls optimize response for your listening area. Individual driver fuses provide full overload protection. Comes with assembled walnut veneer cabinet.

Kit AS-1373, Shpg. wt. 68 lbs. . . . . each 224.95

**AS-1373 SPECIFICATIONS:** Frequency Response ( $\pm 3$  dB): 40-20,000 Hz. Maximum Power: 250 watts per channel. Crossover: 500 Hz (12 dB/octave) and 3000 Hz (12 dB/octave). Controls: 3 kHz switch, flat or 2.5 dB attenuation; 10 kHz switch, rolloff or flat. Dimensions: 26" H x 14 $\frac{1}{2}$ " W x 17 $\frac{1}{8}$ " D.



Surround yourself with superlative sound



Alaska, Hawaii and Michigan Residents: Call 616-982-3411



## 1 Lab-grade Portable Real-Time Spectrum Analyzer is a professional audio tool

**NEW**

- Use it anywhere, even in your car – operates on six "C" batteries

**An impressive value:** As the world's first hand held, microprocessor-controlled 1/2- and 1-octave Real-Time Spectrum Analyzer, Heath's new Pro-Series AD-1308 is a breakthrough in uncompromising mobile capability. It has comparable specs and more features than many units costing thousands of dollars. It gives the audio technician, recording engineer or home music enthusiast a precise means of spectral evaluation for their daily work or increased listening pleasure.

**Sound you can see:** The AD-1308 provides a bright visual display of line input or acoustic-pickup spectral response and sound pressure level, making it possible to optimize your entire audio system. The AD-1308 features 1 or 3 dB scaling for accurate setups – from tape recorders to public address systems.



## Integrated Amplifier combines fidelity with versatility

**\$249<sup>95</sup>** 30 WATTS, MIN. RMS, PER CHANNEL INTO 8 OHMS WITH <0.009% T.H.D. FROM 20-20,000 HZ

- The most adaptable amplifier in its class, with design features of a high-power amp at a mid-power price

There's no need to sacrifice important, audio-improving ingredients if you buy performance-matched 'separates' for stereo listening. This efficient amplifier has the same AMP/PREAMP specifications as the AR-1250 Receiver, plus many more advanced preamp features to please the serious audio architect. These include a continuously variable loudness control, high and low filters with dual turnover points, switchable tone controls at 2.5 or 5 kHz treble and 250 or 500 Hz bass, a dual tape monitor function, LED bargraphs for left and right channel power output, plus inputs for one tuner, two phono, two tape and two auxiliary sources. These matched separates each measure 4 3/8" H x 14 7/8" W x 13" D.

Kit AA-1205, Shpg. wt. 18 lbs. .... 249.95

10/STEREO HIGH FIDELITY

Five memories let you store and recall responses for instant comparison, plus an exclusive Difference mode displays the difference between any two sources. A thumbwheel attenuator selects the scaling in 10 dB steps from 50 to 120 dB SPL, with standard ANSI fast, slow or peak response modes and A or C weighting for precise SPL or 'noise exposure' measurements.

To ensure absolute measurement accuracy, every microphone element is tested individually, and a ROM chip programmed to correct for frequency response errors. A machine-drawn calibration curve is also supplied.

Kit AD-1308, Shpg. wt. 5 lbs. .... 279.95

**SAVER!** ADS-1308, System including AD-1308 Analyzer, ADA-1308-1 Power Supply and AD-1309 Noise Generator, Shpg. wt. 27 lbs. .... 399.95

**AD-1308 SPECIFICATIONS:** SPL and Spectrum Analyzer Display Range: 23-126 dB SPL. SPL Accuracy: ± 1 dB A-weighted. Microphone Self-Noise Level: <36 dB SPL. A and C Weighting Filters per ANSI: SI.4-1971 (Rev. 1976). Fast and Slow SPL Response per ANSI: SI.4-1971 (Rev. 1976). Flatness on Direct Input: ± 1 dB. Input Impedance: >10k ohms. Input Sensitivity, 90 dBspl Range: 0 dB = 350 mV rms = 10%. Power Requirements: 10.5 V, ± 10% @ 425 mA. Low Battery Indication: 6 V = 5%.

## 2 Power Supply/Rack-Mount Accessory

Affords the best way to install and power your AD-1308 in standard 19" EIA racks, charge the batteries when using NiCads for portable power, and couple your system's audio signals to the Analyzer. Sturdy 9-pin D-connector permits unit to "snap" in and out easily. Has paralleled phono jacks for each channel. Left, Right, L + R or L - R signals can be selected and displayed. Ample space to store small accessories, microphone and AD-1309 behind hinged, swing-up front panel.

Kit ADA-1308-1, Shpg. wt. 8 lbs. .... 119.95

**ADA-1308-1 SPECIFICATIONS:** AMPLIFIER: Frequency Response: ± 2 dB, 10 Hz to 50 kHz. S/N Ratio: 50 dB ref. 200 mV. L-R Common Mode Rejection: 40 dB, 20 Hz to 10 kHz. Input Impedance: 22k ohms.

## 3 Accurate Pink/White Noise Generator

The AD-1309 supplies audio energy with the precise frequency characteristics to properly make measurements with real-time or swept-filter spectrum analyzers – at a fraction of the cost of comparable generators. Front panel phono plug outputs and rotary power level control. Operates on one 9 VDC battery.

Kit AD-1309, Shpg. wt. 2 lbs. .... 49.95

**AD-1309 SPECIFICATIONS:** PINK NOISE: Frequency Response: ± 1 dB from 20 Hz to 20 kHz. Output Level: rms average is >350 mV; peak is >1.5 V. WHITE NOISE: Frequency Response: ± 3 dB from 20 Hz to 20 kHz. Output Level: rms average is >350 mV; peak is >1.5 V. Dimensions: 2 1/2" H x 4 1/8" W x 4" D.



## Matching Stereo FM Tuner has far-reaching sensitivity

**\$199<sup>95</sup>**

- Sharp 36.8 dBf stereo (50 dB Quieting, IHF 1975) sensitivity pulls in weak and distant stations
- Dual ceramic filter elements give 52 dB selectivity for isolating desirable signals in the crowded FM band

Critical listeners agree that a dependable Tuner can dramatically improve your world of music. In the AJ-1200, you get the high-performance, low cost Tuner you want. All frequencies are displayed digitally. Mute-actuated AFC makes tuning quick and crisp. Three LEDs indicate center-tune clearly, and a five-LED bargraph shows signal strength. A front panel Multipath pushbutton helps you set the best antenna orientation. These elements and specifications spell outstanding separation, negligible noise and inaudible distortion. Together with the AA-1205, a top notch system you can display with pride and use with lasting pleasure.

Kit AJ-1200, Shpg. wt. 14 lbs. .... 199.95

Kit AJA-1600-2, Dolby FM Module, Shpg. wt. 1 lb. .... 54.95

Kit AJA-1200-2, AM Module, Shpg. wt. 2 lbs. .... 39.95



# Quality creates its own image in a 30-Watt Receiver of superb musical value and design

**30 WATTS, MINIMUM RMS, PER CHANNEL INTO 8 OHMS WITH LESS THAN 0.009% T.H.D FROM 20-20,000 HZ**

**\$349<sup>95</sup>**

- Superb all-in-one audio quality – designed for high fidelity first, then high style
- An array of exceptional specifications; more performance for your dollar, with high 2.5 dB (53 watt) dynamic headroom
- The new technology from our audiophile separates (at left) in one slim chassis, with a multitude of versatile features

For the college student, apartment dweller or budget-minded audiophile who desires a high quality, medium-power source of infinite entertainment variety, the Heathkit AR-1250 Digital FM Stereo Receiver is a considerable value. Endowed with equal qualities from its sister 'separates' (the AA-1205 and AJ-1200 combo at left) the AR-1250 design fuses the best in sound technology and the most in versatile features for a new realism in response to your listening tastes. A fun, four-evening kit, it has the source fidelity, stereo control and clean, undistorted power that every audio enthusiast wants to build around for maximum musical pleasure.

**No sacrifice at this price:** Heath's award-winning Pro-Series engineers designed the AR-1250 to meet the highest standards of accurate reproduction and elegant styling for absolute satisfaction. An investment to build with pride, and a beauty to behold, its performance will impress everyone who looks and listens for quality.

**The action starts with a bright green digital frequency readout,** bargraph displays of instantaneous signal strength and power output level, exact LED center-tune and stereo locking indication. You're given a wealth of capability: High- and Low-cut Filters plus Bass and Treble controls shape the sound; adjustable FM Muting silences interstation hiss while mute-actuated AFC tuning helps you zero in with ease; Tone Flat yields smooth response and uncolored recordings; Loudness boosts the low frequencies; Mono narrows audio perspective while Volume and Balance may vary with your mood. Three source switches route signal input for creative output, with full monitor or dub from deck-to-deck, and choice of what source you listen to while recording from another source.

**What emerges is proof that our precision design has met its goal.** Like excellent FM sensitivity and vast 45 dB separation. Radically clear FM reception for pure musical appreciation. Delayed turn-on speaker protection from deadly transient "thumps." True-to-the-source fidelity. A tympanic bass quality and crisp, ethereal highs that deliver an uncanny new reality in musical presence and stereo dimensionality. Almost unlimited system potential. Plus an ultra-low distortion spec and



plenty of pulse-pounding power to excite your airspace.

**AR-1250 provides the versatility to expand** with up to four speakers, optional AM and Dolby FM Noise Reduction modules, two tape decks, headphones, power amp, auxiliary sources like TV or turntable, and more. Dual pre-amp-out/power-amp-in adapter loops make inserting an equalizer, audio processor or electronic crossover easy. You're invited to press the power switch at a nearby Heathkit Electronic Center, hook up the source and speakers of your choice, and experience instant aural gratification. Take one home and share the exclusive pride of hand-crafted achievement. With such an extraordinary Receiver of outstanding specifications and value available to the kitbuilder, why settle for anything less? Build one with pride and satisfaction for yourself and hear the quality!

**Kit AR-1250, Shpg. wt. 23 lbs. .... 349.95**

**Kit AJA-1200-2, AM Module, Shpg. wt. 2 lbs. .... 39.95**

**Kit AJA-1600-2, Dolby FM Module provides reduced noise and increased dynamic range factors on Dolbyized broadcasts, Shpg. wt. 1 lb. .... 54.95**

**SPECIFICATIONS FM SECTION:** Mono/Stereo Usable Sensitivity: 1.9 (10.8) 3.5(16.1)  $\mu$ V (dB $\mu$ ). 50 dB Sensitivity: 3.5 (16.1) 38 (36.8)  $\mu$ V (dB $\mu$ ). S/N Ratio: 70 65 dB. Hum and Noise: 65 dB. Harmonic Distortion: 0.15/0.3% Frequency Response: 30 to 15 kHz @  $\pm$  1.5 dB. PREAMPLIFIER: Frequency Response: 20-20 kHz @  $\pm$  0.5 dB Phono, 20-20 kHz @  $\pm$  0.3 dB Aux. THD and IMD (2 W out): 0.009%. Input Sensitivity (0.5 V out): 1.25 mV Phono, 100 mV Aux. Input Overload: 150 mV Phono, 10 V Aux. S/N: 75 dB Phono, 85 dB Aux. AMPLIFIER IMD: 0.012% TIM: <0.02%. Frequency Response: 20-20 kHz @  $\pm$  0.2 dB. 1 kHz Separation: 50 dB. A-Weighted S/N: 95 dB. Power: 120 VAC/60 Hz. Antenna Connections: 300 & 75 ohm. Convenience Outlets: 1 switched, 1 unswitched (200 W max.). Dimensions: 4 1/2" H x 17" W x 15 1/4" D.

## Multi-purpose Mono Amplifier



**3.25 WATTS, MINIMUM RMS INTO 8 OHMS WITH 1.5% T.H.D. FROM 40-20,000 HZ**

This solid-state kit takes a minimum 250 mV signal from source (ceramic phono, mono AM or FM tuner, tape player, etc.) and amplifies it cleanly. Drives 8 $\Omega$  speakers to surprising sound levels! Has rear panel speaker terminals and input jack; front panel power switch with 'on' lamp, headphone jack, volume and tone controls in a 2 3/8" H x 7 3/4" W x 5 1/2" D metal case. Fuse-protected for 120 and 240 VAC.

**Kit AA-18, Shpg. wt. 4 lbs. .... 44.95**

## High-efficiency phono cartridges

Dynavector Karat Ruby moving-coil cartridge is acknowledged as one of the world's very finest with wide 20-50,000 Hz response and superior tracking ability. Has 0.2 mV output, >20 dB separation at 1 kHz. **SAVE** – buy this renowned cartridge with memory turntable (right) at a system price. Requires AP-1800-type preamp.

**ADP-1370, Shpg. wt. 1 lb. .... 310.00**

**Shure V-15 Type V** with Dynamic Stabilizer has 10-28,000 Hz response, 3.2 mV output, >25 dB separation and 1.0-1.25 gm tracking force on a hyperelliptical nude diamond. Mfg.'s price: \$250.

**ADP-1261, Shpg. wt. 1 lb. .... 199.95**

**AUDIOPHILES:** Cash in on your valuable turntable & cartridge systems (at right, and on page 13).



## Anti-resonant direct drive memorymatic Onkyo turntable

- Straight, low-mass tubular tonearm



The Pro Series-compatible Onkyo CP-1130F turntable features two-speed, microcomputer-controlled fully automatic direct drive. Enjoy soft-touch control of Search, Cue, Memory Repeat and Play modes with  $\pm$  3% variable pitch. Has 0.025% W/RMS wow and flutter, >72 dB DIN-B s/n ratio and anti-skating.

**ACP-1130, Assembled, Shpg. wt. 15 lbs. ... 249.95**

**SAVER!** Onkyo CP-1130F turntable with Dynavector Ruby moving-coil cartridge described at left.

**ACS-1130A, Shpg. wt. 24 lbs. .... 519.95**

**SAVER!** CP-1130F with Shure V-15 Type V, at left.

**ACS-1130B, Shpg. wt. 24 lbs. .... 429.90**



**NEW**  
Possibly the two most important components to evaluate and improve your hi-fi performance.

## Heath Pro-Series Audio has studio-quality capability and performance for the home

Superlative by any standard, Heath's highly-acclaimed Pro-Series components are engineered so they can be used by professional studios, sound engineers or recording artists. And by creative, discriminating audiophiles.

### 1 Nikko ND-1000C Cassette Deck with Dolby C noise reduction attains the highest level of performance

Electromagnetic properties differ from tape to tape. This is true not only for different *types* of tape but also different *brands* of the same type. But the amazing, microcomputer-based Tape Evaluation and Control System of the ND-1000C will actually record test signals, evaluate the results... then optimize bias and sensitivity for *any* tape you elect to use. At the touch of a button, each recording parameter is automatically adjusted in order to extract the maximum level of playback performance from every tape formulation. Without compromising the distortion or dynamic range specifications, it assures extended flat high frequency response. It's even possible to commit the optimized parameters of your favorite tape types—normal-bias, chrome and metal—to the memory.

Feather-touch, IC-logic tape transport control allows direct change of operating mode with built-in delay and 'flying start' recording. The accurate 2 motor 3-head design has off-the-tape monitor capability, memory play, auto repeat, Dolby C noise reduction, two mic inputs, headphone jack and bargraph LED peak level meters. In all, a fully-compatible tape recording system with a remarkable style of improving playback performance. Manufacturer's suggested retail: \$630.

ATP-1846, Assembled and tested, Shpg. wt. 16 lbs. .... 549.95  
ATP-1845-1, Rack-mounting Accessory to fit AE-1705, 1 lb. .... 24.95

### 2 Get better reception with this Digital AM/FM Tuner

As the center of a powerfully-endowed stereo music system, the AJ-1600 AM/FM Stereo Tuner carries a set of outstanding specifications and performance characteristics. For prime reception, it has a digital frequency display plus center-tune

meter for the most exact tuning with selectable wide/narrow IF bandwidth for the lowest interference distortion and a high capture ratio in all station areas. An RF input attenuator reduces overload and cross modulation, while a mute switch can improve threshold tuning. A switchable signal strength/multipath meter will assure precise antenna orientation and maximum reception of a broadcast, so music comes through with spacious separation and brilliant clarity.

The Tuner's significant specifications include a sensitivity of 1.8  $\mu$ V (mono) and 3.5  $\mu$ V (stereo) for clean, crisp realization of weak and distant stations; signal-to-noise ratio of 83 dB mono/75 dB stereo for purer enjoyment of noise-free music; total harmonic distortion levels below 0.1% at 1 kHz; and channel separation better than 45 dB at mid-frequencies for full, expressive stereo listening and clear spatial imaging. One audition will convince you of its musical worth.

Kit AJ-1600, Shpg. wt. 25 lbs. .... 449.95  
Kit AJA-1600-2, Dolby FM Noise Reduction Module, Shpg. wt. 1 lb. .... 54.95  
AEA-1800-2, Oak-finished Cabinet, Shpg. wt. 6 lbs. .... 34.95

### 3 Preamp provides complete audio signal control

In *Stereo Review Magazine*, Julian Hirsch stated: "In sum, the Heath AP-1800 does practically everything one could want, and does it with perfection."

Our infinitely versatile Deluxe Preamp gives you absolute mastery over a multitude of source inputs without the introduction of static distortion or coloration. It has a built-in moving-coil preamp, plus two moving-magnet inputs with three sensitivity and capacitance selections to match any turntable cartridge; tape monitoring for two decks, plus deck-to-deck dubbing and the ability to listen to any source while copying; separate bass and treble controls for each channel, plus dual turnover points for precise tone adjustment and bypass. With two-level high (6 or 12 kHz) and low (20 or 50 Hz) filter switches, a continuously variable loudness control, 0/20/40 dB switchable muting, four speaker capability, equalization or active processing added through an adapter loop switch, six conve-



nience outlets and many other high quality features, you're capable of tailoring raw source material with an incredible degree of artful finesse.

**Kit AP-1800**, Shpg. wt. 27 lbs. .... **399.95**  
**AEA-1800-2**, Oak-finished Cabinet, Shpg. wt 6 lbs. .... **34.95**

#### 4 Graphic Output Indicator monitors peak power levels

**Accurate monitoring of peak power output is critical to avoiding overloads and speaker damage.** The AD-1701, one of the fastest output indicators on the market, gives you an instantaneous visual check of power amplifier or preamplifier output. Two rows of 15 LEDs (one row for each channel) warn you of dangerous peak loads that could harm other components or ruin your tweeters. When the output range switch is set to select the 0 dB reference level for high or low level input, the Indicator exactly displays your system output within a 53 dB dynamic range, calibrated in rms values between each vertical pair of LEDs. The six-position range switch offers extremely wide sensitivity, with response time capturing transient bursts as short as one-half cycle of 20 kHz. A peak hold/average button allows you to supplement slow and restricted VU meters.

**Kit AD-1701A**, Shpg. wt. 15 lbs. .... **199.95**  
**AEA-1800-3**, Solid Oak End Panels, Shpg. wt. 2 lbs. .... **19.95**

#### 5 10-Band Octave Equalizer alters tonal parameters

**Adjust the audio response of records, tapes and FM broadcasts to your creative taste by adding the Pro-Series Equalizer to your rack.** It's an accessory that can dramatically enhance the performance of every other system component, and improve your environmental acoustics *without contributing noise.*

**Ten ISO-centered frequency band slide controls for each channel give you octave-by-octave boost or cut preference over the entire audible range.** They let you eliminate 'live' or 'dead' room spots for smooth, flat-graph characteristics. You'll notice right away that selective frequency-band equalization can enrich cartridge response, cut harmful subsonics, boost deep bass response to the anatomical vibration level and put lively resonance back into woofer, midrange and tweeter efficiency. A six-way mode/monitor combination network allows you to equalize, monitor, record or bypass without rearranging any cables. Left and right channel LED clipping indicators warn of peak overload conditions. Harmonic distortion is a phenomenally low 0.001% from 20-20,000 Hz at rated output.

**Kit AD-1703**, Shpg. wt. 17 lbs. .... **274.95**  
**AEA-1800-2**, Oak-finished Cabinet, Shpg. wt. 6 lbs. .... **34.95**

#### 6 **NEW!** The latest Pro-Series member: Heath's AD-1308 Portable Real-Time Spectrum Analyzer, plus optional ADA-1308-1 Power Supply/Rack-Mount Accessory and AD-1309 Pink/White Noise Generator can be seen on page 10.

#### 7 Specially-priced turntable-and-cartridge systems

**The Onkyo CP-1130F (see also pg. 13) is a high quality, direct drive fully automatic turntable.** One with streamlined cabinet design, repeat capability, soft-touch controls, better tracking, vibration isolation — and freedom from the irritating effects of rumble, noise, wow and flutter. In tandem with one of our two professional-status cartridges described below and on page 11, you'll enjoy pristine audio playback pleasure.

**ACP-1130**, Assembled, 15 lbs. . . **249.95**

**SAVER!** CP-1130F turntable with world-renowned Dynavector Ruby moving-coil cartridge. Has a square, 2.3 mm ruby cantilever for maximum rigidity and groove-to-coil signal transmission.

**ACS-1130A**, Shpg. wt. 24 lbs. . . . **519.95**

**SAVER!** CP-1130F turntable with Shure V-15 Type V cartridge.

**ACS-1130B**, Shpg. wt. 24 lbs. .... **429.90**



**Handsome optional oak-finished cabinets and solid oak end panels for Heathkit Pro-Series Audio Components (for selected models) are listed and sold separately for each unit.**



 Alaska, Hawaii and Michigan Residents: Call 616-982-3411

#### 8 Active Audio Processor increases your dynamic range

**Dynamic range is to music what perspective is to painting or photography.** It gives audio depth and feeling. Some of the dynamic range in most music is lost in the recording or broadcast process, but the expansion circuit in the AD-1706 can restore up to 8 dB of this loss. You'll discover your music has even more realism, better definition and lower background noise while maintaining full response and ultralow distortion — even at high volume levels. The superb noise reduction circuitry sifts out up to 10 dB of noise from records and hiss from tapes, to effectively increase your system's total dynamic range by up to 18 dB. A 7 kHz linear-phase filter can be switched in to reduce ultrasonic noise.

**Front panel LEDs indicate relative noise reduction and dynamic range expansion levels precisely.** Compatibilities between the built-in tape monitor and mode selector switch let you apply processing either during or after recording, specify the processing insertion point or bypass the Processor completely.

**Kit AD-1706**, Shpg. wt. 18 lbs. .... **299.95**  
**AEA-1800-2**, Oak-finished Cabinet, Shpg. wt. 6 lbs. .... **34.95**

#### 9 Variable Electronic Crossover extends bass response

**Add a separate bass channel to your system!** Used with a Subwoofer like the AS-1320 on page 14, this component will give a more accurate crossover alignment for lower distortion and clearly-improved low end response *down to as low as 20 Hz!* Crossover points at 40, 60, 80, 100, 125 and 150 Hz can be frequency scaled up to 6 kHz. Switches select 6 dB/octave or 18 dB/octave slopes for flat frequency response at crossover points and well-defined imaging. Outputs for stereo, monaural and bridged hookup give you the provisions to connect another amplifier and subwoofer to your system. Better control of drivers is possible in bi-amp and tri-amp applications, so you can play music at live performance levels without the slightest distortion. Has bass level control, crossover bypass switch and a 15 kHz infrasonic filter to remove annoying record warp noise.

**Kit AD-1702**, Shpg. wt. 15 lbs. .... **199.95**  
**AEA-1800-3**, Solid Oak End Panels, Shpg. wt. 2 lbs. .... **19.95**  
**Kit AS-1320**, Subwoofer, 177 lbs., Motor Freight Collect ..... **319.95**

#### 10 Build the finest high-level Stereo Power Amplifier

**The phenomenal dynamic range of new audio sources requires more power and headroom to faithfully reproduce the total sound spectrum.** Without that power, musical peaks get hard-clipped and the dynamic range is compromised. Additionally, amplifiers driven to clipping can have more than 40% harmonic distortion and may force a speaker to dissipate twice the normal heat.

**The Pro-Series AA-1800 Amplifier has the necessary power to scrupulously reproduce all of your music from tape, disc or FM dial, with sound peaks that would ordinarily be crushed by less capable amplifiers.** It will give you more power and transient 3 dB dynamic headroom to carefully duplicate every detail of the essential waveform and multiply your listening pleasure without introducing noise into the experience. Hum and noise is a full 85 dB down, with a T.I.M. of less than 0.03%. Audiophiles will find it exquisitely faithful to the source.

**A patented protection system double-safeguards your speaker from damaging input signals.** Special overload and high-frequency cutoff circuitry, a thermal circuit breaker and 8-second turn-on/turn-off delay circuits further protect your system from destructive voltages, disconnecting the speakers and causing a front panel Protection LED to glow. Massive heat sinks cool the electrical network while LEDs for each channel precisely indicate full power output.

**Two line cords with remote AC switching relieve your preamp from the burden of transferring high current.** Twin inputs, level controls, speaker outputs and a line fuse are on the back panel. Rack handles ease installation.

**September 1982 High Fidelity Magazine reported:** "In short, the AA-1800 is as fine an amplifier as one could want; sonically neutral, and powerful enough for just about any reasonable domestic application. And provided you don't mind spending a few evenings behind a soldering iron, its price is a bargain."

**Kit AA-1800**, Shpg. wt. 75 lbs. .... **649.95**

#### Pro-Series Rack combines beauty and functional convenience

**Put your Pro-Series audio equipment together in a portable, space-saving rack so all controls are within easy reach!** Comes with dividers for storing records and top shelf for turntable. Has locking swivel casters for quick mobility. Handsome walnut veneer side panels add contemporary taste to any room and a unified look to a set of components that mirror your exceptional taste in audio hardware. EIA standard rack measures 43½" H x 21½" W x 18" D.

**Kit AE-1705**, Shpg. wt. 74 lbs. .... **274.95**





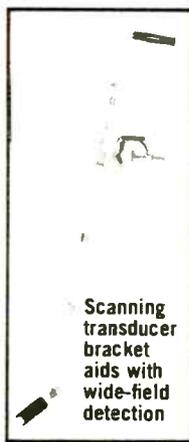
## Bottom contours and deepwater fish can't hide from the chart-recording Heathkit Seeker™

- Record of best spots and their depths helps you return again and again
- One roll of paper lasts approximately 13 hours for continuous charting

The Heathkit Seeker Chart Recording Depth Sounder is one of the most useful boating and fishing accessories you can own. Use it to find schools of small fish as well as individual large fish. It's bottom recording accuracy makes it a valuable navigation aid for following coast line depths and mapping lakes.

You get a wider picture of what's below: An extra-wide beam 50 kHz transducer, three depth ranges (5 to 200', 200-400' or 400-600'), sensitivity and special "white line" controls allow you to mark more fish and set your line accordingly. A switch-controlled marker puts a vertical line on the chart for easy reference. Rugged, water-tight housing has locking hinged panel for quick chart roll replacement, and is lighted for easy night reading. Includes one roll of chart paper.

- Depth Sounder with through-hull transducer and 30 feet of connector cable.**  
 Kit MI-2910-1, Shpg. wt. 17 lbs. .... **299.95**
- Depth Sounder with transom-mount transducer and 30 feet of connector cable.**  
 Kit MI-2910-2, Shpg. wt. 17 lbs. .... **299.95**
- MIA-2910-1, Two rolls of chart paper, Shpg. wt. 2 lbs. .... 10.95**
- SAVER! MIS-2910-1, Twelve rolls of chart paper, Shpg. wt. 12 lbs. .... 49.95**



## Sensitive and accurate Deluxe Dual-Range Fish Spotter delivers professional results

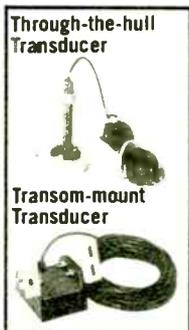
A Heathkit Deluxe Fish Spotter should be standard tackle for any serious angler. It can help you increase the size and weight of your catches by detecting single or schools of fish swimming, and submerged objects between the surface and any preset depth you choose. Two sounding ranges, 0-60 or 0-240 feet, insure the high accuracy and sharp definition so important in an instrument of this type.

Fish entering the transducer's ultrasonic range will trigger an audible alarm (if selected) as a bright neon indicator shows the exact depth. Relatively small variations in fish location can be observed while your boat is in motion.

**Two precision instruments in one portable package:** The MI-2901 will locate the best fishing habitats and stand duty as a dependable depth sounder for navigation through unknown waters. Has sensitivity control, corrosion-resistant aluminum case, sun-shielded dial and watertight ceramic transducer element with suction cup mount. Powered by two 6-volt lantern batteries (not included). Take it with you in any boat and come home with more fish in your cooler!

- Kit MI-2901A, Shpg. wt. 9 lbs. .... 139.95**
- Scanning Transducer Bracket for use with MI-2901. Has C-clamp mounting, scans 360° and locks in any position. Accepts 1 3/8" transducer element.**  
 Kit MIA-2900-1, Shpg. wt. 4 lbs. .... **39.95**

HEATH HAS A BETTER MARINE VALUE!



## Deluxe Dual-Range Depth Sounder marks hazard areas and doubles as a thermocline finder

- Protect your hull from scrapes or puncture; find one or a school of fish

Whether you're fishing, cruising or scuba diving, this Dual-Range Depth Sounder will add an extra measure of safety to your boating season pleasure. When selected, a high-pitched beeping alarm alerts you to shoals or submerged objects projecting above any preset depth from 5 to 240 feet, thus eliminating the need for continuous visual monitoring. Two ranges, one for depths to 60 feet and one for depths to 240 feet, provide extremely accurate readings instantly.

Underwater obstacles will trigger a bright neon flash alongside the perceived depth from the object on one of two circular scales. In addition to its use as a fine navigational instrument, a sensitivity control aids in discriminating between bottom readings and those returned by single or schools of fish. A special noise rejection circuit eliminates false flashes caused by interference.

Housed in a water-resistant, black Cyclocac case, the MI-1031 has a glare-free bezel with sunshield and a super-bright neon indicator to make accurate depth readings easy day or night. The gimbal mount bracket and quick-disconnect power and transducer leads allow for easy removal when your boat is not in use.

- Depth Sounder with through-hull transducer and 25 feet of connector cable.**  
 Kit MI-1031-1, Shpg. wt. 8 lbs. .... **119.95**
- Depth Sounder with transom-mount transducer and 25 feet of connector cable.**  
 Kit MI-1031-2, Shpg. wt. 8 lbs. .... **119.95**

## 1 Automatic, dual-range Digital Depth Sounder has five alarm depths for assured safety

As low as **\$179<sup>95</sup>**

- Detects changes in depth from 2 to 499 feet
- Alerts you to depth changes both audibly and visually
- Built-in, adjustable keel offset for greater accuracy

**Pays for itself if it sounds the alarm just once!** A great aid for coastal navigation. Features self-adjusting range selection that monitors water's depth from 2' to 499'. Also has self-adjusting gain for accurate depth readings in fresh or salt water. Crystal oscillator updates depth readings every 0.9 seconds. Big, easy-to-read LCD display with automatic night light shows depths in 0.1' increments from 2' to 9.9' and in 1' intervals from 10' to 499'.

**Has 5 alarm settings at 2, 4, 10, 20' and 40'** Built-in keel offset automatically subtracts displacement hull depths for exact depth readings. Made from weather-resistant materials. Back connector for MI-2917 or MI-2918 Remotes.

Kit MI-2916-1, Depth Sounder with Through-Hull Transducer, 8 lbs. . . . . **189.95**  
 Kit MI-2916-2, Depth Sounder with Transom-Mount Transducer, 7 lbs. . . . . **179.95**  
 Kit MI-2916-3, Depth Sounder with Flush-Mount Transducer, 8 lbs. . . . . **199.95**

MI-2916 SPECIFICATIONS: Frequency: 200 Hz Accuracy:  $\pm 5\%$ , -1 count Power: 10 to 17.7 VDC

## 2 Digital Remote Depth Sounder repeater station

Works off the MI-2916 model above, providing added alerting station. Has same display, all-weather sealed cabinet construction, audio-visual alarm, but with independent alarm/depth settings and keel-offset capability. Includes 25' connector cable. Same size as MI-2916, with tilting gimbal-mount bracket.

Kit MI-2917, Shpg. wt. 4 lbs. . . . . **69.95**

## 3 Flush-mount Digital Remote Readout for sailboats

5" diameter, operates like MI-2917 as readout repeater. Requires MI-2916.

Kit MI-2918, Remote with visual warning only, Shpg. wt. 4 lbs. . . . . **89.95**  
 Kit MIA-2918-1, Audible warning alarm for MI-2918, Shpg. wt. 1 lb. . . . . **12.95**

## 4 Sailboaters! Powerboaters! The low-cost Heathkit Digital Knotmeter/Trip Log gives you outstanding speed and log accuracy

**\$99<sup>95</sup>**

- Keeps track of nautical speed and distance with  $\pm 5\%$  accuracy; designed to be used on all types of hulls
- Designed to be used with all types of hulls
- Priced 50% lower than comparable-performing models

**Upgrade your boat** by installing the low-cost, but highly accurate Heathkit Digital Knotmeter/Trip Log. For sailors, it allows you to trim sails for maximum racing speed. For fishermen, it lets you control boat speed for best lure action, and mark distance to your favorite "hot spots." For powerboat owners, it improves navigation for reduced fuel consumption. And for water skiers, it lets you earmark speeds for safe towing of one or more skiers.

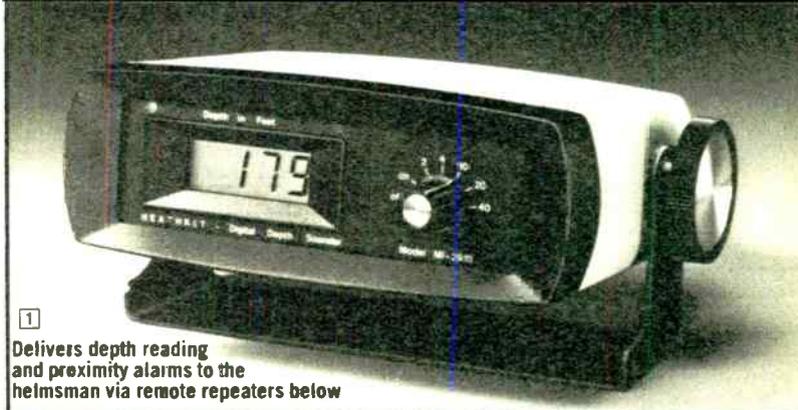
**The most accurate knotmeter/log of its kind!** The Heathkit digital Knotmeter/Trip Log features integrated circuits for precise speed and readouts. These circuits, using three active filters, constantly compute and update your average speed and distance every two seconds with  $\pm 5\%$  accuracy. And you enjoy this accuracy no matter what type of boat hull you have, because the transducers for the MI-2956 and -2958 both feature a special optimizing speed calibration that enables you to fine-tune the circuits to the shape of your individual hull.

**Each has an easy-to-read LCD display that shows speed or distance.** The readout is in three 1/2" digits, with automatic backlighting for night outings. With the flip of a switch, it will tell you speed in mph (or knots), from 0.1 to 40 mph; or tell you distance traveled from 0 to 99 miles (or nautical miles).

**It's tough and durable:** The housing, including the on/off and speed/distance switches, is completely sealed for protection against salt spray and corrosion.

**It's available in two models:** You can order the MI-2958 Knotmeter/Trip Log for your sailboat or the MI-2956 Knotmeter/Trip Log for power boats. What's more, you have a choice of transducers to correctly match the necessary transmitting unit to your individual preference, or according to the size of your craft.

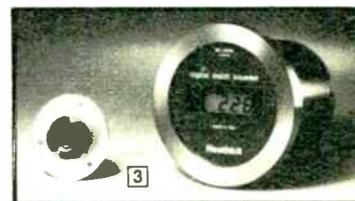
Kit MI-2958, Sailboat Knotmeter/Trip Log, Shpg. wt. 4 lbs. . . . . **99.95**  
 Kit MI-2956, Powerboat Knotmeter/Trip Log, Shpg. wt. 4 lbs. . . . . **99.95**  
 MIA-2950-1, Through-Hull Transducer, Shpg. wt. 2 lbs. . . . . **39.95**



1 Delivers depth reading and proximity alarms to the helmsman via remote repeaters below



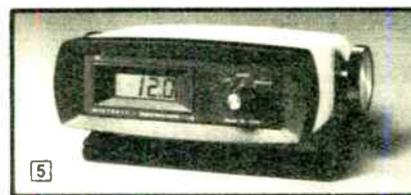
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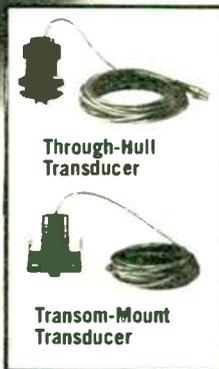
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MIA-2950-2, Transom-Mount Transducer, Shpg. wt. 2 lbs. . . . . **29.95**

MI-2958 & MI-2956 SPECIFICATIONS: Speed Range: 0.1 to 45 mph or knots. Log Range: 0 to 99.9 miles or nautical miles, auto reset @ 100 Speed and log accuracy: 15%. Display: 3 digit LCD, non blinking with automatic backlighting. Display Update: 2 seconds. Power Req: 11 to 16 VDC (from boat's system or 2-6 VDC lantern batteries, reverse polarity protected. Dim: MI-2958: 5" diam. by 4 1/2" deep. Requires a 4 1/8" hole for mounting. MI-2956: 2 1/2" H x 7.0" W x 5 1/2" D.

Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## Heath's Ultrasonic Cleaner for delicate items

**\$99<sup>95</sup>**

- For those almost-impossible special cleaning chores
- Cleans and sanitizes most precious items that might be damaged by abrasive scrubbing or harsh cleaners

The Heathkit Ultrasonic Cleaner makes light work of all those items that you could never get clean without tedious labor. Whatever your 'impossible' cleaning chore, odds are the GD-1150 Ultrasonic Cleaner can handle it – thoroughly, safely and automatically.

This scientific method is the fastest, most effective way to deep clean dirt, stains and undissolved solids from hard-to-clean jewelry, watch parts, glass, coins, components, dentures, paint brushes, etc. Cleaned objects sparkle like new! All your delicate items, except pearls and turquois, are safely cleaned without abrasion.

Simply fill the stainless steel tank with a safe cleaning solution, place dirtied objects in the tank, set the timer for up to five minutes – and the efficient Ultrasonic Cleaner does the rest. You'll be amazed how quickly and easily your possessions come clean. *How does it work?* The GD-1151 features an all-solid-state circuit, a lead-zirconate transducer, a stainless steel tank and a durable plastic cabinet. The 41 kiloHertz mechanical motion of the tank creates microscopic bubbles within the contaminants. These grow and collapse rapidly, forcing cleaning solution through the impurities so they can be completely dissolved and rinsed away.

The GD-1150 Ultrasonic Cleaner is efficient, with a maximum power consumption of only 100 watts. Use a standard laundry detergent or softener at any temperature between 32° and 122° F. Filling the 6" L x 4" W x 2<sup>3</sup>/<sub>8</sub>" D tank with one inch of



Variable zero to five minute timer

Stainless steel cleaning tank

cleaning solution only requires about 1<sup>3</sup>/<sub>4</sub> cups.

Professional artisans, jewelers and watchmakers have used the ultrasonic method for years. This low-cost kit is easy to build, in two evenings – and it lets you take advantage of this safe and efficient cleaning process. 4<sup>3</sup>/<sub>8</sub>" H x 11" W x 5<sup>3</sup>/<sub>8</sub>" D. 120 VAC.

Kit GD-1151, Shpg. wt. 5 lbs. .... 99.95

## Get consistent darkroom processing

**\$139<sup>95</sup>**

- Programmable memory recalls up to 10 steps; precise auto-step sequencing and microprocessor control provide more accuracy than dial timers
- Waterproof front panel has selectable backlighting

Have the precise timing required for quality color or black and white prints, and program the timing sequence you need for developing prints and films. Use memory for absolutely consistent exposures when making multiple prints, or make one-time timer settings. The Programmable Darkroom Timer features a 4-digit timer and a 12-hour LED clock to synchronize printing and developing steps.

Audible alarm settings are available at 1, 30 or 60 second intervals in any combination, or once at the end of a programmed cycle. A 10-second, end-of-cycle alarm tells you when to begin pouring from the tank.

Convenience is built in: Enlarger and safelight outlets are toggled so when one turns on, the other goes off. The focus switch permits turning on the enlarger while the safelights remain on. An Optional Auxiliary Outlet turns on external devices (such as color drum) during countdown in the Process mode. Optional foot switches make operation even easier by providing convenient foot control of start and focus functions. Metal case. 120/240 VAC.

Kit PT-1500, Shpg. wt. 5 lbs. .... 139.95



PTA-1500-1, Optional Single Foot Switch, Shpg. wt. 1 lb. .... 12.95

PTA-1500-2, Optional Dual Foot Switch, Shpg. wt. 3 lbs. .... 29.95

PTA-1500-3, Optional Auxiliary Outlet, Shpg. wt. 1 lb. .... 15.95

## Electronic Metronome helps you practice



**\$24<sup>95</sup>**

- Variable between 40 and 210 beats per minute for efficient tempo-teaching
- Reliable performance year after year housed in handsome cherry-finish birch

Whatever instrument you play, the Heathkit Electronic Metronome will maintain a steady beat so you can practice confidently at the correct tempo. Uses a sound board and solenoid to produce an authentic metronome sound.

Front panel control lets you set the tempo you need. A rear panel control lets you adjust the volume from soft to a loud, conventional "tick-tock" rhythm. Includes a handy label so a student can relate the number of beats per minute to tempos in different time signatures.

Kit TD-1257, Shpg. wt. 2 lbs. .... 24.95

## Digital Thermometer for accurate measurements

**\$49<sup>95</sup>**

- Highly accurate and super dependable – with dozens of everyday applications

Check the temperature of liquids and air – if you need to accurately measure temperatures, this reliable, battery powered electronic thermometer delivers perfect readings every time. Quickly and accurately! This micro-marvel weighs only 5.5 ounces and fits comfortably in the palm of your hand. Operates on one 9V battery (not supplied) for up to one year.

No more squinting at difficult-to-read thermometers. Solid state circuitry gives easy-to-read 4-digit temperatures in less than ten seconds. Wand senses from 32° to 230° F (0° to 110° C) with ±0.2° F (±0.1° C) biomedical accuracy and 0.5% overall accuracy with 0.1° F or °C resolution.

GD-1226, Assembled and tested, Shpg. wt. 2 lbs. .... 49.95



## Use a Digital Scale to accurately monitor weight loss and progress to a more compelling figure

**\$99<sup>95</sup>**

- Battery operated for accuracy and safety anywhere
- No-wear electronic strain-gauge mechanism sensitive to weight change as small as 1/10 of a pound or kg.

The Heathkit Digital Scale is a multi-purpose balance that offers far more accuracy than mechanical scales. Dieters and fitness enthusiasts can closely watch their weight improve, and everyone will enjoy a precision readout on items requiring accurate measurement. An electronic transducer element eliminates the springs and weights that wear out on conventional scales.

**Don't sacrifice quality for a few less dollars** – GD-1186 is no ordinary bathroom scale with digital readout attached, but a true resistive strain gauge!

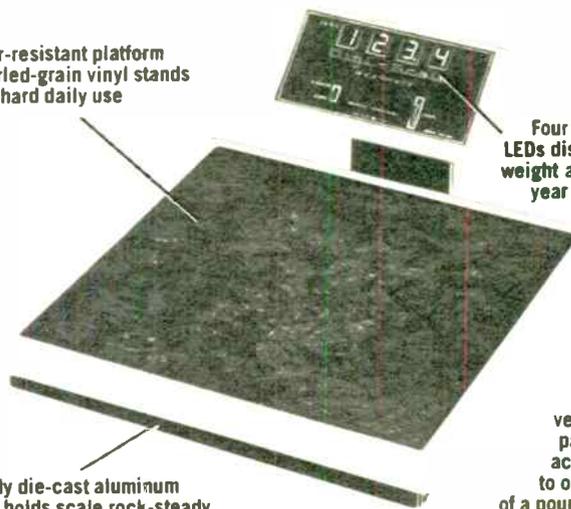
**Four bright, easy-to-read 1/2" digits display the weight.** You decide whether to wire the kit to read in pounds or kilograms. Features both manual and automatic modes; in manual, the display is on constantly and can measure weights as small as 2 ounces, to a 300-lb. capacity. On automatic, it conserves power by remaining off until weight is placed on the platform.

**A manual zero adjustment makes it easy to weigh small items.** This special offset feature means you can weigh the baby without weighing the blanket. Safe to use after the shower. Requires 6 'C' cell batteries (not included).

Kit GD-1186, Shpg. wt. 9 lbs. .... **99.95**

Water-resistant platform of burled-grain vinyl stands up to hard daily use

Four bright 1/2" LEDs display your weight accurately year after year



Sturdy die-cast aluminum base holds scale rock-steady

Weigh very small packages accurately to one-tenth of a pound or kg.

## Guests love the Programmable Musical Doorbell

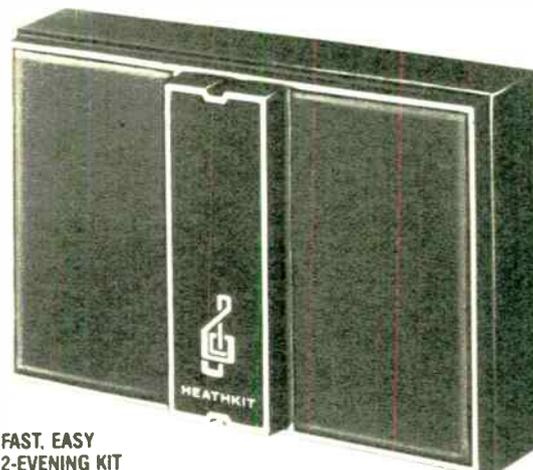
**\$49<sup>95</sup>**

- Program it to play up to 16 beats of your favorite tunes
- Easily programmed for your mood or any special occasion
- Includes song book with over 50 programmable melodies

Bring a little music into your everyday life with the touch of a button. Greet your friends with a tune by building this Electronic Doorbell for your home. It's a versatile and ingenious replacement for the conventional doorbell, buzzer or simple chime. Imagine the pleasant reaction and smiles on visitor's faces when they're greeted with a friendly song you've selected to fit any circumstance. It's a very uniquely warm way to say "welcome" to all who call.

**Changing tunes is easy,** by arranging wire leads on a one-octave 'keyboard' behind the front panel. The songbook includes 15 college songs, 7 seasonal songs plus 9 Christmas songs, 5 to commemorate special occasions – and many more to celebrate your mood. The assembly manual has programming instructions for a variety of tunes, or compose your own. Controls for adjusting volume, tone, speed and delay characteristics add synthesized variety to any tune. Attaches easily to existing doorbell transformer. And extra speakers may be wired on to spread the music around your home. You'll even know which door to answer, as the back door button will activate only a portion of the tune you select. Extend a musical hello – and own the neighborhood's most unique chimes! Install it in your home, then surprise and greet every caller with an infinitely - imaginable, new kind of musical merriment.

Kit TD-1089, Shpg. wt. 3 lbs. .... **49.95**



FAST, EASY  
2-EVENING KIT

## 3-Tune Doorbell greets with beautiful music

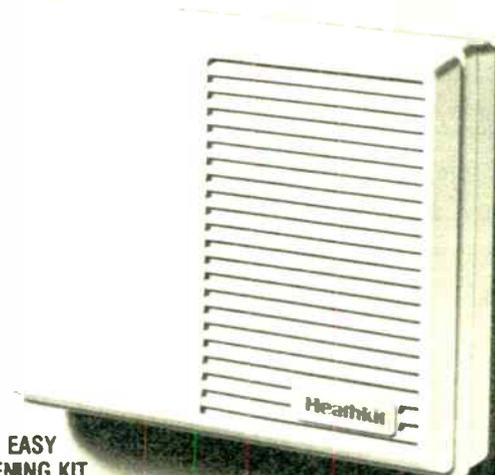
**\$19<sup>95</sup>**

- Can be built and easily installed in a single night
- Adjustable volume carries tune throughout your home
- The low-cost way to put a difference in your doorbell

If you want to replace your ho-hum doorbell with one that plays a tune or two, the Electronic Doorbell is a kit you'll be proud to install new, or switch with your old-fashioned ringer. The TD-2089 plays three diverse selections: an upbeat 4-note ring, a short tune (Beethoven's *Für Elise*) and a long tune (*Romance*). Each tune is reproduced polyphonically by an IC synthesizer.

**Quickly select different tunes for front and back door** by jumping wires to small sockets. Assembly requires almost no hardware, as the circuit board snaps firmly into the attractive case and spring clips hold the speaker. For extra sound, remote speakers can be added to extend music throughout your home. Hidden connections are made through plug-in jacks and a 10-foot extension ribbon lets you change tunes or service the unit at table level rather than on the wall. Two "C" cell batteries (not included) power the low-drain electronics while your present 10 to 16 volt doorbell transformer supplies your pushbutton circuits. Case size is 4 3/4" H x 5 7/8" W x 1 1/4" D. Spread the joy of music by putting a warm and classical spirit of welcome in your home...and open the door to a friendly smile every time!

Kit TD-2089, Shpg. wt. 1 lb. .... **WAS \$24.95, NOW ONLY 19.95**



FAST, EASY  
1-EVENING KIT



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## Three rugged instruments to help you with the tough jobs around the workshop and the home

### 1 IM-5228 VTVM offers dependable service

**\$79<sup>95</sup>**

- Accurately measures  $\pm$  DC, AC voltages and resistance
- Very high 11 M $\Omega$  input impedance reduces circuit loading

**Indispensable tool:** For engineers, servicemen and hobbyists, the IM-5228 vacuum tube voltmeter provides the accuracy needed for effective troubleshooting. A full scale accuracy of  $\pm 3\%$  is available when measuring DC voltages in seven ranges up to 1500 volts. On AC measurements, accuracy is  $\pm 5\%$  in all seven ranges up to 1500 VRMS. Precision resistors allow precise resistance readings to be made from 0.1 ohm to 1000 megohms in seven ranges.

**Convenient to use:** Separate 1.5 and 5 volt ranges permit low AC voltage readings. A single jack input and a switchable test probe eliminate the tangle of front panel test leads. Requires one "C" battery. Operates on 120/240 VAC, 50/60 Hz.

Kit IM-5228, VTVM, Shpg. wt. 6 lbs. .... **79.95**  
PKW-4, Assembled Replacement Probe for IM-5228, Shpg. wt. 1 lb. .... **19.95**

### 2 Portable IM-5217 solid-state voltmeter

**\$44<sup>95</sup>**

- An accurate and easy-to-operate general utility meter
- An ideal first-kit project for the electronics novice

**General purpose volt/ohm meter:** Perfect for home repairs or service calls, the IM-5217 features four  $\pm$  DC and AC ranges of 1.5V (1.7 VAC), 15V, 150V and 500V with an accuracy of  $\pm 3\%$  ( $\pm 5\%$  AC). Four ohmmeter ranges used are x1, x100, x1k and x1M ohms. The 1.5 volts used in the ohmmeter circuit is also useful as a test voltage for checking semiconductors. The rugged plastic case, with a test lead storage compartment, measures 9 $\frac{3}{8}$ " W x 5 $\frac{3}{8}$ " H x 9" D. The meter requires two 9-volt and one 1.5-volt "C" batteries. Test leads included.

Kit IM-5217, Utility voltmeter, Shpg. wt. 4 lbs. .... **44.95**

### 3 Convenient clamp-on AC current measurements

**\$49<sup>95</sup>**

- Electricians tool for testing power/lighting circuits
- Homeowners aid for checking current use of appliances

**Clamp-on current meter:** Really easy to operate, the SM-2206 measures the 50 and 60 Hz current flow in a circuit or appliance by simply clamping its inductive pickup around a conducting AC wire. Five current ranges of 6A, 15A, 60A, 150A, and 300A allow monitoring of almost any AC circuit. For checking AC voltages, the meter has three ranges of 150V, 300V, and 600V. A resistance range of 0 to 5 kilohms is also available for such uses as circuit continuity checks and other home and shop resistance measurements.

**Convenient:** For those hard to reach one-handed current measurements, the SM-2206 features a convenient finger-operated switch. With this special switch, the meter's pointer can be locked into position during a measurement. The meter is then removed from the circuit and the current directly read from the scale.



1  
IM-5228 workbench VTVM

2  
IM-5217 compact and portable VOM

3  
SM-2206 clamp-on current meter

**Rugged:** Whether it's the homeowner looking for possible savings by checking appliance current usage or an electrician checking power and lighting circuits, the SM-2206 is built to take constant use. The meter is protected by a shock-resistant housing and a pointer lock-down switch. Included are test leads, 1.5 volt "AA" battery, spare resistance range fuse and carrying case.

SM-2206, Assembled and tested, Shpg. wt. 2 lbs. .... **49.95**

## Economical high-voltage and logic test probes

### 1 IM-5210 HV probe features built-in meter

**All-in-one probe:** Quickly and easily measure up to 40,000 volts with an accuracy of  $\pm 3\%$  and never remove your eyes from the test point. With the built-in meter, you can see the probe tip and the meter reading at the same time.

Kit IM-5210, Shpg. wt. 2 lbs. .... **29.95**

### 2 IMA-100-10 probe allows kilovolt readings

**Accessory probe:** The IMA-100-10 plugs into any 10 M $\Omega$  input DMM to measure up to 30,000 volts. Probe requires a 10 M $\Omega$  meter input impedance.

Kit IMA-100-10, Shpg. wt. 1 lb. .... **14.95**

SMA-100-10, Assembled and tested, Shpg. wt. 1 lb. .... **19.95**

### 3 IT-7410 tests ICs and digital circuits

**Logic probe:** This handy and versatile probe tests TTL/CMOS digital circuits and other ICs. Besides detecting and indicating high and low logic levels, it indicates the polarity and presence of signal pulses as short as 10 ns. Probe includes 34" power leads that clip to circuit under test or separate DC supply.

Kit IT-7410, Shpg. wt. 1 lb. .... **39.95**



1  
IM-5210 high-voltage probe with meter

2  
IMA-100-10 30 kilovolt accessory probe

3  
IT-7410 low-priced logic probe



# Equip your service or hobby bench with these professional and economical test instruments



## 1 IM-4180 FM Deviation Meter measures peak FM

**\$169<sup>95</sup>** • Checks carrier frequencies between 25 and 1000 MHz  
• Optional antenna or direct line monitoring of signals

**Features:** Four deviation modulation ranges from 2 to 75 kHz, coarse and fine tuning controls for locking in difficult UHF FM signals, two scope monitoring jacks, a speaker for audio, and portable battery or bench AC operation.

Kit IM-4180, Shpg. wt. 7 lbs. .... 169.95

Kit IMA-4180-1, Battery Charger/Eliminator, Shpg. wt. 2 lbs. .... 32.95

SMA-2400-1, Swiveling Telescopic Antenna, Shpg. wt. 1 lb. .... 9.95

## 2 IG-1271 Function Generator supplies signals

**\$159<sup>95</sup>** • Produces sine, square and triangle waveshapes  
• Frequency range extends from 0.1 Hz to 1 MHz

**Quality instrument:** Easy to assemble unit supplies a 10-volt peak signal into a 50-ohm load and features a calibrated attenuator that is adjustable in 10 dB steps, from 0 to 50 dB. Also has 20 dB variable attenuator. Uses 120/240 VAC.

Kit IG-1271, Shpg. wt. 7 lbs. .... 159.95

SG-1271, Assembled, calibrated, tested, Shpg. wt. 6 lbs. .... 225.00

## 3 Low-cost IT-5230 CRT Tester and Rejuvenator

**\$139<sup>95</sup>** • Tests, cleans, and restores almost any TV picture tube  
• Use on color and 8&W CRTs, even in-line-gun tubes

**TV shop necessity:** Pushbutton control of individual gun testing, cleaning, and rejuvenation. Checks for shorts, gassy or enlarged grids, and life expectancy.

Kit IT-5230, Shpg. wt. 9 lbs. .... 139.95

**NEW** **CRT Socket Adapter:** Test even more CRTs with this versatile adapter accessory to the IT-5230. Universal clip leads allow you to hook up and test CRTs with known basing configurations.

ITA-5230-1, Shpg. wt. 1 lb. .... 29.95

## 4 Compact IG-5240 Hand-Held Color Generator

**Portable color pattern generator:** The IG-5230 supplies color bar, dot, cross-hatch and vertical and horizontal line patterns for aligning color and B&W TV sets on channel 4 (optional Ch. 3). Three crystals controlling the RF channel carrier, and color and timing oscillators provides a stability and a frequency accuracy of  $\pm 0.005\%$ . This portable 8-ounce generator is powered by two 9-volt DC transistor batteries (not included) which are protected by a five-minute turn-off circuit.

Kit IG-5240, Shpg. wt. 2 lbs. .... 74.95

## 5 IG-5218 Sine/Square Wave Audio Generator

**Versatile signal source:** Designed for service and testing, the IG-5218 generates sine waves from 1 Hz to 100 kHz with less than 0.1% distortion and square waves from 5 Hz to 100 kHz. Sine output is adjustable through eight ranges from 0.003 to 10 volts. Square wave has less than a 50 ns rise time.

Kit IG-5218, Shpg. wt. 10 lbs. .... 139.95

## 6 IG-5257 Post-Marker/Sweep Generator

**For TV and FM receiver alignments:** A solid-state fifteen-crystal marker generator and electronic sweep generator for aligning tuned circuits in TVs and stereo receivers. Other features include a blanking switch, trace reversing switch, and a phase control. Also includes a 70 dB attenuator pad.

Kit IG-5257, Shpg. wt. 16 lbs. .... 279.95

## 7 Portable IT-3120 FET/Transistor Tester

**Quick checker:** Tests transistors, diodes, FETs, SCR's, triacs and UJT's in- and out-of-circuit. Shows gain, transconductance and leakage current.

Kit IT-3120, Shpg. wt. 5 lbs. .... 79.95

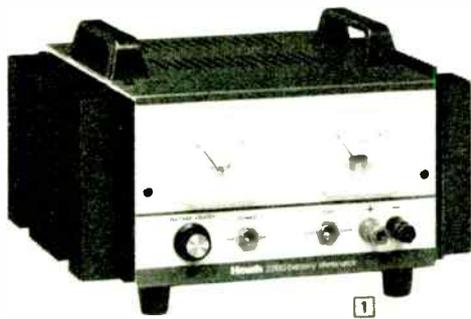
## 8 Valuable IN-3117 Decade Resistance Box

**Resistance substitution box:** Covers from 1 to 999,999 ohms in 1 ohm steps. All resistors are 1 watt, 0.5% tolerance type. Rugged case includes binding posts.

Kit IN-3117, Shpg. wt. 3 lbs. .... 59.95

INSTRUMENTS/19

# Heathkit provides adjustable power for your workbench with three different supplies



## 1 Heavy-Duty Power Supply/Battery Eliminator

**\$169<sup>95</sup>**

- Regulated variable output from 9 to 15 volts
- Current output 12A continuous or 20A intermittent
- Front panel voltage and current monitoring meters

For any high-current usage between 9 and 15 volts DC, as for Ham and CB radio servicing, the IP-2760 reliably supplies all that's required. When a lot of current is needed, the Power Supply/Battery Eliminator maintains less than a 2% output change under varying load conditions. Effective filtering removes AC for less than a 1% output ripple at full load. Double heatsinks allow the IP-2760 to run cooler while its four power transistors are fused at 20 amps to protect it against overloads. A front panel voltage meter indicates the output voltage while a similar current meter indicates the current drawn by the connected load. Also on the front panel is a switch to temporarily remove the output voltage from the load. Housing is painted in instrument blue.

Kit IP-2760, Shpg. wt. 31 lbs. .... 169.95

**IP-2760 SPECIFICATIONS:** Output Voltage: Variable from 9-15 VDC Output Current: 12 A continuous, 20 A intermittent (per derating curve in manual) Ripple: Less than 1% at full load Regulation: Less than 2% variation from no load to full load. Fuses: 7A, 3 AG slow-blow primary, 20A, 3 AG output Power Requirement: 120/240 VAC, 50/60 Hz 840 watts. Dimensions: 5¼" H x 11" W x 11" D

## 2 Tri-Power Supply functions as three supplies

**\$109<sup>95</sup>**

- Fixed 5 VDC output at 1.5 amps plus two separate adjustable 20 VDC outputs at 0.5 amps
- All outputs short-circuit proof with current limiting
- Independent outputs can be connected together

**Ideal for design or experimentation:** The 5 VDC output is rated at 1.5 amps which is enough to power most digital devices. The two variable 20 VDC outputs provide 0.5 amps each and feature a special "tracking" mode. In this mode, one 20-volt supply can be set at a certain voltage and as the second 20-volt supply is adjusted, the voltage difference between the two will remain the same. This feature is ideal for providing + and - voltages for operational amplifier circuits. All three outputs can be operated independently from each other with either floating or referenced grounds. The three outputs can also be connected in series to provide up to 45 VDC or connected in parallel to supply higher current through a load. Each supply is overload protected with their output currents fixed slightly above rated current to provide short-circuit protection. A front panel meter allows you to monitor any of the voltage or current outputs. All outputs and controls are readily accessible on the front panel, and clearly marked for easy operation. Metal housing is painted in instrument blue.

Kit IP-2718, Shpg. wt. 12 lbs. .... 109.95

SP-2718, Assembled and tested, Shpg. wt. 12 lbs. .... 195.00

**IP/SP-2718 SPECIFICATIONS:** Outputs: 5 VDC at 1.5 A, 0-20 VDC at 0.5 A Regulation: No Load to Full Load: <0.1% variation on 20V supplies; <3% variation on 5V supply For 10V Line Voltage Change: <0.2% variation on 20V supplies; <0.15% variation on 5V supply. Power Requirement: 120 240 VAC, 50 60 Hz, 100 watts full load Dimensions: 4½" H x 10¾" W x 9" D

## 3 Regulated High Voltage Power Supply

**\$189<sup>95</sup>**

- Separate 0 to 400 VDC at 100 mA high voltage output and 0 to -100 VDC at 1 mA bias voltage output
- Separate 6.3 VAC and 12.6 VAC filament outputs

**High voltage and bias voltage applications:** The IP-2717A is a compact, convenient source of variable regulated high voltage, variable bias voltage, and filament voltage for workshops and experimenters. The high voltage (B+) output provides 0 to 400 volts of regulated DC at a continuous 100 mA or an intermittent 125 mA. The B+ has less than 10 mV (RMS) ripple and varies less than 1% from a no load to full load condition. The bias (C-) output provides negative voltages from 0 to -100 volts DC up to 1 mA. All high voltage and bias voltage output binding posts are insulated from the chassis allowing high B+ and C- voltages to be used as either negative or positive voltage sources. Also available are two filament voltages, 6.3 VAC and 12.6 VAC at 2 amps, which may be used at the same time as long as the total combined power doesn't exceed 25 volt-amperes. A separate transformer is used for filament voltages allowing tube filaments to be left on while the high voltage circuit is shut off. A front panel meter monitors either high voltage or bias voltage as determined by the setting of the meter switch. High voltage DC current is also monitored by a 0 to 150 mA meter. A special taper control allows fine adjusting of low values of bias voltages. Kit and assembled versions measure 13¾" W x 11¼" D x 5½" H.

Kit IP-2717A, Shpg. wt. 19 lbs. .... 189.95

SP-2717A, Assembled and tested, Shpg. wt. 20 lbs. .... 239.95

**IP/SP-2717A SPECIFICATIONS:** Outputs: High Voltage: 0-400 VDC. Bias Voltage: 0-100 VDC. Filament Voltage: 6.3 VAC and 12.6 VAC Regulation: Less than 1% from no load to full load for output of 100 to 400 VDC. Ripple: Less than 10 mV RMS. Output Impedance: Less than 10 ohms from DC to 1 MHz (per manual impedance curve). Power Requirement: 120 240 VAC, 50 60 Hz

## Regulated DC Power Supply for low-voltage

**\$44<sup>95</sup>**

- Floating ground permits positive or negative outputs
- Output voltages can be AC- or DC-voltage controlled



**Regulated low DC voltage source:** Furnishing between 1 and 15 volts up to 500 milliamps, the IP-2728 is ideal as a power source for transistor radios, portable tape recorders, etc. It has a continuously variable 1-15 VDC output with less than 50 mV line and load regulation. The IP-2728 has fully adjustable current limiting from 10 mA to over 500 mA. A three-terminal "floating" output enables the Supply to furnish either positive or negative voltages. Programming terminals on the rear of the cabinet allow the use of AC or DC voltages from another source to control the output voltage of the IP-2728. Binding-post terminals allow easy and fast banana-plug and wire connections. Measures 4¾" H x 5½" W x 5¾" D.

Kit IP-2728, Shpg. wt. 5 lbs. .... 44.95

# Value-priced Heathkit 5280 Series Test Equipment makes a perfect 'starter' bench set

The Heathkit 5280 Series of test instruments is intended for the beginning hobbyist, serviceperson and student. Designed to work together, they're an excellent way to assemble a truly versatile test bench, without spending a lot of money. Each of the high-quality instruments is priced under \$50, with build-it-yourself reliability as an added benefit. Whether you're doing television repair, hi-fi servicing or circuit experimentation, the 5280 Series represents real value for your dollar.

Your  
choice  
only  
**\$49<sup>95</sup>**  
each

## 1 RCL Bridge for experimentation and design work

- Front panel meter indicates null (balanced bridge condition) accurately
- Read unknown values of resistance, inductance and capacitance directly

The Heathkit IB-5281 RCL Bridge is priced right for your pocketbook, and has the features you'll really appreciate for testing and design work. A tough 5280 Series cabinet houses the solid-state circuitry that lets you easily determine unknown values of resistance, inductance and capacitance. Resistance is indicated in three ranges from 10 $\Omega$  to 10M $\Omega$ ; inductance in three ranges from 10  $\mu$ H to 10 H; and capacitance, also in three ranges, from 10 pF to 10  $\mu$ F. As always, the step-by-step Heathkit Manual makes this instrument easy to build — single circuit board construction speeds assembly. Terminals are provided on the front panel for the component under test, and an external standard. With component clips. Handy snap-tight compartment in top of cabinet stores leads and accessories. Needs two 9V batteries or IPA-5280-1 Power Supply (below, right).

Kit IB-5281, Shpg. wt. 5 lbs. .... **49.95**

**IB-5281 SPECIFICATIONS:** Resistance Ranges: 10 $\Omega$  to 10M $\Omega$  in three ranges. Inductance Ranges: 10  $\mu$ H to 10H in three ranges. Capacitance Ranges: 10 pF to 10  $\mu$ F in three ranges. Oscillator Frequencies: 1 kHz, 10 kHz, 100 kHz. External Standard Range: 1 to 10.1. Cabinet Dimensions: 11" W x 5 3/4" H x 7 3/4" D. Weight: 3 1/2 lbs.

## 2 Wide-range Sine and Square Wave Audio Oscillator

- 10 Hz to 100 kHz frequency range with sine and square wave output
- Both 0-3 volt signals may be used simultaneously or independently

The IG-5282 Audio Oscillator is an instrument that you'll find useful in many audio test applications. Frequency output is in four ranges, from 10 Hz to 100 kHz, in either sine or square wave modes. Use the IG-5282 as an audio signal source during signal tracing or, with the appropriate associated test equipment, use the sine wave output for audio stage gain and distortion analysis. If you're interested in determining frequency response and harmonic distortion figures, you'll find the IG-5282's square wave output ideal for your purposes, with the necessary additional equipment. Construction is rugged and assembly time is greatly reduced by single circuit board assembly. Requires two 9V batteries for portable use or the IPA-5280-1 Power Supply below. With the multi-function versatility of this precise service aid, you'll wonder how you managed to get along without the IG-5282 until now. A great value and an important addition to your test bench. Has convenient storage compartment.

Kit IG-5282, Shpg. wt. 5 lbs. .... **49.95**

**IG-5282 SPECIFICATIONS:** Frequency Output: 10 Hz to 100 kHz in four ranges. Sine Wave Output Voltage: 0-3 volts RMS. Square Wave Output Voltage: 0-3 volts peak. Dimensions: 11" H x 5 3/4" W x 7 3/4" D. Net Weight: 3 1/4 lbs.

## 3 Quality RF Oscillator for radio/TV alignment work

- 1000 Hz audio output also provides source of internal AM modulation
- Includes test leads, banana plugs and alligator clips to build probes

The IG-5280 Portable RF Oscillator provides an accurate source of amplitude-modulated and un-modulated RF signals for alignment of tuned stages in AM, FM and television receivers. Output is divided into five overlapping bands from 310 kHz to 110 MHz, covering AM, FM, TV, longwave and shortwave broadcasting. RF frequency is indicated on a large, easy-to-read dial scale. Features extra 100 to 220 MHz band of calibrated harmonics. Front panel 1000 Hz AF output is ideal for tracing and isolation of circuit defects and serves as a source of internal modulation, with continuously variable output attenuators. To insure greater RF accuracy, the bandwidth and coil assembly is factory adjusted. Calibration requires only a voltmeter and an AM-FM receiver.

Kit IG-5280, Shpg. wt. 5 lbs. .... **49.95**

**IG-5280 SPECIFICATIONS:** RF Output: Frequency Range: 310 kHz to 110 MHz in five bands. 100 MHz to 220 MHz on harmonics. Output Voltage: 100 mV approx. Internal Modulation: 1000 Hz AF Output: Frequency: 1000 Hz. Output Voltage: 2.0 volts RMS (open circuit). Power Requirements: Two 9-volt batteries or IPA-5280-1 power supply.



## 4 Signal Tracer for radio and TV audio circuits

- Compact, service-oriented instrument for troubleshooting AM, FM and TV
- Use it to check microphones, musical instruments, pickups and speakers
- Audible ohmmeter/voltmeter function works usefully as logic tracer

A great addition to your test bench arsenal when troubleshooting defective equipment. A diode-equipped RF probe (furnished with kit) lets you quickly trace receiver and transmitter circuits to reveal component and RF or IF stage failures. Flip the probe to its straight-through DC position so you can track down and pinpoint failing or defective circuitry in all types of audio components. In the audible volt/ohmmeter mode, the IT-5283 changes tone depending on the test point voltage or resistance which allows you to simply and easily isolate problems by following signal flow through logic circuits. Two front panel jacks permit you to use 16 $\Omega$  internal speaker for substitution tests.

Kit IT-5283, Shpg. wt. 5 lbs. .... **49.95**

**IT-5283 SPECIFICATIONS:** Functions: Substitute speaker, AF signal tracing, RF signal tracing, Audible volt/ohmmeter. Speaker: 3" permanent magnet. Power: Two 9-volt batteries and/or IPA-5280 power supply. Dimensions: 11" W x 5 3/4" H x 7 3/4" D.

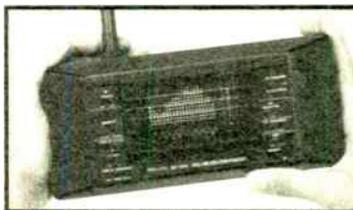
## AC Power Supply for all 5280 Series instruments

- Five output cables with connectors supplied for quick, easy bench setup

**Power for the 5280 Series:** The Heathkit name stands for value — and the IPA-5280 (not shown) confirms it. Provides a well-regulated, + and - 9 volts on your bench, from either 120 or 240 VAC, switchable. Features full wave rectification, capacitor filtering and dual integrated circuit regulators to insure correct voltage output. Powers all 5280 Series equipment on your bench simultaneously. Maximum output current is 100 mA. Size is 3" H x 6" W x 3 3/4" D.

Kit IPA-5280-1, Shpg. wt. 3 lbs. .... **34.95**

## NEW-Spectrum Analyzer featured in this catalog



**Professional test instruments:** The new AD-1308 Real-Time Spectrum Analyzer (1/2 and 1-octave) and optional AD-1309 Pink/White Noise Generator are two of the finest diagnostic tools available to the serious audio technician or sound engineer. See page 10.

# Convenient Hand-held Capacitance Meter with leakage detector and auto-ranging display

Equipped with special circuitry to detect leaky capacitors

**\$159<sup>95</sup>**

- Measures all types of capacitors to 199.9 mF with  $\pm 0.2\%$  basic accuracy – automatically selects proper measuring range
- Features a large, easy-to-read liquid crystal display (LCD)
- Built-in polarized "Kelvin" terminals allow for direct measurement
- Remote extension cable for hard-to-reach spots
- Convenient zero offset control equalizes the display level to compensate for stray capacitance within the Meter and assure repeatable accuracy

Compact size allows for use in the shop or the field: Measures all types of capacitors within a range of 0.1 pF to 199.9 mF. Special auto-ranging feature selects the proper range from ten alternatives. A large, 3½ digit LCD displays the correct measurement while one of four LED's lights to show the unit of measurement. Protection from excessive current is provided by clamp diodes and a ¼-amp fuse when the IT-2250 is turned on, and by a 2.2 ohm, 2 watt resistor across the input jacks when the instrument is turned off.

**Accurate and versatile:** The IT-2250 is equipped with "Kelvin" terminals and a zero-control for accuracy. Tests capacitors with low operating voltage. Detects leaky capacitors. Remote cable provided. Uses 9 VDC cell or 120 VAC with optional PS-2350 below. Standard-value capacitors supplied for calibration.

**Kit IT-2250**, Shpg. wt. 3 lbs. .... **159.95**

**IMA-2215-1**, Leather Carrying Case for IT-2250, Shpg. wt. 1 lb. .... **14.95**

**PS-2350**, 120 VAC Battery Eliminator, Shpg. wt. 1 lb. .... **7.95**

**IT-2250 SPECIFICATIONS:** Ranges: 199.9 pF, 1999 pF, 19.99 nF, 1.999  $\mu$ F, 19.99  $\mu$ F, 199.9  $\mu$ F, 1999  $\mu$ F, 19.99 mF, 199.9 mF. Accuracy: Using Laboratory Standards: 199.9 pF, 1999 pF, 19.99 nF and 199.9 nF ranges  $\pm (0.2\%$  of reading + count + 0.5 pF); 1.999  $\mu$ F, 19.99  $\mu$ F, 199.9  $\mu$ F, 1999  $\mu$ F, 19.99 mF and 199.9 mF ranges  $\pm (5\%$  of reading + 1 count) Using Heath Supplied Standards: 199.9 pF, 1999 pF, 19.99 nF, and 199.9 nF ranges,  $\pm (0.75\%$  of reading + 1 count + 0.5 pF); 1.999  $\mu$ F, 19.99  $\mu$ F, 199.9  $\mu$ F, 199.9 mF and 199.9 mF ranges,  $\pm (6\%$  of reading + 1 count). NOTE: The accuracy of the Heathkit IT-2250 Capacitance Meter depends on whether you calibrate with the Heath-supplied standards or laboratory standards. Specifications are listed above for both methods of calibration. Accuracy specifications apply to a temperature range of 67 to 77 degrees F (19 to 25 degrees C). **Conversion and Display Rate:** For values up to 1999  $\mu$ F, less than 1.5 seconds. For values up to 199.9 mF, less than 10 seconds. **Display:** 3½ digit (maximum count, 1999) liquid crystal. **Testing Voltage:** 2.00 VDC maximum, typically varying from 0.6 to 1.4 VDC. **Operating Temperature Range:** 32 to 104 degrees F (0 to 40 degrees C). **Storage Temperature Range:** -4 to -140 degrees F (-20 to -60 degrees C). **Battery Life:** Approximately four to ten hours, in continuous operation. **Battery Indicator:** Displays "LO BAT" warning when battery is down to approximately 5 VDC. **Overall Dimensions:** 2" H x 3¼" W x 7½" L (5.0 x 8.3 x 19.1 cm). **Net Weight:** 16 ounces.



3½-digit LCD Display with ½-inch tall digits

LED's instantly show you which of four ranges is in use



Optional carrying case

Zero-control compensates for stray capacitance, so only the capacitor under test will be measured

"Kelvin" terminals for highly accurate measurements

## Quality accessories for your instruments



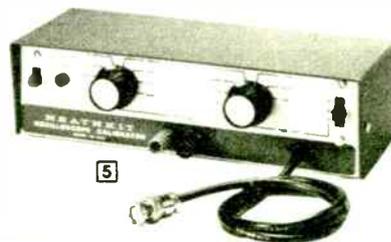
1



3



4



5



2



6

### 1 Deluxe 10:1/Direct flexible probe

For scopes and frequency counters: Covers DC to 80 MHz in X10 position and to 15 MHz in X1 position.

PKW-105, Assembled, Shpg. wt. 1 lb. .... **32.95**

### 3 Low-capacitance isolation probe

Minimizes loading effects: Direct/10:1 probe with coax cable for low bandwidth scopes.

Kit PK-1, Shpg. wt. 1 lb. .... **14.95**

### 5 IG-4505 Oscilloscope Calibrator

Crystal-controlled scope-calibrating accuracy with a rise time <4 ns. Calibrate scopes to over 35 MHz.

Kit IG-4505, Shpg. wt. 4 lbs. .... **59.95**

### 2 Scope/meter demodulator probe

Demodulator/detector probe: Features 500 VDC max. input or 30 VRMS. Coaxial cable/banana plug.

Kit 337-C, Shpg. wt. 1 lb. .... **12.95**

### 4 RF test probe for DC voltmeters

For 10 & 11 M $\Omega$  DC meters: Provides RF voltage measurement capability to over 100 MHz.

PK-3A, Shpg. wt. 1 lb. .... **12.95**

### 6 30 kV DC Probe, X100, 10 M $\Omega$ in

Kit IMA-100-10, for 10 M $\Omega$  meters, 1 lb. .... **14.95**

SMA-100-10, Assembled, Shpg. wt. 1 lb. .... **19.95**

Kit IMA-100-11, for 11 M $\Omega$  meters, 1 lb. .... **14.95**



## Versatile, laboratory-quality instrument for making highly accurate frequency measurements

- Extra-wide 5 Hz to 512 MHz frequency range for measuring frequency, period, and the ratio between two frequencies
- Proportionally-controlled crystal oven controls crystal temperature for greater frequency measuring stability

**\$269<sup>95</sup>**

**Extra-wide frequency range:** For engineers, technicians and hobbyists requiring a frequency counter that extends into the UHF range, the IM-2420 is made to order. Low frequency signals, 5 Hz to 50 MHz, are measured at the 1-megohm A input and high frequency signals, 40 MHz to 512 MHz, are measured at the 50-ohm B input.

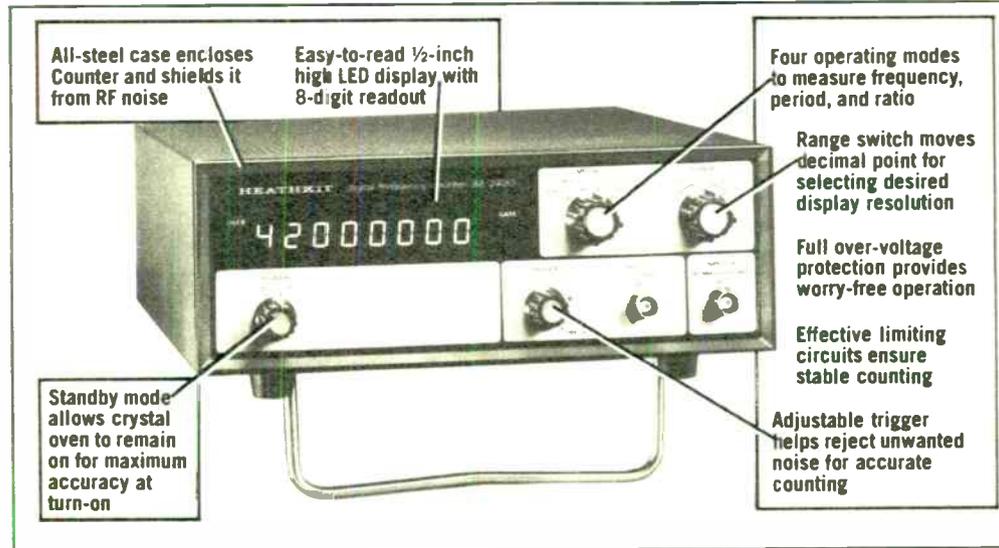
**Accurate measurements:** A proportionally-controlled crystal oven keeps the internal time base extremely accurate, to within 0.2 part per million (PPM) over a wide environmental temperature range. Plus a high-quality precision crystal in the time base oscillator, give this counter excellent long-term stability.

**Added accuracy:** For an even more accurate time base, an external high-precision frequency standard can be connected to a rear panel BNC connector of the IM-2420. Or conversely, the internal time base of the counter can be used as a semi-precision standard for some other test-bench equipment.

**Excellent sensitivity:** While the IM-2420's guaranteed sensitivity is 25 mV, its typical sensitivity is a much lower 4 to 15 mV. This means you can accurately measure low-level signals, like those found in oscillator circuits, as well as high-level transmitter output frequencies. For measuring complicated or noisy waveforms, a trigger level control ensures stable counting. Even indirect frequency readings of transmitter outputs are possible using the optional SMA-2400-1, a swiveling antenna that can be tuned with its telescoping sections.

**High resolution:** With frequency and period readouts down to 0.1 Hz and 100 ns.

Kit IM-2420, Shpg. wt. 9 lbs. .... **269.95**  
 SM-2420, Assembled and tested, Shpg. wt. 9 lbs. .... **320.00**  
 SMA-2400-1, Right Angle Telescopic Antenna for IM-2400, IM-2410, IM-2420 Frequency Counters; Includes BNC connector, Assembled, 1 lb. .... **9.95**



**IM/SM-2400 SPECIFICATIONS:** INPUTS: Frequency Ranges: 5 Hz to 50 MHz and 40 MHz to 512 MHz. Sensitivity: 25 mV RMS guaranteed, 4 to 15 mV RMS typical. Input Impedance: 5 Hz to 50 MHz range, 1 megohm shunted by less than 25 pF; 40 MHz to 512 MHz range, 50 ohms nominal. Input Protection: 5 Hz to 50 MHz range, 250 V RMS to 100 kHz (derating to 25 V RMS at 50 MHz); 40 MHz to 512 MHz, 5 V RMS. Period Measurement Mode: Input: 5 Hz to 50 MHz only. Range: 5 Hz to 10 MHz. Display Resolution (Least Significant Digit): 100 ns to 0.1 ms in decade steps. Ratio B/A Measurement Mode: Input Frequency Limits: 5 Hz to 25 MHz and 40 MHz to 512 MHz. Effective Measurement Range: From 1.6 to 1.024 x 10<sup>8</sup>, guaranteed. Time Base: Frequency: 10 MHz. Setability: To within 0.2 parts per million (PPM). Temperature Stability: 0.2 PPM from 32°F to 104°F (0°C to 40°C). Crystal Aging Rate: Less than 1 PPM per year. Oven Operating Temperature: 167°F. ± 9°F (75°C ± 5°C). Warm-up Time From Cold Oven (unplugged) Start: 10 minutes to within 1.0 PPM. 20 minutes to within 0.1 PPM. External Input: TTL or 2.5 V RMS from 50 ohm source (10 MHz). Input Protection: Any voltage with peak-to-peak limits between -3.5 and +10 volts. Output: Will drive one standard TTL (i.e. 7400) load. Short circuit protected. General Gate Time: 0.01 second, 0.1 second, 1 second, and 10 seconds (switch selectable). Sampling Rate: Every 0.1 second, 0.33 second, 1 second or 10 seconds. Dimensions: 4 1/4" H x 10" W x 12 1/2" D (10.8 x 25.4 x 31.8 cm). Power: 120 240 VAC, 50 60 Hz.

## Easy-to-use IM-2410 Frequency Counter accurately measures frequencies from 10 Hz to 225 MHz

**\$129<sup>95</sup>**

- High-resolution frequency measurements in both 10 Hz to 50 MHz and 20 MHz to 225 MHz ranges
- Switchable dual time gate provides 0.1 second and 1.0 second count periods

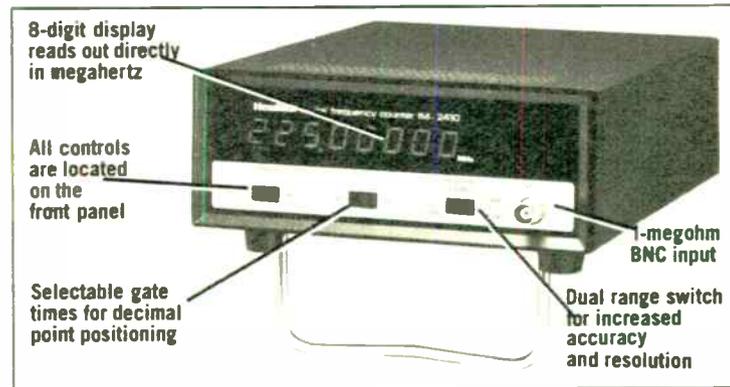
**Exceptional accuracy and stability for its price:** A highly accurate frequency counter, the IM-2410 measures frequencies down to 1 Hz in the 10 Hz to 50 MHz range and 10 Hz in the 20 MHz to 225 MHz range. And, its crystal-controlled time base supplies an excellent ± 10 PPM long-term stability. You'd expect features like these only on more expensive counters.

**Simple to operate:** One BNC input is provided for fast, direct frequency measurements. Just slide the range switch to the correct frequency coverage. Then, set the gate switch for the desired decimal point location. The frequency is displayed on eight large LEDs and is read directly in megahertz. For indirect frequency measurements, the optional SMA-2400-1 Telescopic Antenna (see above) can be connected to the counter.

**RFI protected:** The IM-2410 is enclosed in a rugged and compact metal cabinet which shields it from radio-frequency interference that can cause measurement errors. The IM-2410's input is protected to 150 VAC up to 100 kHz and derated to 5 VAC between 160 MHz to 225 MHz for those high-frequency at low voltage measurements. Complete voltage protection ensures worry-free operation.

**Additional features:** Included with the IM-2410 Frequency Counter is a locking swing-down stand to elevate the front of the Counter for a comfortable viewing angle. The IM-2410 can be assembled to operate either on 120 VAC or 240 VAC at 50 Hz or 60 Hz and at a maximum of 25 watts.

Kit IM-2410, Shpg. wt. 6 lbs. .... **129.95**  
 SMA-2400-1, Telescopic Antenna, Shpg. wt. 1 lb. .... **9.95**



**IM/SM-2410 SPECIFICATIONS:** Sensitivity: 10 Hz to 50 MHz range, 25 mV RMS maximum, 10 mV typical from 10 Hz to 30 MHz; 50 mV RMS maximum from 30 to 50 MHz; 20 MHz to 225 MHz range, 25 mV RMS maximum, 10 mV typical from 20 to 150 MHz; 50 mV RMS maximum from 150 to 225 MHz. Input Impedance: 1 megohm, shunted by less than 24 pF. Input Protection: 150 VAC, up to 100 kHz - derating to 5 VAC from 160 to 225 MHz. Time Base Frequency: 3.58 MHz. Setability: ± 1 PPM. Temperature Stability: ± 10 PPM, from 0 to 40 degrees C. Gate Time: 0.1 or 1.0 second, switch selectable. Frequency Resolution: 10 Hz to 50 MHz range, ± 1 Hz; with gate time set at 1.0 second and ± 10 Hz with gate time set at 0.1 second; 20 MHz to 225 MHz range, ± 10 Hz with gate time set at 1.0 second, ± 100 Hz with gate time set at 0.1 second. Display: Eight-digit LED display. Overall Dimensions: 3 3/8" H x 7 1/4" W x 9 1/2" D (8.6 x 18.4 x 24.1 cm). Net Weight: 5 lbs. (2.3 kg).



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

Full-featured  
multimeter



Rugged  
handheld  
design

Includes exclusive  
"touch hold" lock-  
in function



## Deluxe handheld analog and digital multimeter from Fluke\*

**\$119<sup>95</sup>**

- Power-up self-test checks all functions and chirps audible OK
- Manual or autoranging with 0.3% basic DC accuracy
- "Touch-hold" function locks in meter reading when stable

**Fluke excellence:** Created for design, industrial, service and hobby applications by Fluke, the SM-77 features quality and dependability in an easy-to-use and low-cost multimeter. Its 3¾ digit display measures DC and AC volts in five ranges up to 1000 VDC and 750 VAC, resistance in six ranges up to 32 megohms, and DC and AC current up to 10 amps.

**Advanced features:** Besides a large and easily readable digital display, this multimeter features an analog bar graph display. It indicates the magnitude of the meter's input which is ideal for readings that change, like, peaking, nulling, and observing trends. An exclusive "touch hold" function lets you lock in readings while you concentrate on your test points. An internal beeper gives you an audible signal while in the diode test and continuity modes. The SM-77

also features manual and autoranging range selection. This allows you to lock into a range or let the meter automatically select its own range.

**Further features:** The SM-77 uses an LCD display that shows an overload condition, a low battery, and a standby condition in which the display blanks when the meter is unused after an hour.

**SM-77, Assembled and tested, 3 lbs. . . . . 119.95**  
**SMA-77-1, Soft Carrying Case, 1 lb. . . . . 9.95**

\*Fluke is a registered trademark of John Fluke Mfg. Co., Inc

**SM-77 SPECIFICATIONS:** DC Volts: Ranges: 320 mV, 3.2 V, 32 V, 320 V, 1000 V. Sensitivity: 0.1 mV (320 mV range). Accuracy: 320 mV-320 V Range: ± (0.3% of reading + 1 digit). 1000 V Range: ± (0.4% of reading + 1 digit). Input Resistance: 10 megohms. Overload Protection: 1000 V (500 V on 320 mV range only). AC Volts: Ranges: 3.2 V, 32 V, 320 V, 750 V. Sensitivity: 1 mV (3.2 V range). Accuracy: 3.2 V Range (45 Hz - 500 Hz): ± (2.0% of reading + 2 digits). Input Impedance: 10 megohms shunted by approx. 50 pF. Overload Protection: 750 VAC. Ohms: Ranges: 320, 3200, 32K, 320K, 3.2M, 32M. Sensitivity: 0.1 ohm (320 range). Accuracy: 320 Range: ± (0.5% of reading + 2 digits) 32M Range: ± (2.0% of reading + 1 digit) Power Supply: Single standard 9V battery.

Rugged and  
compact case



Easy one-handed  
operation

Extremely  
accurate  
performance

Inputs are fuse and  
diode protected

## Economical IM-2215 provides bench-meter features and accuracy

**\$89<sup>95</sup>**

- Easy, fingertip control of ranges and functions
- Checks semiconductors and in-circuit resistances
- Basic 0.25% DC accuracy when set to lab standards

**Digital multimeter:** The IM-2215 supplies you with all the advantages of a DMM: a large and easily read display, high accuracy and resolution, and superior overload protection. It features auto zero, auto-polarity, and automatic decimal point placement. It has DC/AC volts and amps, and resistance measurement ranges with superior overload protection on all ranges. Plus, the IM-2215 maintains a high 10 megohm input resistance on DC/AC volts ranges to eliminate circuit loading when measuring in-circuit values.

**Status indicators:** The large 3½ digit liquid crystal display continuously keeps you informed of the meter's operational status by showing overload, low battery, or normal operation.

**More features:** Built-in references enable you to cali-

brate the IM-2215 and maintain its accuracy.

**DC or AC operated:** For portable operation, the IM-2215 can be powered by an ordinary 9-volt transistor battery (NEDA #1604, not supplied). A typical alkaline battery provides approximately 200 hours of operation. For bench operation, you can also operate the multimeter from line voltage using an optional PS-2350 120 VAC converter listed below.

**Kit IM-2215, Shpg. wt. 2 lbs. . . . . 89.95**

**IMA-2215-1, Rugged leather Carrying Case with belt loop, Shpg. wt. 1 lb. . . . . 14.95**

**PS-2350 Battery Eliminator:** Allows IM/SM-2215 to operate from 120 VAC, Shpg. wt. 1 lb. . . . . 7.95

**IM/SM-2215 SPECIFICATIONS:** DC Voltage: Ranges: 200 mV, 2 V, 20 V, 200 V, 1000 V. Accuracy: Lab Standards: ± 0.25% of reading + 1 count (SM-2215, ± 0.1%). Built-in Standards: ± 0.35% of reading + 1 count. AC Voltage: Ranges: 200 mV, 2 V, 20 V, 200 V, 750 V. Accuracy: Lab Standards: ± 0.5% of reading + 3 counts. Built-in Standards: ± 0.6% of reading + 3 counts. DC and AC Current: Ranges: 2 mA, 20 mA, 200 mA, 2000 mA. Basic Current Accuracy: 0.75% (DC), 1.5% (AC). Resistance: Ranges: 200, 2 K, 20 K, 200 K, 2000 K, 20 M. Basic Resistance Accuracy: 0.25%. Dimensions: 2" H x 3¾" W x 7½" L.

Handheld counter  
goes anywhere

Excellent  
sensitivity



Rugged and  
compact case  
is ideal for  
field checks

## IM-2400 Counter easily checks installed mobile transmitters

**\$139<sup>95</sup>**

- High sensitivity allows very low signal pickup
- Crystal oscillator maintains excellent counter accuracy
- Rechargeable batteries are included for true portability

**Wide range:** The IM-2400 quickly and easily measures frequencies between 50 Hz and 512 MHz in two ranges. This makes it ideal for checking the output frequencies of mobile car, boat, and plane transmitters. And, the seven digit LED display of the counter gives an excellent resolution of 10 Hz in the low 50 Hz to 50 MHz range and 100 Hz in the counter's upper 40 to 512 MHz frequency range.

**High sensitivity:** The IM-2400's guaranteed sensitivity is 25 mV RMS (10 mV RMS, typical).

**DC/AC powered:** Five rechargeable 1.2 VDC nickel-cadmium "AA" size batteries are included with the counter to provide hours of operation on a single charge. To recharge these batteries or use AC power, the PS-2404 or PS-2405 Eliminator is used.

**Kit IM-2400, Shpg. wt. 3 lbs. . . . . 139.95**

**SMA-2400-1, Telescopic Antenna:** Assembled and includes BNC connector, Shpg. wt. 1 lb. . . . . 9.95

**Battery Eliminator/Charger for IM-2400:** For 120 VAC meter operation and charging of batteries.

**PS-2404, Assembled, Shpg. wt. 1 lb. . . . . 7.95**

**Battery Eliminator/Charger for IM-2400:** For 240 VAC meter operation and charging of batteries.

**PS-2405, Assembled, Shpg. wt. 1 lb. . . . . 12.95**

**IM-2400 SPECIFICATIONS:** Frequency Range: 50 Hz to 50 MHz and 40 MHz to 512 MHz. Sensitivity: 25 mV RMS guaranteed, 10 mV typical. Input Impedance: 50 Hz to 50 MHz range, 1 megohm shunted by less than 24 pF, 40 MHz to 512 MHz range, 50 ohms. Input Protection: 50 Hz to 50 MHz range, 150 volts RMS to 100 kHz derating to 10 volts RMS at 50 MHz, 40 MHz to 512 MHz range, 5 volts RMS. Time Base: Frequency: 10 MHz. Setability: ± 1 part per million (PPM). Temperature Stability: ± 10 PPM from 0 degrees C to 40 degrees C. General: Gate Time: 1.0 second or 0.1 second, switch selectable. Resolution: 50 Hz to 50 MHz, 10 Hz with time base set at 1.0 second or 100 Hz at 0.1 second, 40 MHz to 512 MHz range, 100 Hz with time base set at 1.0 second or 1 kHz at 0.1 second. Dimensions: 1½" H x 3¾" W x 8¾" L.





## IT-2232 Component Tracer effectively increases your troubleshooting efficiency

- Tests unpowered circuit boards and components
- Quickly identifies defective circuit boards
- Allows easy troubleshooting of problems to the component
- Displays comparison between two circuits or components

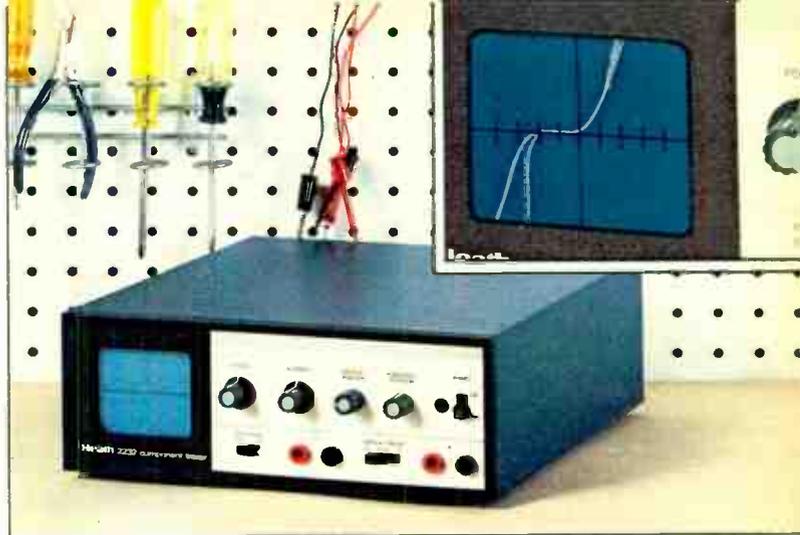
**\$249<sup>95</sup>**

**Troubleshooting redefined:** Heathkit's new IT-2232 Component Tracer is an ideal addition to anyone's workbench for troubleshooting electronic circuits. It enables a user to check digital and analog circuits that have no power applied to them. The tracer does this by displaying a component's or circuit's unique E/I characteristic curve on its CRT. And, with its two input channels and dual display, the tracer can be used to compare suspect circuits or devices against a known good unit.

**Unique display:** The IT-2232 features two separate inputs that can be viewed as individual traces on its 3-inch CRT or together in a unique superimposed display. On the scaled screen, one channel is seen as a solid line trace while the second is converted by a unique, patent-pending circuit into a dotted line. In the superimposed mode, good and suspect units are checked at the same time and their overlapping traces compared. Any differences between the two are then clearly identified to effectively determine good or bad components.

**Multi-purpose tester:** The Component Tracer is an extremely helpful troubleshooting tool and an ideal addition to anyone's service bench. It can test circuit boards and components without powering up the circuit under test. Also, it can accurately check semiconductor devices in circuit as well as out of circuit. Using the color-coded test probes that are included with the tracer, even the most inexperienced user can check for shorts, opens, or wrong parts in a minimum amount of time. In addition, the tracer can be used to detect parts that cause difficult-to-locate problems due to noise leakage, temperature instability and intermittent conditions that might go undetected using other testing methods.

**Dual testing ranges:** Two ranges, 5 and 50 volts, are provided for low and high



voltage capacity devices. Current limiting protects all circuits and components.

Kit IT-2232, Component Tracer, Shpg. wt. 15 lbs. .... **249.95**

**IT-2232 SPECIFICATIONS:** Display Modes: Channel A; Channel B; Dual. Channel A: Solid line trace. Channel B: Dotted line trace. Test Voltages: 5 volts and 50 volts peak-to-peak. Current Limits: 5 volts peak-to-peak at 5 milliamps; 50 volts peak-to-peak at 0.5 milliamps. Operational Controls: Focus, Intensity, Vertical and Horizontal Position. Cathode Ray Tube (CRT): 3RP1A, round 3-inch flat face. Accelerating Potential: Approximately 1.1 kilovolts. Operating Temperature Range: 50 degrees F to 104 degrees F (10 degrees C to 40 degrees C). Power Requirements: 120 240 VAC, 50/60 Hz, 22 watts. Dimensions: 4" H x 10" W x 12 1/2" D (10.2 x 25.4 x 31.5 centimeters) Weight: 8.4 pounds (3.8 kilograms).



## IM-2264 accurately measures true RMS values

**\$249<sup>95</sup>**

- True RMS readings of all AC voltages and currents
- Special diode test function checks semiconductors
- Features analog meter, alarm and crest warning LED

**True RMS reading digital meter:** The IM-2264 is a full-function multimeter with added AC measurement accuracy. Measurement capabilities include: five DC and AC voltage ranges extending from 0.1 mV to 1000 VDC and 750 VAC, six DC and AC current ranges from 0.1  $\mu$ A to 10 A, and six resistance ranges from 0.1 ohm to 20 megohms. The IM-2264 also uses a special circuit that electronically converts all AC signals into true RMS values for accurate measurements of complex waveforms. A high 10 M $\Omega$  input prevents the meter from loading down circuits.

**Additional features:** An auto-polarity analog meter complements the LCD digital display making nulls, peaks and trends easier to follow. A switch-enabled alarm function allows quick testing of voltage and continuity. A flashing crest warn LED alerts the operator of possible erroneous readings of AC signals due to an excessive crest factor. Battery or AC operated with PS-2404 (p. 24).

Kit IM-2264, Shpg. wt. 7 lbs. .... **249.95**

**IM-2264 SPECIFICATIONS:** Voltage Ranges: 200 mV, 2 V, 20 V, 200 V, and 1000 VDC (750 VAC). Basic Accuracy: DC:  $\pm$  (0.5% of reading + 1 count), AC:  $\pm$  (0.75% of reading + 2 counts). DC and AC Current Ranges: 200  $\mu$ A, 2 mA, 20 mA, 200 mA, 2000 mA, 10 A. Basic Accuracy: DC:  $\pm$  (0.5% of reading + 1 count), AC:  $\pm$  (0.75% of reading + 2 counts). Resistance Ranges: 200, 2 k, 20 k, 200 k, 2000 k and 20 M. Basic Accuracy:  $\pm$  (0.5% of reading + 1 count). Special Features: Crest Warn Indicator, Audible Alarm, Analog Meter. Dimensions: 3" H x 8 1/2" W x 11" D.

## IM-2260 features economy in a five-function meter

**\$119<sup>95</sup>**

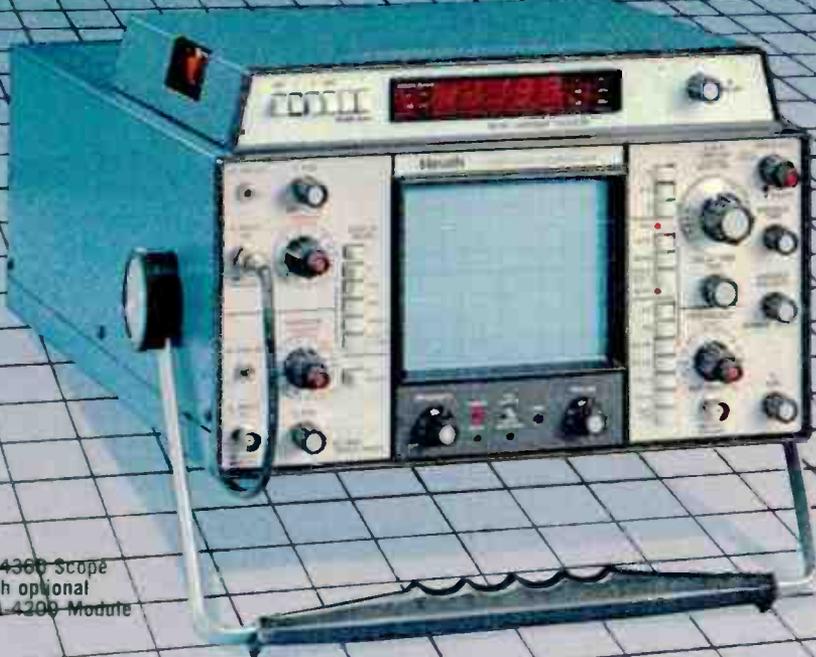
- Convenient autzero, autodecimal, and autopolarity
- Special test function checks diodes and transistors
- All functions protected with fully-isolated circuitry

**Excellent performer:** Bright, easy-to-read LEDs in a 3 1/2 digit display show DC and AC voltages in four ranges up to 1000 VDC and 750 VAC. Pushbutton switches select all functions including DC and AC current in five ranges up to 10 amps and resistance in five ranges to 20 megohms. Input protection is provided on all functions while fully isolated circuitry allows floating measurements up to 500 volts peak from earth ground.

**Special features:** To help determine the condition of a diode or transistor, the IM-2260 measures forward conducting voltage and reverse leakage resistance. For in-circuit resistance checks, the meter's 2 k to 2000 k ranges use a low 0.2 volt resistance test voltage. DC or AC operation is possible with either six "C" size batteries (not included) or a PS-2404 battery eliminator (p. 24). A built-in battery charger keeps nickel-cadmium batteries (if used) recharged.

Kit IM-2260, Shpg. wt. 5 lbs. .... **119.95**

**IM-2260 SPECIFICATIONS:** Voltage Ranges: 2 V, 20 V, 200 V, and 1000 VDC (750 VAC). Basic Accuracy: DC:  $\pm$  (0.5% of reading + 1 count), AC:  $\pm$  (1.0% of reading + 3 counts). Frequency Response: 40 to 1 kHz,  $\pm$  0.5%. Input Impedance: 10 megohms. Current Ranges: 2 mA, 20 mA, 200 mA, 2000 mA, 10 A. Basic Accuracy: DC:  $\pm$  (1.5% of reading + 1 count), AC:  $\pm$  (2.0% of reading + 1 count). Ohms Ranges: 2 k, 20 k, 200 k, 2000 k, and 20 M. Basic Accuracy:  $\pm$  (0.25% of reading + 1 count). Dimensions: 3" H x 8 1/2" W x 1" D.



IO-4360 Scope  
with optional  
IOA-4200 Module

## A high performance 60 MHz scope with digital display accessory

- Hook up one oscilloscope probe to view a waveform, then at the same time read on the digital display its frequency, period, pulse width or the averaged  $\pm$  DC voltage at that point
- Mark any portion of a displayed waveform on the oscilloscope for an instant direct readout of its period, frequency or pulse width
- Measure up to  $\pm$  1000 volts DC using separate isolated inputs on the module
- An external, viewable, triggered input adds versatile triple trace viewing capability
- A 60 MHz bandwidth and fast 7 ns vertical rise time allows waveform viewing above 90 MHz
- Dual input channels with 2 mV/cm sensitivity, inverting switch and algebraic add function
- Internal vertical delay lines ensure waveforms will be completely displayed
- A sync separator for stable viewing of composite video TV signals

## **NEW** IO-4360 60 MHz Triple Trace Oscilloscope and optional IOA-4200 Time-Voltage Module

**\$999<sup>95</sup>**

Compare the 'all in one probe' measurement capability of Heath's new top-of-the-line scope and companion voltage-frequency module with the competition, and see our value. Yes, you can pay more for a 60 MHz scope somewhere else, but you won't buy any more features, versatility or money-saving self-servicability than is found in the IO-4360.

**Multi-trace oscilloscope:** Two of the IO-4360's channels are controlled by an attenuator network of 12 calibrated ranges from 2 millivolts/cm to 10 volts/cm. This provides you with the needed sensitivity to make low signal measurements within an accuracy of 3% using AC or DC coupling. The IO-4360's third trace, available at the external input, can be viewed by simply pressing the TRIPLE trace button. For added versatility, Channel 2's input signal can be inverted and "added" to Channel 1's signal for making differential measurements.

**Extra wide DC to 60 MHz bandwidth:** The IO-4360 provides you with the bandwidth needed to view waveforms in both digital and analog circuits. Even though this multi-trace scope has a specified bandwidth of 60 MHz, signals up to and beyond 90 MHz can be displayed on its 8 x 10 cm screen.

**Sweep control:** Besides providing the sweep speeds to observe fast logic pulses, the IO-4360 also supplies a delayed sweep for fast and accurate timing measurements. Internal vertical delay lines ensure that the horizontal sweep starts at the beginning of the input signal. This permits you to view a complete vertical waveform. With its very fast 7 ns rise time, rapid rise-time signals are faithfully reproduced. Also providing sweep control is the calibrated time base. It ranges from 0.1 second/cm to 100 ns/cm in a 1-2-5 stepped sequence. And, any sweep speed can be expanded 10 times by simply pulling a switch. A delayed sweep allows you to see the leading edge of a waveform as well as select the exact portion of a waveform for expansion by any factor you desire.

**Complete trigger system:** The oscilloscope can be triggered from either one of the vertical input channels, line voltage, or from an external trigger which is also the input for the third trace. A filter network allows you to choose the AC, DC, low or high frequency component of a signal to be used for triggering the scope. This filter network also allows you to reject either the horizontal or vertical sync pulses of TV signals when using them for triggering on video waveforms. Fine trigger adjusting is done with a precise-level control. When a trigger signal isn't used, the baseline can be automatically displayed by using the scope's automatic mode.

Kit IO-4360, Shpg. wt. 41 lbs. .... 999.95

Save \$50.00 and purchase both the IO-4360 Scope and IOA-4200 Module.

IO5-4360, Shpg. wt. 48 lbs. .... Separately 1349.90 **ONLY 1299.90**

26/INSTRUMENTS

**IO-4360 SPECIFICATIONS:** Display Modes: Y1, Y2, Add (Y1  $\pm$  Y2), Dual trace, Triple trace, ALT/Chop. VERTICAL: (CH. Y1 and Y2) Deflection Factors: 2 mV/cm to 10 V/cm, 12 steps in a 1-2-5 sequence, continuously variable to approx. 30 V/cm. Accuracy: Within 3%. Bandwidth: DC to 60 MHz (5 mV to 10 V/cm); DC to 50 MHz (2 mV/cm). Rise Time: 7 ns or less. Delay Line: Allows at least 20 ns of pretriggered waveform display. CH. Y3: Sensitivity: 200 mV/cm or 2 V/cm. Response: DC to 25 MHz. Rise Time: 14 ns. Accuracy: Within 3%. HORIZONTAL: Display Modes: A, Int, B, and B. Time Base Ranges: 100 ms/cm to 0.1  $\mu$ s/cm, 19 steps in 1-2-5 sequence; continuously variable to approx. 300 ms/cm. Accuracy: Within 3%. Magnifier: Times ten. TRIGGERING: Source: Y1, Y2, EXT, Line. Coupling: AC, DC, AC-HF, AC-LF, TV-V, TV-H. Modes: Automatic baseline, Normal, Single Sweep. Hold Off: Variable, Including "B-ends-A" position. GENERAL: Internal Calibrator Accuracy: 1 V-P-P, within 2%. CRT: Mesh-expanded with 8 x 10 cm internal graticule. Accelerating Potential: 10 kV regulated. External Z Axis: continuously adjustable. Power Requirements: 108-132 or 216-264 VAC, 50/60 Hz. Dimensions: 6" H x 11 1/2" W x 18" D, with handle folded. Complete specifications are available by calling the Heath Co. at 800-253-0570 or requesting ONLY the IO-4360 specifications on catalog order form.

## Auto-ranging Time-Voltage Module increases capability



**Add-on Time-Voltage Module:** Used only with the IO-4360 Oscilloscope, the versatile IOA-4200 provides a 3 1/2 digit display of time, frequency or DC voltage measurements made with the scope's probe. Inputs are also provided on the IOA-4200 for making external voltage measurements up to  $\pm$  1000 volts DC. Bright LEDs are used to show all measurements with an automatic "-" being displayed for negative DC voltages. Low-profile cabinet mounts easily to scope.

Kit IOA-4200, Shpg. wt. 7 lbs. .... 349.95

**IOA-4200 SPECIFICATIONS:** TIME: Ranges:  $\pm$  10 s to  $\pm$  2.0  $\mu$ s (1, 2, 5 fullscale sequence). Basic Accuracy:  $\pm$  2% reading,  $\pm$  1 count. FREQ: Ranges:  $\pm$  1.0 Hz to  $\pm$  0.5 MHz (1, 5, 2 f.s. sequence). Maximum Display: 19.99 Hz on 100 ms to 19.99 MHz on 0.2  $\mu$ s. Accuracy:  $\pm$  3%.  $\pm$  1 cm. VDC (internal): Ranges:  $\pm$  0.2V, 2V on 2mV to 50mV;  $\pm$  2V, 20V on 100mV to 0.5V;  $\pm$  20V, 200V on 1V to 10V; auto-ranging. Accuracy:  $\pm$  1.0% ( $\pm$  0.75%),  $\pm$  2 cnts. EXT VDC: Ranges: 2V to 2000V; auto-ranging. Basic Accuracy:  $\pm$  0.5% ( $\pm$  0.25%),  $\pm$  1 cnt. GENERAL: Display: 3 1/2 digit, LED, Automatic minus for negative, positive implied. Dimensions: 1 1/2" H x 10 3/4" W x 9 3/4" D. \*Accuracy specs are for built-in calibration. Numbers in parentheses are for laboratory standards calibration.

## Heathkit's IO-4235 laboratory-grade oscilloscope with outstanding features at a very low price

**\$849<sup>95</sup>**  
Kit

- Wide 35 MHz frequency range with practical observation of frequencies above 50 MHz
- Dual trace capability with individual amplitude control
- Delayed sweep for examining an expanded waveform
- Precisely trigger at any point on the slope of a signal
- Fast 10 nanosecond vertical rise time for observing complex and short duration signals

**Dual-trace oscilloscope:** The IO-4235 is a top performer that can monitor two inputs simultaneously. Each channel has a 12-step calibrated attenuator ranging from 2 mV/cm to 10 V/cm. Either or both inputs can be inverted which allows both signals to be algebraically added for observing differential signals.

**Wide bandwidth:** Although the IO-4235 has a specified bandwidth of DC to 35 MHz, you can still observe signals above 50 MHz because of the oscilloscope's smooth rolloff. And, the IO-4235's very fast 10 nanosecond rise time ensures faithful signal reproduction. Also, internal vertical delay lines make sure that the horizontal sweep always starts from the beginning of the waveform to allow you to see a complete waveform as well as its critical leading edge.

**Calibrated time base:** The IO-4235 features a 21-position time/cm switch that allows selection of sweep speeds from 0.2 s/cm to 50 ns/cm in a 1-2-5- setp sequence. In addition, any sweep speed can be expanded 5 times for closer waveform observation. And, using the oscilloscope's delayed sweep, any portion of a waveform can be selected and expanded by any factor you desire.

**Triggered control:** Beside featuring precise trigger control, the IO-4235 also offers several different triggering options including: line frequency, channels 1 or 2, or a signal from an external source. Other trigger control switches affect the input bandpass, cutting off unwanted low frequencies for triggering on only fast AC signals. A unique TV coupling feature rejects high frequency signals and triggers on alternate field signals when you are viewing vertical field TV signals. Also, an automatic or normal baseline can be displayed.

Kit IO-4235, Shpg. wt. 52 lbs. .... Was \$899.95 NOW ONLY 849.95

**LAST CALL:** Limited quantities of the assembled and tested SO-4235 35 MHz Dual Trace Oscilloscopes are available. Shpg. wt. 38 lbs. .... 1370.00

## Portable IO-3220 20 MHz Dual-Trace Oscilloscope takes bench scope features into the field

**\$649<sup>95</sup>**  
Kit

- Dual-trace ability for monitoring or comparing signals
- Wide 20 MHz bandwidth and fast 18 ns vertical rise time
- Full X-Y operation with external signal Z-axis input
- Triggered sweep for controlling the displayed signal
- Full portable operation with optional battery pack which is recharged by an internal battery charger

**Laboratory-grade instrument:** The IO-3220 packs into its small case all the features of oscilloscopes used in laboratories and service shops. Its two channel input lets you control trace size and position. A 1-2-5 stepped attenuator for each channel has 12 calibrated ranges from 2 mV/division to 10 V/division. The inverting second channel allows algebraic addition of two signals in the scope's ADD function. This portable scope also features calibrated time-base ranges from 0.1 s/division to 100 ns/division, also in a 1-2-5 step sequence. In addition, a calibrated 1 V P-P square wave signal is available through a front panel connector.

**Versatile triggering:** To precisely stop a signal at any point along its positive or negative slope, you use the IO-3220's trigger switch and level control. Also use auto baseline, and different low or high frequency triggering. Even select external triggering to trigger the trace from any waveform. A X5 magnifier is available to expand your trace for closer examination.

Kit IO-3220, Shpg. wt. 24 lbs. .... Was \$699.95 NOW ONLY 649.95

SO-3220, Assembled, tested and calibrated, Shpg. wt. 22 lbs. .... 995.00

**Probe Set with Pouch for IO/SO-3220 Portable Oscilloscope:** Attaches to scope and includes two 4.5 foot PKW-105 X1/X10 Oscilloscope Probes.

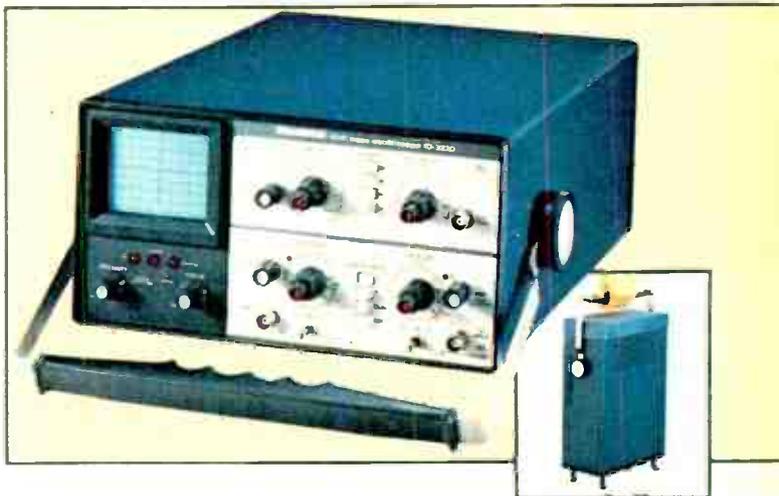
IOA-3220-1, Shpg. wt. 1 lb. .... 59.95

**Rechargeable Gel-Type Cell Battery Pack for IO/SO-3220 Portable Oscilloscope:** Provides a minimum of two hours continuous operation from a full charge. Batteries are recharged when the scope is in the charging mode or automatically recharged while the scope is operating from AC line voltage.

IOA-3220-2, Shpg. wt. 7 lbs. .... 44.95



**IO/SO-4235 SPECIFICATIONS:** **VERTICAL:** Frequency: DC, DC to 35 MHz (-3 dB). AC, 3 Hz to 20 MHz (-3 dB). Rise Time: Less than or equal to 10 ns. Overshoot: Less than or equal to 5%. Deflection Factor: 2 mV/division to 10 V/division in 12 calibrated steps, 1-2-5 sequence. Variable between steps. **Vertical Windows:** Two minimum (16 divisions). Input Impedance: One megohm shunted by approximately 35 pF. **Maximum Input Voltage:** 400 volts (DC plus peak AC). **Display Modes:** Y1, Y2, Dual (TB selected), Add. **Accuracy:** 3% (20-30°C), 5% (10-40°C) (Variable in cal. position). **Horizontal:** Time Base: 0.1 sec./division to 100 ns/division in 19 steps, 1-2-5 sequence. Variable between steps. X5 magnifier increases sweep speed to 20 ns/division. **Accuracy:** 3% (20-30°C), 5% (10-40°C) - except X5 within 5% (20-30°C), 7% (10-40°C) (Variable in cal. position). **X-Y Channel:** Same performance as vertical. **Y Channel:** Same performance as vertical, but with limited response of 2 MHz. **Phase Shift:** Less than 3° at 100 kHz. **Triggering:** Source: Internal A or B (±). External (±), Line (±). **Modes:** AC, DC, Low-Frequency Reject, High-Frequency Reject (Automatic baseline in absence of trigger when in auto mode). **Sensitivity:** Automatic, Adjustable over 10 divisions; Normal, Adjustable over 10 divisions; External, Adjustable over 0.8 volt in either auto or normal mode. **Input Impedance (External):** 1 megohm shunted by approximately 100 pF. **Z Input:** Full On to Full Off: 0 to 5 volts. **Maximum Input:** 50 volts peak.



**IO/SO-3220 SPECIFICATIONS:** **Vertical:** Frequency: DC, DC to 20 MHz (-3 dB). AC, 3 Hz to 20 MHz (-3 dB). Rise Time: Less than or equal to 18 ns. Overshoot: Less than or equal to 5%. Deflection Factor: 2 mV/division to 10 V/division in 12 calibrated steps, 1-2-5 sequence. Variable between steps. **Vertical Windows:** Two minimum (16 divisions). Input Impedance: One megohm shunted by approximately 35 pF. **Maximum Input Voltage:** 400 volts (DC plus peak AC). **Display Modes:** Y1, Y2, Dual (TB selected), Add. **Accuracy:** 3% (20-30°C), 5% (10-40°C) (Variable in cal. position). **Horizontal:** Time Base: 0.1 sec./division to 100 ns/division in 19 steps, 1-2-5 sequence. Variable between steps. X5 magnifier increases sweep speed to 20 ns/division. **Accuracy:** 3% (20-30°C), 5% (10-40°C) - except X5 within 5% (20-30°C), 7% (10-40°C) (Variable in cal. position). **X-Y Channel:** Same performance as vertical. **Y Channel:** Same performance as vertical, but with limited response of 2 MHz. **Phase Shift:** Less than 3° at 100 kHz. **Triggering:** Source: Internal A or B (±). External (±), Line (±). **Modes:** AC, DC, Low-Frequency Reject, High-Frequency Reject (Automatic baseline in absence of trigger when in auto mode). **Sensitivity:** Automatic, Adjustable over 10 divisions; Normal, Adjustable over 10 divisions; External, Adjustable over 0.8 volt in either auto or normal mode. **Input Impedance (External):** 1 megohm shunted by approximately 100 pF. **Z Input:** Full On to Full Off: 0 to 5 volts. **Maximum Input:** 50 volts peak.



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

# The Heathkit IO-4550 Dual-Trace 10 MHz Oscilloscope is ideal for your service and design work



## The IO-4550 – High Performance and High Value

- Save \$246 for other accessories if you buy the kit
- Features an extra-bright CRT trace for sharp, easy-to-read displays, even in high ambient light
- A trigger select switch and level control allow the time base to be precisely triggered at any point along positive or negative slope of signal on display
- Sensitivity adjustable from 10 mV/cm to 20 V/cm with 1-2-5 attenuator through eleven calibrated ranges
- 19 switch-selected time base steps – 200 ns/cm to 0.2 s/cm in a 1-2-5 step sequence
- Expand any sweep speed five times to a maximum 40 ns/cm; variable between switch positions
- Probe compensation is easier with the front-panel available 1 volt (peak-to-peak) square-wave signal
- Mu-metal shielding helps eliminate errors caused by stray electromagnetic signal interference
- Four printed circuit boards for easier assembly
- Like all Heathkit scopes, IO-4550 includes complete operation, calibration and service documentation

With all these features, the IO-4550 will be a welcome addition to your lab or test bench!

**IO/SO-4550 SPECIFICATIONS:** VERTICAL : Deflection Factor: Sensitivity: 10 mV/cm-20 V/cm, 11 steps in 1-2-5 sequence. Variable: Continuous between steps to approximately 60 V/cm. Accuracy: 3%. Vertical Response: DC Coupling: DC-10 MHz AC Coupling: 2 Hz-10 MHz. Rise Time: 35 ns. Overshoot: Less than 5%. Attenuator: Vertical Input: Impedance: 1 megohm, shunted by 38 pF. Maximum Input: 400 volts peak, combined AC and DC. Connector: BNC. Modes: Single, Y1 or Y2 selected by position control: Dual, Chopped (200 kHz) or alternate automatically selected by time/cm switch. HORIZONTAL: Time Base: Ramp: 20G ns/cm to 0.2 s/cm, 19 steps in 1-2-5 sequence. Variable: Continuous between steps to approximately 0.6 s/cm. Accuracy: 3%. Magnifier: X5 (adds additional 2% to sweep accuracy). EXTERNAL: Sensitivity: Approximately 0.1 V/cm. Impedance: Approximately 100 kilohms. Polarity: Positive input causes: right-hand deflection. Frequency Response: DC to 1MHz. Connector: BNC. Trigger: Internal: Automatic: Adjustable over 10 divisions. Normal: Adjustable over 10 divisions. Slope Selection: + or -. Impedance: 1 megohm, shunted by 40 pF. Connector: BNC. X-Y: Y Channel: Same as vertical. X-Channel: Same as vertical, except response is limited to 1 MHz GENERAL: Operating Temperature Range: 50-104 degrees F (10-40 degrees C). Power Requirement: 120/240 VAC, 50/60 Hz, 70 watts. Overall Dimensions: 67/8" H x 127/8" W x 191/4" D (17.6 x 32.7 x 48.9 cm) without handle.

The IO-4550's many versatile features make it the scope of choice for TV and general servicing, digital experimentation and design work of all types. Ultraprecise measurements are assured from two vertical input channels with an excellent, stable sensitivity of 10 mV/cm. Variations in line and load conditions are no problem with the fully-regulated, high-voltage power supply. Lab-grade reliability, with fast vertical rise time and writing speed.

For ease of operation, input channels are *automatically* displayed, chopped or alternated as you select. Exact X-Y operation assures accuracy in all phase measurements, with facilities to help determine wave frequency.

The 4550's **digitally-controlled time base** provides automatic triggering so no stability control is necessary and fewer adjustments are required. Calibration requires a precise source of square waves, such as the Heathkit IG-4505 on page 22, or the new IG-4244 Precision Calibrator on page 29.

Kit IO-4550, Shpg. wt. 27 lbs. .... Was \$469.95 NOW ONLY 449.95  
SO-4550, Assembled and tested, Shpg. wt. 25 lbs. .... 695.95

## Select the right Heathkit oscilloscope for you from this chart:

Model(S)	Number of Traces	Bandwidth Rise Time	Sensitivity	Time Base Ranges	Delayed Sweep	Vertical Add	Delay Line	X-Y	Z Axis	External Horizontal Input	Battery Operation	Compatible with Time-Voltage Module	CRT
IO-4360	3	DC-60 MHz 7 ns	2 mV/cm to 10 V/cm	0.1 s/cm to 100 ns/cm	✓	✓	✓	✓	✓			✓	8 x 10 cm, mesh-expanded internal graticule
IO/SO-4235	2	DC-35 MHz 10 ns	2 mV/cm to 10 V/cm	0.2 s/cm to 50 ns/cm	✓	✓	✓	✓	✓	✓			8 x 10 cm, mesh-expanded internal graticule
IO/SO-3220	2	DC-20 MHz 18 ns	2 mV/div to 10 V/div	0.1 s/div to 100 ns/div		✓		✓	✓		✓		8 x 10 div 0.6 cm/div internal graticule
IO/SO-4550	2	DC-10 MHz 35 ns	10 mV/cm to 20 V/cm	0.2 s/cm to 200 ns/cm				✓		✓			8 x 10 cm
IO/SO-4205	2	DC-5 MHz 70 ns	10 mV/cm to 20 V/cm	0.2 ms/cm to 200 ns/cm						✓			8 x 10 cm
IO-4105	1	DC-5 MHz 70 ns	10 mV/cm to 20 V/cm	0.2 ms/cm to 200 ns/cm						✓			8 x 10 cm

NOTE: All Heathkit oscilloscopes feature mu-metal shielding for protection from interfering signals, and regulated power supplies for highly-reliable operation and measurements.



# Economical dual- and single-trace oscilloscopes that feature quality and top performance

## IO-4205 dual-trace DC to 5 MHz oscilloscope

- Excellent input sensitivity for nearly all signal applications
- Triggered horizontal sweep circuit for locking in waveforms
- Special TV trigger coupling function makes it easier to trigger on the vertical frequency of television sets

**\$349<sup>95</sup>**  
KIT

**An outstanding value:** With its many features and low price, the IO-4205 oscilloscope is a welcome addition to the lab, service shop, or hobbyist's workbench. The scopes' dual-trace capability lets you directly compare two signals, check phase and other timing functions, measure AC and DC voltages, determine frequency, trace circuit conditions, and aids in alignment and troubleshooting. And, an excellent 10 mV/cm vertical input sensitivity allows you to use this scope in nearly all types of waveform applications.

**Stable triggering circuit:** A feature found on more expensive scopes, the IO-4205 offers the advantages of triggered sweep with automatic sync plus a special TV position. This position allows low frequencies to pass while rejecting higher frequencies for easier triggering on TV signals. The IO-4205 also features seven calibrated time bases, each variable controlled, ranging from 200 ms/cm to 0.2 us/cm. In addition, you can apply an external X-input signal to the scope which can be attenuated by a factor of 10 to 1.

**Value-packed features:** The IO-4205 oscilloscope is a compact, versatile, easy-to-build instrument that will provide years of valuable service. Eleven calibrated vertical input attenuator positions allow the scope to accept a wide range of inputs. An 8 x 10 cm graticule and bright CRT with astigmatism adjust allows a user to make quick and accurate waveform measurements. A fully regulated, low-voltage power supply provides ripple-free voltage and current, even when line and load conditions are unstable. Also, partial mu-metal shielding helps eliminate possible CRT display errors created by stray magnetic fields and other sources of electrical or magnetic interference.

**Kit IO-4205, 5 MHz Dual-Trace Oscilloscope, Shpg. wt. 25 lbs. . . . . 349.95**

## IO-4105 single-trace DC to 5 MHz oscilloscope

- Low cost single-trace oscilloscope provides the features and performance of higher-priced dual-trace oscilloscopes

**Excellent low-priced alternative:** With many features of dual-trace oscilloscopes, the IO-4105 is an economical alternative for situations requiring only a single-trace scope. A low 10 mV/cm sensitivity and eleven calibrated attenuator steps



from 20 volts to 20 mV provides the scope with a wide variety of input ranges including variable gain control between settings. As with our more expensive models, a stable triggering circuit provides solid waveform displays. Trigger controls include selection of normal or automatic modes, switch controlled AC or DC coupling and input of external triggering signals. The time base is adjustable from 0.2 us/cm to 200 ms/cm plus variable control.

**Kit IO-4105, 5 MHz Single-Trace Oscilloscope, Shpg. wt. 25 lbs. . . . . 249.95**

**IO-4205 SPECIFICATIONS:** VERTICAL: Bandwidth: DC to 5 MHz,  $\pm 3$  dB. Sensitivity: 10 millivolts/centimeter. Attenuator: 1-2-5 sequence, calibrated and variable. Rise Time: 70 nanoseconds. Overshoot: Less than 5 percent at 1 kilohertz. Impedance: 1 megohm, shunted by 38 picofarads. SWEEP: Type: Triggered. Range: 200 milliseconds to 0.2 microseconds in seven steps, plus variable. Trigger Source: Y1, Y2, External, Line. Trigger Modes: AC, DC or TV; plus or minus slope; automatic or normal. HORIZONTAL: Sensitivity: 0.1 volt/centimeter. Bandwidth: DC to 1 megahertz. Impedance: 1 megohm, shunted by 50 picofarads. External Horizontal Input: X1 and X10 attenuator, as well as variable. GENERAL: CRT: 5DEP31F, 8 x 10 centimeter viewing area, blue-green medium persistence phosphor, 5-inch round flat-face tube. Accelerating Potential: Approximately 1.6 kilovolts. Graticule: Screened, 8 x 10 centimeters. Dimensions: 8" H x 13" W x 17" D (20.3 x 33 x 43.2 cm).

**IO-4105 SPECIFICATIONS:** Same as for the IO-4205 oscilloscope above, except single trace capability and SWEEP: Trigger Source: Int, Ext, Line.

## IG-4244 Precision Oscilloscope Calibrator helps you to maintain scopes at their peak performance level

ONLY

**\$149<sup>95</sup>**

- Crystal-controlled oscillators for precisely timed signals
- Square wave out with less than 1 nanosecond rise time
- Accurate voltage signals plus a sine wave signal output
- Serves equally well as a bench standard to calibrate other equipment or as an experimental signal source

**Precise time signals:** This dependably accurate calibrator uses two crystal controlled oscillators to generate square waves from 0.5 seconds to 10 nanoseconds (ns) within a tolerance of 0.015%. And, with the leading edge of the square wave output having a rise time less than 1 ns (at less than 2% or 10 millivolts aberration, whichever is greater), the IG-4244 is exceptionally equipped for calibrating oscilloscopes to over 100 MHz.

**Accurate signal amplitudes:** For vertical scope calibrations and attenuator compensation adjustments, this calibrator has an accurate and wide range of output voltages available in a 1-2-5 sequence. A 1 kHz square wave output is also available from 1 mV to 100 V peak and is accurate to within 1% into a 1 M $\Omega$  load.

**Kit IG-4244, Precision Oscilloscope Calibrator, Shpg. wt. 6 lbs. . . . . 149.95**

**SG-4244, Assembled and tested Calibrator, Shpg. wt. 6 lbs. . . . . 249.95**

**IG/SG-4244 SPECIFICATIONS:** Time: Range: 0.5 s to 10 ns. Amplitude: 0.5 to 20 ns, 100 mV to 1 V peak; 10 ns, 100 mV to 0.5 V peak. Rise Time: <1 ns. Leading Edge Aberration: <2% of peak-to-peak amplitude or 10 mV, whichever is greater. Output Impedance: 50 ohms, nominal. Voltage: Range: 1 mV to 100 V peak in a 1-2-5 sequence. Accuracy:  $\pm 1\%$ . Rise Time: <5 us. Frequency: Approximately 1 kHz. Sine Wave Frequency: Approximately 1 kHz. Amplitude: Approximately 1 V P-P. Power Requirements: 120/240 VAC, 50/60 Hz, 25 watts maximum. Dimensions: 3" H x 7 1/4" W x 9 1/2" D.



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

# Introducing Heath/Zenith solutions to your computing needs...the HS-151 Personal Computer



**HS-151 Personal Computer features Heathkit quality and IBM compatibility**

Low-Profile for as low as

**\$1899<sup>00</sup>**

Kit Price

- Takes advantage of IBM software and hardware
- Standard 128 KB memory expandable to 640 KB
- Available with one or two 5.25-inch floppy disk drives or optional Winchester\*

Heath/Zenith proudly offers a new and exciting personal computer...the HS-151 Desktop Personal Computer...with the enhanced features that you are looking for. A quality personal computer, the HS-151 PC provides Heathkit excellence in design and workmanship along with access to the wealth of available IBM software and hardware.

Using the advanced 16-bit 8088 microprocessor, the HS-151 PC gains a great deal of high speed computing power along with the ability to run sophisticated and high quality 16-bit software. In addition, the 8088 supports the MS\*-DOS operating system. This allows you to select software from the full range developed for the IBM Personal Computer and run it on the Desktop PC.

A standard 128 kilobytes (KB) of RAM user memory, with internal parity checking, is available on all models of the HS-151. For larger programs where additional memory is needed or desired, 64 KB increments can be added to the main memory board for up to 320 KB of RAM. For the user's convenience, a very useful debugger is permanently stored in ROM along with a pre-set auto-boot routine which can be disabled.

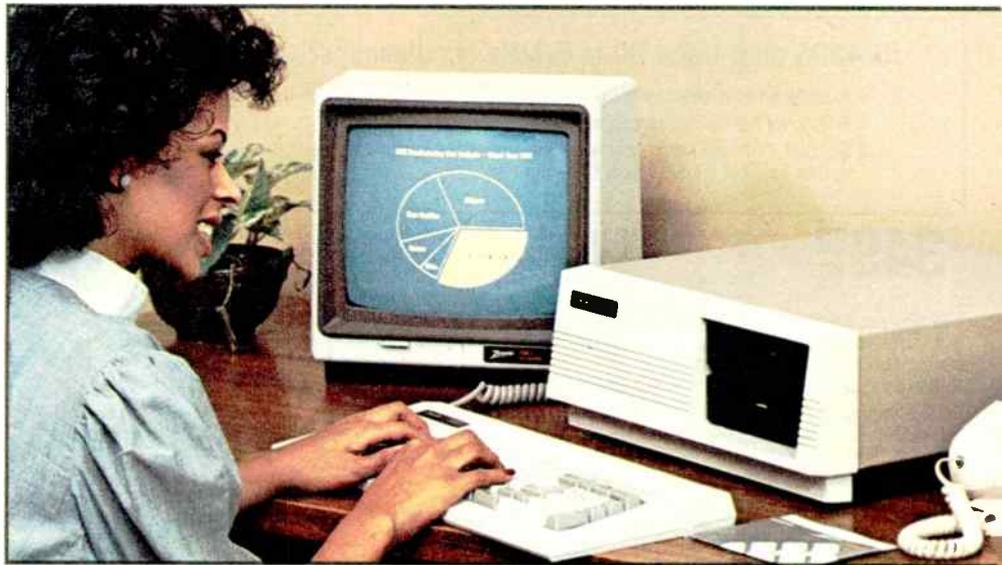
Optional single or dual 5.25-inch floppy disk drives supply the HS-151 PC with high-capacity auxiliary storage. These double-sided, double-density drives are IBM formatted and each stores up to 360 KB of data. An optional hard disk drive\* provides an extensive 10.6 megabytes (MB) of added storage for those larger, more comprehensive business and scientific programs.

Four open IBM compatible slots are provided for your future expansion. Use one of these slots to expand memory up to 640 kilobytes, or use one for a Winchester controller card,\* or both. By being able to accept most peripheral boards designed for the IBM-PC, the HS-151 PC provides unlimited off-the-shelf flexibility in hardware configurations. With more hardware choices available, you can choose from a wider variety of software programs and peripherals to meet your ever-changing and expanding computer needs.

Two video outputs on the rear panel of the Desktop PC provide connections for either a color or monochrome video display monitor. Connect an RGB monitor to the standard nine-pin D connector and enjoy the benefits of a full color presentation. In the character mode, see a colorful 80 character by 25 line display in a selectable one of eight background colors and 1 of 16 foreground colors. In the graphics mode, each pixel of a 320 x 200 area can be painted in one of four colors selected from 1 of 2 color pallets. For easier viewing of word processing and accounting programs, a standard phono type connector allows the use of monochrome video display monitors. On a monochrome monitor, color displays are represented by a corresponding gray level.

A detached low-profile keyboard adds to the HS-151 Personal Computer's ease of use. The user-friendly keyboard is clearly labeled and has color-coded keypads that permit rapid key identification. It is laid out in the standard typewriter format, even the shift and return keys are where they belong. Ten programmable function keys, and separate plus and minus keys increase the HS-151 PC's accurate data entry capability. A calculator-style keypad, with enter key, allows rapid entry of large groups of numbers. LED indicators on the keyboard give instant operating status notice at a glance. An audible click is sounded at each keypress to signal successful key entry. This lightweight keyboard connects to the main unit by a coiled cord that expands up to six feet and plastic legs swing out for two levels of keyboard adjustment.

Three communication ports provide the HS-151 PC with the flexibility to expand. Available are two IBM compatible serial ports and a parallel port that can be used with peripherals such as a matrix or letter quality printer or a modem. The two



serial I/O ports are standard EIA HS-232 DTE connectors capable of baud rates between 110 and 9600 operating in asynchronous full or half duplex. The parallel interface is a Centronics compatible printer port using a 25 pin D connector.

Three separate testing procedures allow you to check your Desktop PC's hardware accuracy and adds to your data entry protection. These three levels of diagnostics include: power-on checks with their results indicated on eight internal LEDs; a ROM-based user-implemented screen diagnostic; and, optionally, an extensive disk-based set of diagnostics. The diagnostic floppy disk is included with the HS-151 PC and provides an easy and broad range of diagnostic tests to ensure your computer is operating at peak efficiency.

Many editing capabilities are provided with the HS-151 Desktop PC to aid you in your program writing. With the HS-151, you can insert and delete characters and lines; erase a line; erase to the beginning of a line, to the end of a line, or to the end of the page. Control the cursor with up, down, left, right, and home controls. Scroll through your programs with options such as a jump or smooth scroll, or a scroll that's ROM or software selected.

Filled with important extras, the HS-151 PC lets you enjoy using a computer. Enjoy such features as a ready-to-use computer three to four seconds after applying power, easy hardware configuration with a menu- and diagram- driven program, booting from any drive, smooth scroll search, flickerless video and much more.

In the office or in the home, the HS-151 Desktop Personal Computer is ready to provide even more ways to help you be more productive and creative. One way is with the MS-DOS operating system that's included with the computer. It'll start you on the way to using software packages like those found on pages 45 and 46.

An all-metal chassis with decorative bezels blends strength and superior styling into the HS-151 PC. It measures 16" wide by 6 1/4" high and 6 1/2" deep, excluding the keyboard. The computer operates on 120/240 volts AC at 50/60 Hz and uses 300 watts (maximum) of power.

**Heathkit Kit HS-151-21, Low-Profile Personal Computer, 128K RAM, one 5.25" disk drive with 360 KB storage 64 lbs. .... 1899.00**

**Heathkit Kit HS-151-22, Low-Profile Personal Computer, 128K RAM, two 5.25" disk drives with 720 KB storage 73 lbs. .... 2199.00**

**data systems ZF-151-21, Assembled Low-Profile Personal Computer, 128K RAM, one 5.25" disk drive with 360 KB storage, 38 lbs. .... 2699.00**

**data systems ZF-151-22, Assembled Low-Profile Personal Computer, 128K RAM, two 5.25" disk drives with 720 KB storage, 41 lbs. .... 3099.00**

**data systems ZW-151-22, Assembled Low-Profile Personal Computer, 128K RAM, 10.68 Mbyte 5.25" rigid disk, one 5.25" disk drive with 360 KB total storage, Shpg. wt. 42 lbs. .... 4799.00**

\*Watch the July catalog for further Winchester upgrade information. MS is a registered trademark of Microsoft, Inc.



## and the HS-161 Portable Personal Computer...new total-performance 16-bit kit computers

### HS-161 Portable Personal Computer with Heathkit capability and IBM compatibility

Assembled and tested

**\$2899<sup>00</sup>**

Computer

- Designed for a computer user to be more productive while on-the-go
- Takes advantage of IBM software and hardware
- Standard 128 KB memory with single or dual 5.25" drives

For those who need a computer to go, Heath/Zenith introduces the HS-161 Portable Personal Computer. It does everything a personal computer can do, perhaps a bit more, and it can do it on the go. Designed-in are Heathkit quality and performance with the added plus of IBM compatibility. Move it from the office, to meetings, to the hotel room, and to your home. Use the computer at your convenience and be able to take advantage of virtually all IBM programs and hardware without changing any computer hardware. With the HS-161 PC, you get problem-solving power, portability and flexibility...a powerful combination.

**Extensive memory and storage capacity** are two advantages of the new HS-161 Portable. A standard 128 kilobytes (KB) of RAM is available on all models which can be expanded on the main board to 320 KB. For auxiliary storage, the portable computer is available with one or two high-capacity 5.25-inch floppy disk drives. Each drive stores data in the standard IBM format on double-sided, double-density disks for a total capacity of 360 KB. When not in use or during transit, the disk drive section can be lowered into the computer.

**For future expansion**, four open slots are available for almost any off-the-shelf IBM compatible accessory boards. This allows you access to hundreds of software and hardware alternatives to meet your ever-changing computer needs.

A **9-inch amber phosphor video display monitor** is built into the HS-161 PC with full business graphics capability. The amber monitor is most preferred by users for easy-on-the-eyes viewing during long periods of use. A "gray scale" feature allows color intensities to be programmed for easier viewing of color programs on a monochrome screen. As an option, an RGB color monitor can be used with the portable for a more exciting graphics display.

A **detachable 84-key keyboard** connects to the main unit by a coiled cable. This allows the user to locate the keyboard at a convenient working position. The keyboard is laid out like a standard typewriter. Keypads are clearly marked and color coded for easy identification. Ten programmable function keys can be user defined for special software applications. Separate plus and minus keys and an L-shaped return key increase the portable's ease of operation. LED indicators, for caps lock and numeric lock, give instant notice of operating status. When moved, the keyboard safely locks into the front of the computer.

**Utilize the three input/output ports** of the HS-161 and expand the usefulness of this portable computer. A parallel port and two IBM compatible serial ports are available on the rear panel for use with dot matrix or letter quality printers, modems and other computer-expanding peripherals.

**Protect your data entries** by using three separate testing procedures to check the HS-161 Portable's hardware accuracy. One test is automatically conducted when the portable computer is powered up. Eight internal LEDs indicate the results of this test. Access the ROM or monitor diagnostic which is displayed on the CRT. Or, use the diagnostic disk that's included with the computer for an extensive check of the HS-161 PC's operation.

**Featuring many extras**, the HS-161 Portable offers a quick 3-4 second start-up time from turn on, booting from either drive and a friendly configuration program including menus and diagrams. The computer also features a smooth video display without the flicker as seen in other models, high-density diskette formatting on floppy drives, plus many other advantages.

**Your access to a wealth of software**, is another plus feature of the HS-161 Portable Computer. Included with the HS-161 PC is the powerful MS-DOS operating system (page 45) that allows you to use all the applications software developed for the IBM-PC. Several of these software packages can be found on pages 45 and 46. These programs will help you become more productive and creative.



Keyboard and drives nest safely and neatly inside computer during transit.

**Heathkit Kit HS-161-21**, Portable Personal Computer with non-glare 9" amber CRT, 128 KB RAM, 4 open IBM compatible expansion slots, one 5.25" disk drive, with 360 KB of storage. . . . . **AVAILABLE IN JULY CATALOG.**

**Heathkit Kit HS-161-22**, Portable Personal Computer with non-glare 9" amber CRT, 128 KB RAM, 4 open IBM compatible expansion slots, two 5.25" disk drives, with 720 KB of storage capacity. . . . . **AVAILABLE IN JULY CATALOG.**

**ZFA-161-21**, Assembled Portable Computer with non-glare 9" amber CRT, 128 KB RAM, 4 open IBM compatible expansion slots, one 5.25" disk drive, with 360 KB of storage capacity, 55 lbs. . . . . **2799.00**

**ZFA-161-22**, Assembled Portable Computer with non-glare 9" amber CRT, 128 KB RAM, 4 open IBM compatible expansion slots, & two 5.25" disk drives, with 720 KB of storage capacity, 55 lbs. . . . . **3199.00**

**Z-205-1**, 64 KB RAM Memory Expansion Set, nine chip set installs onto main board. of Personal and Portable Computers. Three sets required for 320 KB limit, Shpg. wt. 1 lb. . . . . **EACH 165.00**

**Second Optional Drive**, available by visiting your local Heathkit Electronics Center or calling 800-253-7057 from 8 AM to 6 PM EST Mon.-Fri.

**HS-151 and HS-161 SPECIFICATIONS:** Processor: intel 16-bit 8088. Clock: 4.77 MHz. On-Board Memory: 128 KB standard expandable to 320 KB on main board, up to 640 KB total memory via expansion slot. VIDEO DISPLAY: CRT (HS-161 only): Non glare 9-inch diagonal, amber phosphor. Display Format: 25 lines of 80 characters. Display Size: 5.0" high x 7.0" wide. Character Size: 0.165" high x 0.075" wide. Character Type: 8 x 8 dot matrix. Dot Resolution: 640 horizontal x 200 vertical. Colors: Characters: 1 of 8 background colors with 1 of 16 foreground colors. Graphics: Each pixel can be 1 of 4 colors selected from 1 of 2 color palettes. Gray Scale: Eight levels on a monochrome display. Video Outputs: RGB with intensity control and composite monochrome. Cursor: Blinking underline or reverse video or off. Cursor Controls: Up, down, left, right, home. Cursor Addressing: Relative and direct. Tab: 8 columns. Refresh Rate: 60 Hz, 50 Hz. Edit Functions: insert and delete characters or lines. Erase Functions: Erase line, erase to beginning of line, erase to end of line, erase to end of page. Bell: Audible alarm in receipt of ASCII BEL command. BUS STRUCTURE: Type: IBM compatible. Slots: 8, 4 available for expansion. KEYBOARD: Type: 84 keys, 57 alphanumeric and 10 special function plus 17 keypad keys including separate numeric keypad. Key Click: Yes. DISK SYSTEM: Drives: single or dual 5.25-inch double-sided double-density 48 TPI floppy disk drive. Capacity: IBM formatted for 350 KB each. Winchester Drive: Optional internal 5.25-inch rigid disk drive with single 5.25-inch floppy disk drive. Capacity: 12.76 unformatted, 10.68 formatted. INPUT/OUTPUT: Serial I/O: Dual DTE RS-232C ports. Baud Rate: 110-9600. Operation: Asynchronous full or half duplex. Parallel I/O: Centronics compatible. Power Supply: 120/240, 50/60 Hz, 300 watts (maximum). Dimensions: HS-151: 16" W x 6 1/4" H x 16 1/2" D (40.6 x 15.9 x 42 cm). HS-161: 19 1/2" W x 8 3/8" H x 19 1/8" D (20.9 x 49.5 x 48.6 cm). Weight: HS-151: Approximately 42 lbs. with keyboard and two disk drives. HS-161: 39 lbs



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

World Radio History

COMPUTERS/31

# For your present needs and future goals, get a kit or an assembled H/Z-100 Desktop Computer

1 HSG-1121-21 All-In-One kit computer shown with green CRT and second 5.25-inch drive installed



## 1 All-In-One, a complete computer package

As low as  
**\$2149<sup>00</sup>** Kit  
for All-In-One  
model

The H/Z-100 All-In-One Desktop Computer is a powerful and complete system with everything you need to compute, today and tomorrow. High-resolution 12" video display, 5.25-inch floppy disk drive, keyboard and a dual 8/16-bit computer are brought together in one self-contained, compact unit. And, it can expand with extra memory, data storage, accessories and peripherals. Look at these H/Z-100 items:

- Dual microprocessors to run both 8/16-bit software
- RAM memory that can be expanded to 768 kilobytes
- Highly detailed graphics in monochrome or color
- High-capacity 5.25" and Winchester storage
- LOTUS 1-2-3 software included with all ZF and ZW models

**Increased data processing speed:** With its advanced 16-bit 8088 microprocessor, the H/Z-100 runs high-speed and sophisticated 16-bit software. This higher-performance software provides for significantly accelerated performance, up to ten times faster than 8-bit software. Meaning, you can run programs faster and manipulate more information. And, with an 8-bit 8085 companion microprocessor, the H/Z-100 allows you to run most of today's 8-bit CP/M and many Heathkit/Zenith software programs.

**Handle larger programs:** The H/Z-100 Computer comes with a standard 128 kilobytes (KB), 192 KB in the Winchester model. This capacity lets you handle your larger business programs, such as accounting or inventory control with ease. For even larger programs, you can expand the H/Z-100's memory to three-fourths of a megabyte (768 KB). An optional Z-205 256K RAM Update Board (pg. 33) lets you add 256 KB to your H/Z-100 for those long Assembly Language programs or an application program like SuperCalc.

**Higher resolution graphics:** Beautifully detailed bit-mapped graphics is part of the H/Z-100. It gives you individual dot (pixel) control of a 640 by 225 pixel area.



Need help? Call TOLL-FREE: 800-253-7057. For ordering assistance or information, call toll-free between 8:00 A.M. and 6:00 P.M. EST, Monday through Friday. In Alaska, Hawaii and Michigan, call 616-982-3411.



2 ZW-111-32 with ZVM-123 Video Display

With this control, you can create highly detailed drawings, graphs, etc. Thirty-three special graphic characters are already available from the H/Z-100's keyboard to be arranged and grouped for less detailed graphics. Add eight colors to your monochrome graphics with two Z-219-1 Color Video RAM Chip sets (p. 33).

**High-capacity disk drive storage:** The H/Z-100 includes a built-in 5.25-inch floppy disk drive that can store up to 320K bytes of data. For faster operational speeds and more on-line storage, you can install a second 320K-byte 5.25-inch drive (pg. 33). Still greater storage is achieved by connecting the 8-inch Floppy Disk System (pg. 34). For the storage capacity necessary for large accounting, inventory or technical jobs, an internal 11-megabyte Winchester (pg. 33) could be your solution.

**Convenient expansion capability:** Two RS-232C serial ports and one parallel port combine to give you extensive communications access to the outside world. Two serial connectors, one DTE and one DCE, connect to printers, modems, speech synthesizers, terminals and plotters for transferring information. The parallel port, with its Centronics-type connector, connects the H/Z-100 to industry standard printers such as the MPI-99 or the MPI-150 (pg. 41).

**Software solutions for everyone:** With either Z-DOS/MS-DOS (included with all H/Z-100's) or CP-M operating system (pg. 47), the H/Z-100 has available a wide variety of 16-bit and 8-bit software programs to accomplish what you have in mind. See 16-bit software programs for the H/Z-100 on pages 46-51. For the H/Z-100's 8-bit side, see software on pages 55-57. To learn more about Z-DOS/MS-DOS, see page 59 for the EC-1121 MS-DOS Course.

- Heathkit Kit HSA-1121-21, Monochrome graphics, non-glare amber CRT, 128 KB RAM, one 320 KB 5.25" drive, Z-DOS, 109 lbs. . . . . **2149.00**
- Heathkit Kit HSA-1121-22, Monochrome graphics, non-glare amber CRT, 128 KB RAM, two 320 KB 5.25" drives, Z-DOS, 114 lbs. . . . . **2449.00**
- Heathkit Kit HSG-1121-21, Monochrome graphics, non-glare green CRT, 128 KB RAM, one 320 KB 5.25" drive, Z-DOS, 109 lbs. . . . . **2149.00**
- Heathkit Kit HSG-1121-22, Monochrome graphics, non-glare green CRT, 128 KB RAM, two 320 KB 5.25" drives, Z-DOS, 114 lbs. . . . . **2449.00**
- Heathkit Kit HSW-1121-21, Monochrome graphics, non-glare white CRT, 128 KB RAM, one 320 KB 5.25" drive, Z-DOS, 109 lbs. . . . . **2149.00**
- Heathkit Kit HSW-1121-22, Monochrome graphics, non-glare white CRT, 128 KB RAM, two 320 KB 5.25" drives, Z-DOS, 114 lbs. . . . . **2449.00**
- data systems ZF-120-22, Assembled All-In-One H-100, 12" green CRT, 128 KB RAM, two 320 KB 5.25" drives, 68 lbs. Mrt. Frt. . . . . **3599.00**

## 2 Low-Profile, a versatile and modular system

As low as  
**\$1999<sup>00</sup>**  
for Low-Profile  
model

The H/Z-100 Low-Profile Desktop Computer offers you the advantages of the All-In-One plus the option of a choice of video monitors. Select either a monochrome or color video monitor and add it to these other H/Z-100 features:

- S-100 bus for future growth and increased capability
- Typewriter-style keyboard is intelligently designed
- Excellent documentation provides for easier operation
- Experienced hardware and software help always available
- Assembled and kit computers to fit a particular need and budget

**Designed to grow:** While one slot is filled by a floppy disk controller card, four industry-standard IEEE-696 (S-100) card slots still remain for internal expansion within the H/Z-100. These slots can be filled at any time to increase memory or add peripherals as you find more uses for your Computer. With its add-on capability, the H/Z-100 will protect your computer investment by being able to make use of improving future technology.

**Comfortable keyboard:** Work can be done faster and more accurately on the H/Z-100's sculptured keyboard because it is geared for speed, ease of use, and efficiency. With its typewriter-style layout, touch-typists easily switch to the H/Z-100's keyboard without missing a keystroke. The keyboard also features 13 user-programmable special function keys for added convenience. An 18-key numeric keypad (including cursor and control keys) is located to the right of the keyboard. This convenient keypad allows a user to quickly enter numbers and perform calculations faster and easier.

**Clearly written documentation:** For a better understanding of how the H/Z-100 works and to quickly get you started into computing, all Desktop Computers come with a complete set of plainly written manuals. Each H-100 kit includes a fully detailed and illustrated assembly manual. And both kit and assembled (Z-100) computers have operating manuals written with the user in mind. Eye-saving large type, common-sense glossaries, and plenty of illustrations (on-screen illustrations also) make for an easier and faster road to the benefits of owning an H/Z-100.

 **Kit HS-1101-21, Low Profile, monochrome graphics, 128 KB RAM, one 320 KB 5.25" drive, Z-DOS, 78 lbs. .... 1999.00**

 **Kit HS-1101-22, Low-Profile, monochrome graphics, 128 KB RAM, two 320 KB 5.25" drives, Z-DOS, 83 lbs. .... 2299.00**

 **ZF-101-31, Assembled Low-Profile, monochrome graphics, 192 KB RAM, one 320 KB 5.25" drive, 49 lbs. .... 3029.00**

 **ZF-111-22, Assembled Low-Profile, color graphics, 128 KB RAM, two 320 KB 5.25" drives, 54 lbs. .... 3499.00**

**Z-205-1, 128 KB to 192 KB RAM Upgrade Kit, expands memory of 128 KB All-In-One and Low-Profile Computers to 192 KB, Shpg. wt. 1 lb. .... 165.00**

**Z-205, 256 KB RAM Upgrade Circuit Board, Shpg. wt. 2 lbs. .... 799.00**

**Z-219-1, Color Video RAM Chip Set, Shpg. wt. 1 lb. .... 145.00**

**ZA-100-4, S-100 Extender Board, allows easy maintenance and troubleshooting of accessory boards that fit into S-100 slots, Shpg. wt. 1 lb. .... 79.00**

**HDC-100, Dust Cover for Low-Profile Computer, Shpg. wt. 1 lb. .... 16.00**

**HDC-120, Dust Cover for All-In-One Computer, Shpg. wt. 1 lb. .... 16.00**

**TM-100, H/Z-100 Technical Manuals, Shpg. wt. 22 lbs. .... 55.00**

**Second 5.25" drives** for computers with one drive, visit your nearest Heathkit Electronic Center (list on page 90) or call 800-253-7057 from 8 AM to 6 PM EST.

**H/Z-100 SPECIFICATIONS:** PROCESSORS: 16-bit: Intel 8088, 8-bit: Intel 8085. Clock: 5 MHz. **DATA STORAGE:** Disk Controller: Standard Z-207 controller, supporting both 5.25" and 8" drives simultaneously. One soft-sectored, double-sided, double-density, 48 TPI 320KB 5.25" floppy disk drive standard in kits; Two drives standard in assembled units. **Disk Storage Expansion:** 11 megabyte 5.25 Winchester disk drive, which installs in second internal drive slot of H/Z-100, optional; up to 2.5 on-line megabytes of external 8" floppy disk storage (Z-207-41, 42, p. 34) is also available. **EXPANSION:** Five IEEE-696 (S-100) standard card slots available for expansion. Disk controller occupies one S-100 slot. **DISPLAY:** Display Format: 24 lines x 80 characters, plus 25th line for user information. 225 lines of 640 dots in graphics mode. **Character Set:** 128-character ASCII set, upper and lower case. **Character Type:** 8 x 9 dot character block (0.2" H x 0.17" W), definable to other values using software. Colors: Red, green, blue, white, black, cyan, magenta, and yellow. Color memory RAM standard in Z-110, optional in all kits and Z-120. **Cursor:** Blinking, underline or reverse. **Cursor Addressing:** Relative and direct. **Tab:** Eight columns, software addressable. **Video:** Normal or reverse video by character. **Video Output:** Z-110, RGB; H/Z-120, monochrome standard. **KEYBOARD:** General: Sculptured, typewriter-style keyboard with 95 keys. **Numeric Keypad:** 18 keys (including cursor-control keys). **Special Function Keys:** 13. **INPUT/OUTPUT PORTS:** Serial I/O: Two EIA RS-232C serial interface ports, at 110 to 38,400 baud. Accessible from rear of unit. **Modes:** Asynchronous full- or half-duplex; synchronous. **Parallel I/O:** Centronics-compatible printer port with a 25-pin D connector.



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## 3 Powerful Winchester disk drive data storage

**Huge on-line storage capacity:** With an 11 megabyte storage capacity, Winchester drive conveniently stores data that would require several dozen floppy diskettes. This allows your H/Z-100 to handle very large amounts of data, such as lists of accounts or large inventories.

**Economical alternative:** For serious computer users, a Winchester disk drive can be an inexpensive data storage substitute for a 5.25-inch floppy disk drive in some situations. Especially when many disk drives, costing more than a Winchester drive, are required to put all information "on-line" at the same time.

**High-speed access:** Dramatically decreasing seek time over floppy disk drives, a Winchester drive can be finished retrieving information while a 5.25-inch disk system is just getting started. The H/Z-100's Winchester disk drive can access information ten to twenty times faster than a 5.25-inch floppy disk system.

**Increased data-handling efficiency:** Coupled with high-speed access, an increased data packing technique allows the winchester to transfer data at five megabytes per second. With an internal Winchester drive, this extremely high transfer rate greatly increases the H/Z-100's efficiency in applications requiring a great many disk operations.

**Convenient:** With its huge storage capacity, the Winchester allows you to store all your programs on its sealed disks instead of several dozen floppy diskettes. It eliminates annoying and time consuming disk swapping and keeps your computer area uncluttered by piles of diskettes.

**ZW-111-32, Assembled and tested Low-Profile Desktop Computer with internal 11 MB Winchester disk drive, one 320 kilobyte 5.25-inch floppy disk drive, 192 kilobytes of RAM, color graphics capability, 55 lbs. .... 5499.00**

**ZW-121-32, Assembled and tested All-In-One Desktop Computer with internal 11 MB Winchester disk drive, one 320 kilobyte 5.25-inch floppy disk drive, 192 kilobytes of RAM, non-glare green CRT, Shpg. wt. 70 lbs. .... 5599.00**

**NEW! HS-217, Winchester Upgrade Kit:** Kit contains the controller and data separator boards, and an assembled and tested Winchester disk drive. The hard disk controller board installs in one of the H-100's S-100 expansion slots and the Winchester drive fits in one of the 5.25" disk drive locations. Kit includes all mounting hardware, complete documentation, and step-by-step installation instructions. Upgrade kit is for use with H-100 Computers only. For Z-100 Computer use, contact your nearest Heathkit Electronics Center.

**HS-217, For models with full height drives, 33 lbs. .... 1799.00**

**HS-217A, For models with half height drives .... Available 3rd Quarter**

## SAVER Save 50% on any or all of the items listed below when you purchase an H-100

Get a big 50% discount on any or all of the following items when you buy them within 90 days of your H-100 purchase.

**Any three individual Heath/Zenith software packages.** This also applies to the powerful PeachText 5000 and LOTUS 1-2-3™ business packages described on page 36.

**Two Z-219-1 Color Chip Sets:** Adds color video (left) to your H-100. Regularly \$145.00 each ..... **Discount price 72.50 each**

**One Z-205-1 RAM Chip Set:** Increases the RAM memory capacity of your H-100 from 128 kilobytes to 192 kilobytes as described at the left. Regularly \$165.00 ..... **Discount price 82.50**

**One Set of TM-100 Technical Manuals:** Details the inner workings of your kit H-100 Computer. Regularly \$55.00 ..... **Discount price 27.50**

## HS-207 8-Inch Disk System adds up to 2.5 megabytes of external data storage capacity

As low as  
**\$999.00**

for a one-drive system

- Specifically developed to expand the storage capabilities of the H/Z-100 Desktop Computer system
- Optional one or two-eight-inch disk drive capacity meets the big job requirements of businesses
- 1.26 to 2.52 megabytes of unformatted data storage allows complete management of programs and files

**Expanded H/Z-100 storage:** Factory configured to operate with all H/Z-100 Desktop Computers, the HS-207 System offers optional additional data storage capacity of either 1.26 or 2.52 megabytes. To obtain these amounts of storage, the HS-207 is available in one or two disk drive configurations. Each drive stores up to 1.26 megabytes of data on both sides of an 8-inch double-sided double-density disk. All information is stored on the 8-inch disks using soft-sectoring and formatted in the industry-standard IBM 3740 style.

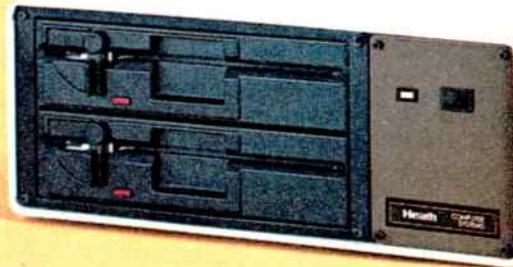
**High performance and reliability:** The drives used in the HS-207 provide exceptional performance with a speedy 90 milliseconds (ms) average access time and a 3 ms track-to-track access time. While data is transferred at a tremendous rate, less than one hard read error occurs for every trillion ( $10^{12}$ ) bits read.

**Self-contained system:** The only connection between the HS-207 and the computer system is a flat 50-conductor cable which carries commands and information. The Floppy Disk System has its own power supply (doesn't burden the host computer's supply) which features a built-in line filter that attenuates line transients and reduces AC line noise.

**More features:** A Read/Write protection system ensures the safety of your data while a front-panel locking lever prevents premature disk removal. The HS/Z-207 is built to last using the superior strength of steel and aluminum. Contemporary low-profile styling, made possible by the half-height drives, provides an exceptionally modern look that's compatible with many computer systems. This system requires 125 VAC and measures 13 $\frac{3}{4}$ " W x 20 $\frac{1}{2}$ " D x 7 $\frac{3}{4}$ " H.

Styling matches H/Z-100 Desktop Computers

Two 8-inch drive HS-207-42



Heathkit

**HS-207-41,** Eight-Inch Floppy Disk System with one disk drive and capable of storing 1.25 megabytes (MB) of data on a double-sided, double-density 8" diskette, Shpg. wt. 57 lbs. .... **999.00**

Heathkit

**HS-207-42,** Eight-Inch Floppy Disk System with two 8" disk drives, 2.5MB of data storage, Shpg. wt. 69 lbs. .... **1599.00**

data system

**Z-207-41,** Assembled and tested single drive Eight-Inch Floppy Disk System with 1.25MB data storage, Shpg. wt. 53 lbs. .... **1599.00**

data system

**Z-207-42,** Assembled and tested Eight-Inch Floppy Disk System with two disk drives and 2.5MB storage, Shpg. wt. 60 lbs. .... **2299.00**

**Z-207-6,** Assembled and tested second Half-Height Eight-Inch Disk Drive, 1.25MB double-sided, double-density storage, Shpg. wt. 8 lbs. .... **699.00**

**HOC-207,** Dust Cover for the HS/Z-207, Shpg. wt. 1 lb. .... **16.00**

## Rugged and stylish computer furniture provides good looks, convenience, flexibility and user comfort

Complement both your computer system and workspace with this attractive and precisely designed computer workstation. While versatile, this furniture features superior strength and rigid construction for supporting heavy loads. Non-glare tabletops and soft edges are provided for comfort and safety. Quality marks each component.

### 1 Computer System Table

**Strength plus convenience:** For rigidity and strength, this stylish table features a non-tipping and non-flexing cantilever design. Double-wall steel leg up-rights bolt to heavy gauge top and bottom supports to form an all steel understructure for superior load bearing capability.

**Wire management system:** A 1 $\frac{1}{2}$ " opening between the top and modesty panel to the 8" convenience shelf below eliminates the tangle of wires and cables. Two-inch grommetted holes in each corner provides access for routing cables.

**User comfort:** The table stands at a conventional desk height of 29" and provides full knee clearance. Laminate top has a non-glare, matte finish with shock-absorbing soft vinyl molding. Leg levels allow height compensation adjust.

**FP-4830,** Shpg. wt. 100 lbs. Mtr. Frt. .... **275.00**

### 2 Stand for printer or terminal

**Versatile table:** Use as part of your computer workstation or as a separate stand for terminals or printers. Constructed with the same strength, features and quality as the system table above. Stand measures 30" W x 27" H x 24" D.

**FP-3024,** Shpg. wt. 62 lbs. Mtr. Frt. .... **195.00**



### 3 Versatile add-on storage module

**Storage unit:** Easily attaches under the computer system table for storing supplies or electronic equipment. The module has side vents and is open in the rear for computer peripherals. It also has access to table wiring system. Module features adjustable shelf and measures 19" H x 21" W x 18" D.

**FP-4819,** Shpg. wt. 27 lbs. .... **75.00**

### 4 Full-length bookshelf storage

**Spacious upper storage shelf:** Four-position shelf attaches directly to pictured computer desk. Deep enough to hold 3-ring notebooks and full sized manuals, this shelf is an ideal place to keep hardware and software manuals. Comes with tack board for posting notes, etc. 48" W x 12" D.

**FP-4812,** Shpg. wt. 47 lbs. .... **150.00**

# High performance video monitors for high-resolution monochrome and brilliant color displays

## High-resolution monochrome displays offer unmatched quality at an economical price

- Excellent character definition and intensity
- Easy-on-the-eyes 40 or 80 column display
- Compatible with most popular computer systems

**High quality:** Both the ZVM-122A Amber and the ZVM-123A Green displays offer crisp character definition because of a wide 15 MHz bandwidth and a fast 30 nanosecond rise time. Special DC-coupling circuitry permits the video to retain its brightness even when their screens are full of information. A special deflection system helps to provide a display that is easy to read and also very easy on the user's eyes. Front panel controls allow easy adjustment.

**Versatile and compatible:** Both monitors, with their 12-inch diagonal screens, offer a large 25 line by 80 character capacity with a switchable 40 or 80 character column display. Use with H/Z-100, Atari, IBM-PC and PC Jr. and others.

**ZVM-122A**, Assembled and tested monitor with amber CRT, 18 lbs. .... **139.95**

**ZVM-123A**, Assembled and tested monitor with green CRT, 18 lbs. .... **139.95**

**ZVM-124**, Assembled monitor for use with IBM-PC and PC compatible computer systems, amber CRT needs monochrome printer adapter card. 18 lbs. .... **199.00**

**ZVM-123-2**, Tilt Base for HVM/ZVM-122/123, Shpg. wt. 2 lbs. .... **15.00**

**ZVM-121-1**, Cable to connect HVM/ZVM-121/122/123, to IBM, 1 lb. .... **5.00**

**ZVM-121-2**, Cable to connect HVM/ZVM-121/122/123, to Atari 1200, Shpg. wt. 1 lb. .... **15.00**



## Build your own monochrome video display

**Kit HVM-122A:** Get all these features: non-glare amber CRT, excellent character definition and intensity, a 40/80 column display, versatile front exterior controls contemporary styling, portability and compatibility with most popular computer systems. The HVM-122 uses the same cables as the ZVM-122/123 monitors which are listed above.

**HVM-122A**, Kit video display, 22 lbs. .... **Was \$109.95 NDW ONLY 89.95**

## 13-inch color monitors for home computers, VCRs, modular TV tuners, and video games

- Full-featured **ZVM-131** and **ZVM-135** Color Monitors with sound
- **ZVM-133** economical high-resolution monitor for RGB inputs only
- **ZVM-136** long-persistence monitor with features of **ZVM-133**

**ZVM-131** and **ZVM-135:** Both feature composite video and analog RGB inputs and are capable of displaying a full range of colors and intensities. A unique feature of each is a switch that cancels all colors except green so that monochrome text material can be displayed for easier reading. Both adjust screen brightness automatically. The one difference between the two is that the **ZVM-131** has a 25 line by 40 character display for use with home computers and the **ZVM-135** has a 25 line by 80 character display which makes it ideal for use with the H/Z-100 Computer. The **ZVM-135** displays 80 characters using the RGB input or 40 characters using the composite input. Easy-to-reach front-panel display and sound controls are other assets of these monitors. With the purchase of a **ZVM-135** monitor, you receive a free computer cable of your choice from those listed below.

**ZVM-133** and **ZVM-136:** Both of these Displays are special versions of the monitors above for use with RGB inputs only. User adjustments include a green-only switch and contrast control, and a front panel brightness control. The **ZVM-136** uses a long persistence CRT to reduce flicker when the interlace mode is used. Both monitors support 16 colors including the IBM-PC's brown.

**ZVM-131**, Assembled medium-resolution monitor, Shpg. wt. 38 lbs. .... **379.00**

**ZVM-135**, Assembled high-resolution monitor, Shpg. wt. 39 lbs. .... **599.00**

**ZVM-133**, Assembled high-resolution RGB-only monitor, 39 lbs. .... **559.00**

**ZVM-136**, Assembled long-persistence RGB-only monitor, 39 lbs. .... **799.00**

**Cables for use with the ZVM-131/133/135/136 Color Video Displays:**

**ZVM-135-1**, to the H/Z-100 Computer (ZVM-135/133/136 only), 1 lb. .... **25.00**

**ZVM-135-2**, to the IBM Personal Computer, Shpg. wt. 1 lb. .... **25.00**

**ZVM-135-3**, to the Apple III Computer, Shpg. wt. 1 lb. .... **25.00**

**ZVM-135-4**, to the Texas Instruments and Atari Computers, 1 lb. .... **25.00**

HVM-122A shown with optional tilt base



Available in non-glare amber and green CRT displays

ZVM-135 Audio-Video Color Display Monitor



Includes a quality sound system for monitoring audio



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## 1 A versatile 8-bit computer and a professional video terminal built into a desktop computer

The H-89 All-In-One Computer is an outstanding single-component system that's ready to work for you. Use it to increase your office's efficiency with business applications and word processing. Create your own programs with versatile operating systems and languages. And, manage your home easier with financial programs and information services.

All New  
Low Price of  
**\$999<sup>95</sup>**  
for kit H-89

### FEATURING A SAVINGS OF UP TO \$300

- Dual 8-bit microprocessors for faster computing
- 48K byte RAM memory that expands to 64K bytes
- Internal 5.25" disk drive stores up to 100K bytes
- High-Quality, professional typewriter keyboard
- Uses both HDOS and CP/M operating systems
- Easily add peripherals or increase data storage

**1 Separate microprocessors:** The H-89 uses two Z-80 microprocessors, one for video and keyboard functions and the other for just powerful computing. With the terminal using its own microprocessor, the computer can concentrate on high-speed processing. This allows the H-89 to be more versatile than other 8-bit desktop computers and computer systems.

**Expandable memory:** At 48 kilobytes of RAM, the H-89's memory is large enough to run most 8-bit software. And for larger programs, memory can be increased up to 64 kilobytes. To add the extra 16 kilobytes of RAM, you simply install the wired WH-88-16 RAM Expansion Kit (p. 37).

**Increased data storage:** For most of your data storage needs, the H-89 comes with an internal 5.25-inch floppy disk drive (H-17-1 on page 37) and an H-88-1 hard-sectored disk controller board (p. 37). This standard equipment allows you to store up to 100K bytes of data on a single floppy diskette. When you need more storage space, the H-89 answers with many add-on storage capacities in a number of different ways. You can increase the amount of disk storage by connecting an H-77/Z-87 external floppy disk system (p. 37) with its one or two disk drives to your H-89. This now brings the total storage capacity up to 300K bytes (100K bytes per drive). Storage capacity can be further increased by replacing the H-88-1 controller board with a Z-89-37 soft-sectored disk controller board (p. 37). With the Z-89-37 board installed in your H-89, total storage (with H-77/Z-87 connected to the H-89) becomes 480 kilobytes. Still more storage is gained by replacing the internal disk drive with a double-sided double-density disk drive (H-17-5 on page 37) and replacing the H-77/Z-87 with an H-37 external floppy disk system. This arrangement increases storage capacity to a massive 1.92 megabytes. For more information on these and other storage capacities for the H-89, see page 37.

**Professional keyboard:** With its standard typewriter keyboard, the H-89 allows touch-typists to immediately take advantage of word processing. Typists easily move from their electric typewriters to the keyboard of the H-89 without losing time in retraining. And, the rugged, highly-reliable keyboard is built to take the constant use found in the office environment. For programmers, the keyboard can display the entire ASCII character set, both upper and lower case, along with 33 graphic symbols. A 12-key keypad beside the keyboard allows accountants to rapidly enter numbers while using bookkeeping and other spreadsheet programs.

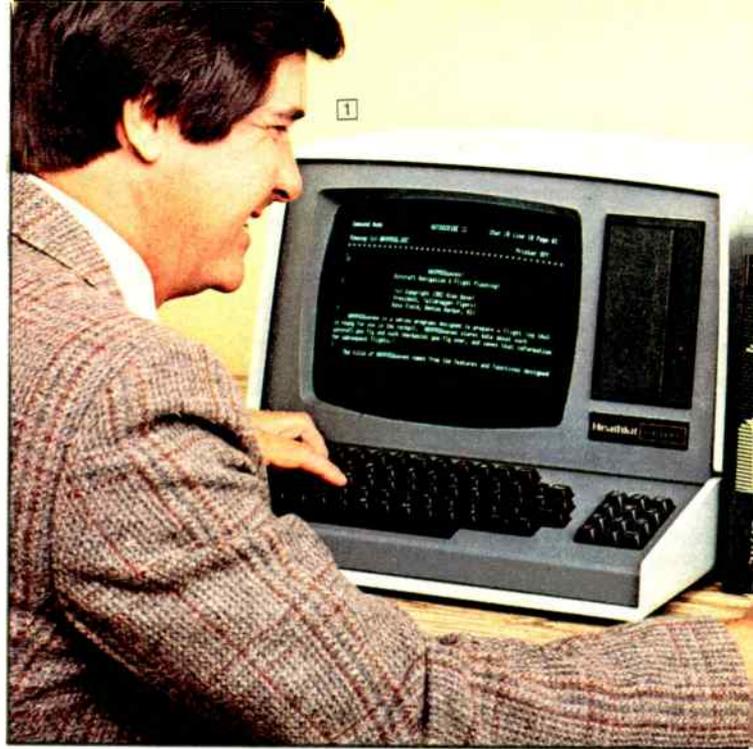
**Quality video terminal:** All information is shown on a 12-inch high-quality video display tube (or CRT) that provides highly detailed characters. The optional white or green CRT displays 24 rows of 80 characters each as well as a software-controlled 25th line. The display is always bright even when the maximum 2000 characters fill the screen. On the screen, upper-case characters are formed by a 5 x 7 dot matrix while lower-case characters use a 5 x 9 dot matrix.

**Add on the peripherals:** For your convenience and the H-89's versatility, three EIA standard RS-232C serial interface ports are part of the H-89. These three standard serial ports let you connect peripherals that make the H-89 more useful to you. Connect a printer such as the H/Z-125, located on page 41, for printed copies. Or, connect a modem (page 40) and use the H-89 to talk to other computers or access information services with their wealth of interesting, useful and profitable information, and services.



Need help? Call TOLL-FREE: 800-253-7057

For ordering assistance or information, call toll-free between 8:00 A.M. and 4:30 P.M. EST, Monday through Friday. In Alaska, Hawaii and Michigan, call 616-982-3411.



**H-89 software:** Choose from either HDOS or CP/M (both on p. 54) as your disk operating system, or use both. Each operating system features sophisticated system control and both support all Heath/Zenith disk systems. Software that can be used with either HDOS or CP/M can be found on pages 54 through 58. This includes: programming languages, financial modeling and planning software, utilities, word processing software, learning software and games. By joining HUG (p. 43) you can gain access to its library of over 700 software programs for your H-89 which are constantly being updated.

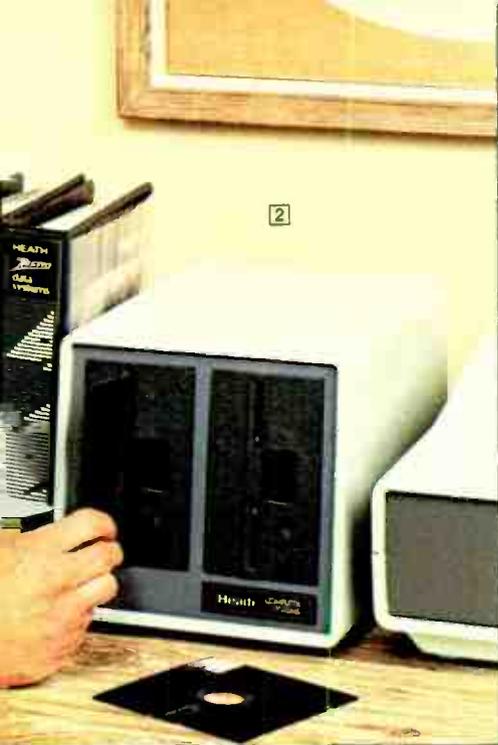
**User oriented manuals:** A step-by-step assembly manual shows you exactly how to assemble your own H-89 computer. Each step is clearly written and well illustrated to ensure a properly built and working kit.

	<b>Kit HS-89-2, All-In-One Computer with anti-glare green CRT,</b> Shpg. wt. 96 lbs. .... <b>Was \$1199, NOW ONLY 1049.95</b>
	<b>Kit HS-89-3, All-In-One Computer with standard white CRT,</b> Shpg. wt. 96 lbs. .... <b>Was \$1099, NOW ONLY 999.95</b>
	<b>Z-90-90, Assembled and tested H-89 with Z-89-37 Controller</b> <b>Board, 64K RAM, less disk drive, Shpg. wt. 53 lbs. .... 2499.00</b>
	<b>Z-90-92, Assembled and tested H-89 with Z-89-37 Controller</b> <b>Board, 64K RAM, 48 TPI disk drive, Shpg. wt. 55 lbs. .... 2799.00</b>

**H-89A SPECIFICATIONS: CPU AND MEMORY: Processor:** Z80. **Clock:** 2.048 MHz. **Memory:** 8K bytes used by system for ROM and RAM; 48K bytes user RAM (expandable to 64K). **VIDEO TERMINAL:** CRT: 12-inch Diagonal. **Display Size:** 6 1/2" H x 8 1/2" W (16.5 x 21.6 cm). **Character Size:** Approximately 1/4" H x 1/10" W (0.5 x 0.3 cm). **Character Type:** Upper case and lower case without descenders, 5 x 7 dot matrix; Lower case with descenders, 5 x 9 dot matrix; Graphics, 8 x 10 dot matrix. **Keyboard:** 84 keys (60 alphanumeric keys and 12 function/control keys) - plus a 12-key numeric/control pad. **Cursors:** Blinking, non-destructive underline or block. **Cursor Controls:** Up, down, left, right, home, CR, LF, back space and tab. **Cursor Addressing:** Relative and direct. **Tab:** Standard eight-column tab. **Refresh Rate:** 60 Hz at 60 Hz line frequency. 50 Hz at 50 Hz line frequency. **Edit Functions:** Insert and delete character or line. **Erase Functions:** Erase line or page, from beginning of line or page, to end of line or page. **Bell:** Audible alarm on receipt of ASCII BEL. **Video:** Normal and reverse, by character. **FLOPPY DISK (H-88-4):** Tracks: 40. **Sectors:** 10. **Formatted Bytes Per Sector:** 256. **Spindle Motor Speed:** 300 RPM ± 1%. **Data Transfer Rate:** 128 kHz. **Motor Start Time:** 1 second. **ACCESSORIES:** Interfacing: Three EIA standard RS-232C Serial Interface ports are provided. **GENERAL: Operating Temperature Range:** 50-95 degrees F (10-35 degrees C). **Power Requirements:** 120/240 VAC, 50/60 Hz, 90 watts. **Dimensions:** 13" H x 17" W x 20" D (33 x 43.2 x 50.8 cm). **Weight:** 46 lbs. (20.7 kg).

### SAVE ON SOFTWARE!

Purchase an H-89 Computer and receive **FREE** your choice of either H-DOS or CP/M (hard- or soft-sectored) operating systems. And, save 50% on any H-89 software package when you order an H-89 Computer.



**2 Increased data storage:** As your need for more disk storage space increases, the H/Z-89 or Z-90 Computer easily expands to supply the storage capacity you need. There are several different ways storage capacity can be increased. You can use the standard internal H-88-1 hard-sectored disk controller board of the H/Z-89 and externally add more single-sided 5.25-inch floppy disk drives to your Computer. Or, replace the H-88-1 with a Z-89-37 soft-sectored disk controller board and use either single-sided or high-capacity double-sided 5.25-inch floppy disk drives.

**HS-77/Z-87:** Triple the data storage of your H/Z-89 with a kit HS-77 or assembled Z-87 Floppy Disk System. Each single-sided disk drive (model number H-17-1) of either system is capable of storing 100K bytes (kilobytes) on a diskette for an added 200K bytes of storage capacity. That's a total capacity of 300K bytes, counting the 100K byte capacity of the Computer's internal drive.

## 2 Add more data storage capacity to your H/Z-89 or Z-90

**Different versions available:** The kit HS-77 is available in one and two drive versions. A kit one-drive system is available under model number HS-77-1 and a kit two-drive system is available under model number HS-77-2. The model number for an assembled two-drive disk storage system for the H/Z-89 is Z-87-89. An assembled two-drive system for the Z-90 Computer is ordered by using the Z-87-90 model number. Refer to the chart below for a summary of these storage systems.

**Available separately:** Besides the Floppy Disk Systems themselves, each component of these systems is available separately. See the list of disk storage accessories listed below. Anytime you wish, you can upgrade your Computer system to handle more data. With multiple drives, you can mount operating system and program disks at the same time. All disk drives are factory assembled and tested to make the kit versions of the disk systems faster and easier to build. It ensures worry-free operation.

**Quality designed:** The H-17-1 disk drive mounts vertically into its cabinet. Mounted this way the drive takes up less space than units which mount their units horizontally. Inside the tough metal cabinet of both disk storage systems is a special heavy-duty power supply. It provides enough power for each system with enough extra capacity to stay cool, even under the heaviest use. For other quality disk storage and H/Z-89 and Z-90 Computer accessories, check over both lists below.

**Increased drive storage:** Replace the H-88-1 hard-sectored controller board in your H-89 with the Z-89-37 soft-sectored disk controller board and increase data storage 1.6 times. The Z-89-37 allows the single-sided H-17-1 disk drive to store up to 160K bytes of data. Used with an H/Z-77 or Z-87 Floppy Disk System, the Z-89-37 increases their capacity to 320K bytes. Added to the Computer's internal drive storage and you get a total of 480K bytes.

**Used together:** Both the H-88-1 and the Z-89-37 controller boards can be used in an H/Z-89 or Z-90 at the same time. This allows you to choose the amounts of data storage you wish with different disk systems. The H-88-1 controller board can only be used with a single-sided H-17-1 disk drive such as the one that comes standard with the H/Z-89. However, the Z-89-37 controller board can be used with either the H-17-1 or H-17-5 (double-sided) drive.

**H-37 Floppy Disk System:** With a Z-89-37 controller board and the two-drive H-37 System, up to 1.28 megabytes of additional data storage is provided. The high-capacity double-sided 96 TPI H-17-5 disk drive, used in the H-37, makes this possible with its large 640K bytes per drive storage capability. By replacing the internal H/Z-89 single-sided drive (H-17-1) with an H-17-5 drive, a huge 1.92 megabytes of total disk storage becomes available.

**Two versions available:** The kit H-37 Disk System can be ordered with one (HS-37-1) or two (HS-37-2) double-sided floppy disk drives. And, the H-17-5 double-sided 96 TPI disk drive can be obtained separately for expanding your system as desired. See the chart below and the accessories list at the right for model numbers and prices. The H-37 uses the same cabinet and power supply as the H/Z-77 and Z-87. It is a damage-resistant steel cabinet that includes its own power supply.

**Power:** The H-37, H-77, and Z-87 Disk Systems use 120/240 VAC at 50/60 Hz. All cabinets measure 8 $\frac{5}{8}$ " H x 8 $\frac{7}{8}$ " W x 15" D.

### Disk Storage Accessories

**Hard-Sectored Disk Controller Board for H/Z-89 Computers:** Use only with H-17-1 Single-Sided Floppy Disk Drives below.

**H-88-1, Assembled, 3 lbs. .... 150.00**

**Soft-Sectored Disk Controller Board for H/Z-89 Computers:** Increases data storage capacity of disk drives below.

**Z-89-37, Assembled, 4 lbs. .... 299.00**

**Single-Sided Floppy Disk Drive for H-77/Z-87 Disk Systems:** Stores up to 100K bytes per disk when used with H-88-1 Controller Board, 160K bytes when used with Z-89-37. Also for H-88, H/Z-89 and Z-90 Computers.

**H-17-1, Assembled, 5 lbs. .... 295.00**

**Double-Sided Floppy Disk Drive for H-37 Disk Systems:** Stores up to 640K bytes on a compatible disk. Requires Z-89-37 above.

**H-17-5, Assembled, 5 lbs. .... 550.00**

**Dust Cover:** Protects H-37 and H-77/Z-87 Disk Systems from dust and contaminants.

**HCA-5-77, Shpg. wt. 1 lb. .... 14.00**

### Accessories for H/Z-89 and Z-90

**WH-88-16, Assembled 64K RAM Expansion Kit:** Expands the RAM capacity of H/Z-89 All-In-One Computers to 64K bytes. Requires a computer with 48K bytes of RAM. Circuit board is fully assembled and tested.

**Shpg. wt. 1 lb. .... 115.00**

**H-88-9, High Capacity Drive Installation Kit:** To install H-17-4s into H-89s, 4 lbs. .... 50.00

**HA-88-3, 3-Port Serial Interface:** For older H-89s, Shpg. wt. 2 lbs. .... 150.00

**H-88-5, Cassette Interface,** (not used with CP/M), Shpg. wt. 2 lbs. .... 49.00

**Kit H-88-10, Wire Wrapping Board with Bus Connectors:** Make custom circuits. Takes 48# 16-pin, 54# 14-pin and other sockets. Uses HCA-7 below. 1 lb. .... 30.00

**Kit HCA-7, Wire Wrapping Socket Kit:** Includes 36 Three-level wire wrapping sockets ranging from 14-pin to 40-pin. Used with above H-88-10. Shpg. wt. 1 lb. .... 29.95

**HCA-5-89, Dust Cover:** Protects H/Z-89s, Z-90s and H/Z-19s from dust. 1 lb. .... 14.00

### How to order external 5.25" disk storage for H/Z-89s, Z-90s

Storage Capacity Using Controller Boards:		Order Model		Includes Cabinet Power Supply And:	Shpg. Wt.	Price
H-88-1	Z-89-37	Kit	Assem.			
100K bytes	160K bytes	HS-77-1	—	One H-17-1 (Single-Sided)	34 lbs.	499.00
200K bytes	320K bytes	HS-77-2	—	Two H-17-1 (Single-Sided)	47 lbs.	769.00
		—	Z-87-89 for H/Z-89		30 lbs.	769.00
		—	Z-87-90 for Z-90	30 lbs.	999.00	
—	640K bytes	HS-37-1	—	One H-17-5 (Double-Sided)	34 lbs.	795.00
—	1.28 megabytes	HS-37-2	—	Two H-17-5 (Double-Sided)	47 lbs.	1295.00
—	1.28 megabytes	—	ZC-37	Two H-17-5 (Doubled-Sided)	28 lbs.	1699.00

Heathkit computer products meet FCC requirements for use in residential areas.

Zenith Data Systems computer products in this catalog are fully assembled and tested.



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## Versatile and compatible terminals that are priced to meet the most demanding budgets



### Z-49 uses the latest in solid-state technology for expanded flexibility

**\$1099<sup>00</sup>**

- All advanced features are set through the keyboard and stored in nonvolatile memory
- A large 14-inch nonglare screen provides 25 rows of a selectable 80 or 132 characters

**State-of-the-art terminal:** The very friendly Z-49 Video Display Terminal is designed to satisfy all your business and personal needs while providing the greatest degree of user convenience. As soon as you turn it on, this smart terminal goes to work and performs a series of internal self-check tests to verify proper operation. All functions, even screen brightness, are easily set up by programming selections through the keyboard as they are displayed on-screen in plain-talk menus. These selections can be stored in nonvolatile memory until changed by the user.

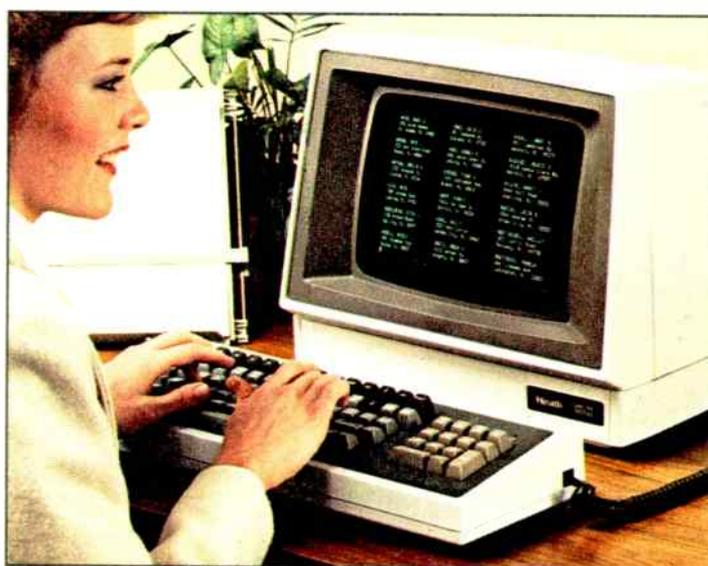
**Advanced keyboard features:** The 92-key, detached keyboard uses a standard typewriter key layout. Included are five user-programmable special function keys, eight LED indicators, and an 18-key keypad with 14 numeric and four user-programmable function keys. The tilt-adjusted, low-profile keyboard connects to the display by a six-foot coiled cord.

**Professional display:** A smoothly scrolling display can be seen on the non-glare 14-inch diagonal Chromogold II™ (amber) screen. This special screen provides a larger and more easily readable viewing area for 25 lines of either a user-selectable 80 or 132 characters. These include 95 printing ASCII characters of upper and lower case, numerics and punctuation plus 33 graphic characters. Alternate characters include 32 graphic representations of non-printing ASCII, seven foreign language sets, 32 special Greek symbols and 32 VT-100 graphic characters. The Z-49 is compatible with the H/Z-19, H/Z-29, DEC VT52 and DEC VT100.

**Interfacing:** The Z-49 Terminal includes a DTE and DCE connector.

	Z-49, Assembled and tested, Shpg. wt. 37 lbs. ....	<b>1099.00</b>
	Z-49-G, Z-49 with green CRT, Shpg. wt. 37 lbs. ....	<b>1099.00</b>

**Z-49 SPECIFICATIONS:** DISPLAY: CRT: 14" diagonal, enhanced contrast, video screen. Display Format: 25 rows of 80 characters or 25 rows of 132 characters. Display Size: 6.75" H x 9.25" W Character Type: 80-column display, 10 x 12 character cell. 132-column display, 8 x 12 character cell. Character Size (approx.): 80-column display, 0.255" H x 0.12" W. 132-column display, 0.255" H x 0.07" W. Video Attributes: Normal or reverse character, normal or underlined character, half intensity character and background, normal or blinking display. Refresh Rate: 50 or 60 Hz. CURSOR: Type: Underline or reverse (solid) video block. Attributes: On, off, blinking Controls: Up, Down, Left, Right, Backspace, Tab, Back Tab, Home, Carriage Return, Line Feed and Brightness. Addressing: Direct or relative. COMMUNICATIONS: Type: EIA RS-232C. Baud Rates: 50 - 19,200 baud. Mode: Half or full duplex. Code: ASCII. Format: Serial asynchronous. Word Length: 7 data bits, one parity bit. Stop Bits: 1 or 2. Sync: Auto XON and XOFF. Parity: Even, odd, mark, space, or none. Power: 105 - 127/210 - 254 VAC, 50/60 Hz, 73 watts.



### H-29 provides more functions and versatility in a smart, user-friendly video display terminal

**\$599<sup>00</sup>**

- Built-in flexibility provides you with the room to grow as your requirements increase
- Complete communications compatibility with many ANSI protocol terminals and host computers

**User-oriented operation:** One of the most user-friendly terminals available, the H-29 allows a user to configure parameters from on-screen selections. Even a user-settable 24-hour clock is accessible for keeping track of standard or elapsed time. A keyboard HELP key is also provided for prompts or help messages used with some software. A special screen saver automatically shuts off the display after 15 minutes of nonuse for those forgetful moments.

**Popular compatibility:** The H-29 is compatible with the popular H/Z-19, Lear Siegler ADM-3A, Hazeltine 1500A display terminals. And, it is also compatible with the DEC VT52 and has many attributes of the DEC VT100 terminal.

**Screen and keyboard capabilities:** Information is clearly displayed in 25 lines of 80 characters on a 12-inch non-glare CRT in normal or reverse video. The detached keyboard has 91 keys and includes a separate numeric keypad. It generates the entire 128-character ASCII set and codes for an alternate character set of 33 special symbols in an 8 x 10 dot matrix.

**Accessible editing features:** Available are character and line insert and delete as well as erase a page, line, to the beginning or end of a line or a page.

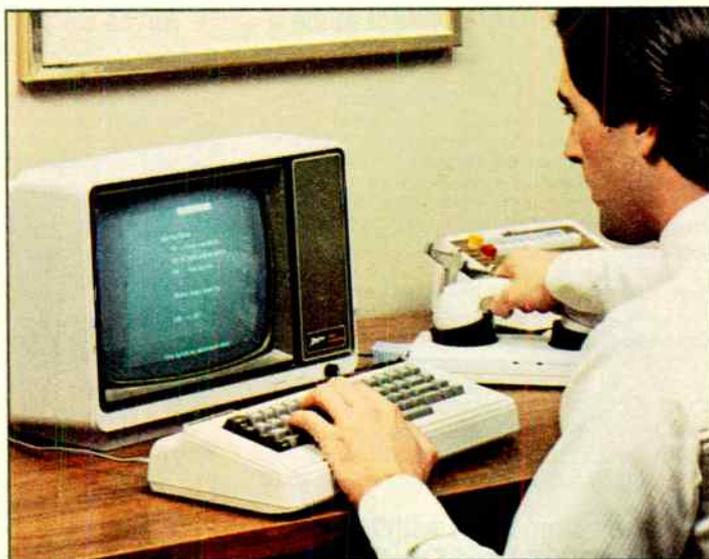
**Interfacing:** Two RS-232C standard connectors are available, a DTE connector for computers or a modem and DCE connector for an auxiliary device.

	Kit H-29, Terminal, Shpg. wt. 41 lbs. ....	<b>599.00</b>
	Z-29, Assembled and tested Terminal, 38 lbs. ....	<b>849.00</b>
	Z-29-1, Palm Rest Accessory, Shpg. wt. 1 lb. ....	<b>15.00</b>
	Z-29-2, ROM Source Listing, Shpg. wt. 4 lbs. ....	<b>25.00</b>

**H/Z-29 SPECIFICATIONS:** DISPLAY: CRT: 12" P31, green, non-glare video screen. Display Format: 25 rows of 80 characters. Display Size: 6" H x 8 1/2" W. Character Type: 8 x 10 character cell. Character Size: 0.2" H x 0.1" W (approx.). Video Attributes: Normal or reverse character, normal or underline character, normal or half-intensity character, normal or blinking. Can be in any or all combinations. Refresh Rate: 60 Hz or 50 Hz. CURSOR: Type: Underline or reverse (solid) video block. Attributes: On, off, blinking. Controls: Up, Down, Left, Right, Backspace, Tab, Back Tab, Back Home, Carriage Return and Line Feed. Addressing: Direct and relative. COMMUNICATIONS: Type: EIA RS-232C. Baud Rates: 75 - 19,200 baud. Mode: Half or full duplex. Code: ASCII. Format: Serial asynchronous. Word Length: 7-data bits, one parity bit. Stop Bits: 2 at 75 and 110 baud rates, 1 at all other baud rates. Sync: Auto XON and XOFF. Parity: Even, odd, mark or space. Operating Temperature: 32° to 105 F (0° to 40° C). Operating Humidity: 10-90% (relative) noncondensing. Power Requirements: 105 - 127 VAC at 60 Hz and 45 watts.



# Personal Information Terminal provides quality and economy in data entry and access systems



## A low-cost entry point data terminal for use in communicating with a computer and a printer

- Instant and user-friendly access to mainframe computers, minicomputers and microcomputers
- Professional data display and keyboard capabilities with DEC VT-52 terminal compatibility

**Information processing terminal:** The HT-10 features an integral RS-232 standard port that can function at speeds from 110 to 9600 baud for communicating with personal, business and other computers. In addition, this versatile terminal is compatible with a DEC VT-52.

**Plain talk:** Built-in prompts and cues in simple English make it easy to communicate with and use this friendly terminal.

**Easy-to-use keyboard:** The keyboard features a standard 63-key layout including the full ASCII set with CTRL, ESC, BREAK, TAB and RETURN. Four cursor control keys and a special HELP key add further convenience.

**Electronic typewriter:** Connect a parallel-type printer to the rear Centronics interface and take advantage of the terminal's printing features.

	Kit HT-10, Terminal includes ZVM-121 video monitor without modem, Shpg. wt. 36 lbs. ....	<b>399.00</b>
	Kit HTX-10, Terminal less video display monitor and without modem, Shpg. wt. 10 lbs. ....	<b>279.00</b>
	ZT-10, Assembled and tested Terminal, includes video display monitor and without modem, Shpg. wt. 32 lbs. ....	<b>499.00</b>
	ZTX-10, Assembled and tested Terminal less video monitor and without modem, Shpg. wt. 6 lbs. ....	<b>399.00</b>

## A rapid access terminal for use with remote computers, information services, data banks...

- Single button accessing of up to 26 pre-selected information sources with universal log-on capability
- System setup allows automatic answering of incoming calls and permits unattended operation capability

**Telecomputing system:** With its internal modem, the HT-10 can be connected anywhere there is a modular phone jack to gain complete access to computer data services. After preprogramming in a menu of up to 26 pre-selected information sources, a user simply presses one button to automatically select a desired information source or place a normal voice call.

**Memory capability:** Besides dialing a desired source, the terminal can transmit all required codes. A special universal log-on feature allows the user to program in log-on procedures including account numbers, escape codes and passwords into a battery-protected memory system. When left unattended, the terminal can be set up to receive incoming calls with automatic answering.

**High-resolution display:** Included with some models is the ZVM-121 monochrome monitor which features a green 12-inch CRT with excellent character definition.

	Kit HT-1011, Includes ZVM-121 video display monitor, RS-232C port and 300 baud modem, Shpg. wt. 44 lbs. ....	<b>449.00</b>
	ZT-11, Assembled and tested HT-1011 with video display, RS-232C port and modem, Shpg. wt. 32 lbs. ....	<b>579.00</b>
	ZTX-11, Assembled and tested HT-1011 with modem RS-232C port less video display monitor, Shpg. wt. 6 lbs. ....	<b>479.00</b>
	ZT-1-U, Assembled and tested Terminal with monitor and modem less RS-232C serial port, Shpg. wt. 30 lbs. ....	<b>549.00</b>
	ZTX-1-U, Assembled and tested Terminal with modem less monitor, RS-232C serial port, 6 lbs. ....	<b>449.00</b>

**HT-10 SPECIFICATIONS: KEYBOARD/TERMINAL: Character Set:** 95 ASCII, 33 graphics. **Keyboard:** 63 keys (26 alphabet, 10 numeric, 4-cursor/special function, 12 control, 11 punctuation). **Storage:** Up to 26 names (to 12 characters) and telephone numbers (to 16 digits). **Cursor:** Blinking or steady block, or off. **Cursor Controls:** Up, down, left, right. **Cursor Addressing:** Direct (VT-52 compatible). **Tab:** Standard 8-column tab stops. **Refresh Rate:** 60 Hz. **Edit Functions:** Insert line, delete line. **Erase Functions:** Page, line, beginning of line to cursor, cursor to end of line, beginning of page to cursor, cursor to end of page. **Bell:** Audible alarm on receipt of ASCII BEL. **Video:** Normal, reverse, half-intensity, blink. **INTERFACES: Telephone Connections (modem models only):** Standard RJ-11, RJ-12, or RJ-13 telephone jack. **Data Rate (modem models only):** 110, 150, 300 baud Bell 103 compatible. **Dial Method (modem models only):** Pulse. **Video:** RS170 compatible. **Serial Equipment I/O:** RS-232 levels at 110, 150, 300, 600, 1200, 2400, 4800 and 9600 baud. **Printer:** Parallel (Centronics-type).

## Accessories for the Personal Information Terminal

ZT-1-2, Terminal Carrying Case, Shpg. wt. 2 lbs. ....	<b>24.99</b>
ZTA-1-1, Parallel Cable, Shpg. wt. 1 lb. ....	<b>25.00</b>
ZVM-121, Optional Monochrome Video Display, for use with HTX and ZTX Terminals. Features high resolution 12" green CRT that can display 25 lines of 80 characters each, Shpg. wt. 18 lbs. ....	<b>139.95</b>
HTX-10-1, Auto-dial and auto-answer 300 baud modem for use only with HTX and ZTX model terminals, Shpg. wt. 1 lb. ....	<b>69.95</b>
ZT-1-3, Universal ROM set for upgrading older ZT-1s into programmable one-key access models, Shpg. wt. 1 lb. ....	<b>49.95</b>



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World Radio History

# Quality peripherals and accessories for your Heathkit/Zenith computer

## 1 Low-cost direct-connect modem

**Full-duplex modem:** The Muraphone MM-100 is an excellent, low-cost modem for sending and receiving information over a standard telephone line. It uses a data transmission speed of 300-baud which is compatible with most time-share systems. Easy front panel selection allows the modem to operate in either an answer or originate mode. And, an RS-232 interface permits simple connection to similarly equipped computers and terminals.

**Accessories:** Included with the modem is an interconnecting phone cable for use with modular-type single-line telephones. To power the unit, a UL and CSA listed 120 volt AC adapter is included.

**Requirements:** For use with either a computer or terminal, the Muraphone modem needs the RS-232 cable (HCA-11) listed below. A computerized phone system (CPS) is advised for use with computers.

**WH-63**, Assembled and tested, 3 lbs. .... **99.00**

**HCA-11**, RS-232 Male to Female Cable, for interconnecting to computers, Shpg. wt. 1 lb. .... **20.00**

## 2 Make connections with Hayes' 300- and 1200-baud Smartmodems

**Computer's telephone:** The popular Hayes 300 and faster 1200 work with any computer having an RS-232 I/O port. They connect to standard single-line modular phone systems and allow you to communicate with anyone similarly equipped. Besides sending and receiving data, Smartmodems will also dial, answer and disconnect calls...all automatically. Both work with rotary dial and TOUCH-TONE phone systems and feature an audio speaker so you can actually listen to a connection being made.

**Choice of speed:** The lower-priced Smartmodem 300 is ideal for local data transfers at 300 baud. For longer distance and larger volumes (which add up to higher costs) the Smartmodem 1200 is the answer with 1200 baud capability and a built-in selector that automatically detects transmission speed. Both modems include a 120 VAC adapter and an interconnecting phone cable. Required is an HCA-11 RS-232 cable. CPS software is recommended.

**WH-43**, Assem. 300-baud modem, 3 lbs. . . **279.00**

**WH-53**, Assem. 1200-baud modem, 4 lbs. **695.00**

**HCA-11**, RS-232 Cable, Shpg. wt. 1 lb. .... **20.00**

## 3 Convenient acoustic modem

**Stand-alone modem:** The LEX-11 is an acoustically coupled frequency shift keying modem designed to operate at rates up to 300 baud. It connects to terminals or computers through a RS-232 interface. This modem is compatible with the standard 103A modem and operates on dial-up telephone networks.

**Features:** A versatile modem, the LEX-11 can be operated in either an answer or originate mode. The modem can also be operated in full duplex or half duplex as desired. To verify its operation, a test mode is provided. A red LED indicates power has been applied and a ready LED lights when the modem has received the proper "ready" signal from a modem at the other end of the telephone line. The LEX-11 is powered by a UL and CSA listed AC adapter which is included. Also included is a phone cable. Needed is an HCA-11 RS-232 cable and CPS software.

**WH-23**, Assembled and tested, 3 lbs. .... **139.00**

**HCA-11**, RS-232 Cable, Shpg. wt. 1 lb. .... **20.00**

## 4 Hayes Chronograph keeps time

**High-tech calendar/clock:** Give your computer the added dimension of precise time keeping with the Hayes Chronograph. With crystal-controlled accuracy, this calendar/clock keeps any RS-232 compatible computer system updated as to the day, date and time to the second in 12- or 24-hour format.

**Record keeper:** Use the chronograph to monitor all computer activity and create an accurate record of how your time was spent. Or, with the clock, instruct your computer to execute programs while unattended. This is extremely useful for transferring data at night when phone rates are lowest.

**On the job:** The time is immediately available when your computer is turned on because it is independently powered by 120 VAC. Should a power failure occur, three "AA" backup batteries (not included) prevent the loss of time. Requires HCA-11 RS-232 cable listed above and CPS or user provided software.

**WH-42**, Assembled and tested, 4 lbs. .... **199.00**

## 5 Votrax TYPE 'N' TALK synthesizer

**Electronic speech:** Get your computer to talking with this completely self-contained phoneme-based speech synthesizer. It easily connects to a computer, modem or any RS-232C compatible serial device. To operate, you simply type in English text and a talk command. Then, a microprocessor-based text-to-speech algorithm automatically converts the type-written words into speech.

**Unlimited speech:** By converting text into electronic phonemes and using a set of English pronunciation rules, this synthesizer provides an unlimited user defined vocabulary. And, all the translations are performed independent of the computer which frees it to perform other functions.

**In addition:** The synthesizer features a 750-character buffer and a selectable baud rate between 75 and 9600. Speech is outputted through a one-watt audio amplifier into an 8-ohm speaker (not included). An HCA-13 cable on (pg. 42) is required as is CPS or other communications software.

**WH-12**, Assembled and tested, 5 lbs. .... **299.00**

## 6 RS-232 Interface Tester

**Line Monitor:** Connects between equipment line and communication line to check 12 different signals. LEDs monitor lines with interface pin test points.

**WH-15**, Assembled and tested, 1 lb. .... **159.00**

## 7 Handy Smart Outlet Box

**Convenience and protection:** Power up all your peripherals by just turning on your computer. It's that easy with the Smart Outlet Box. All you do is plug the AC line cord of your computer into the special current-sensing socket of the outlet box. Plug in the line cords of peripherals into the ten switched sockets. When the controlling computer is turned on, current flow in the socket is sensed and the smart box automatically applies AC power to all your other equipment. Internal MOV device protects your computer investment from line surges and transient spikes. Remaining outlet socket is unswitched for powering clocks or other constant AC devices.

**Kit GD-1295**, Shpg. wt. 4 lbs. .... **49.95**



# High-speed H-125 Dot Matrix Line Printer heads this page of top-quality printers

**\$899<sup>00</sup>**  
Kit

- Prints at over 45 characters per second with a possible 33 graphics characters
- Interfaces to most computers and terminals

**Full-featured printer:** The H-125 is a rugged and quiet dot matrix printer that has a high printout speed and versatile paper handling facilities. With bi-directional printing, it can output over 150 characters per second. The full 96-character ASCII set can be printed out and includes upper and lower case letters with descenders and underlining. Also available are block graphic characters provided by most Heathkit/Zenith computers. Other features include a quad tractor feed with adjustable width, variable pitch, quieting cabinet, self-test capabilities and failure indicators. An RS-232C port and a 20 mA current loop with handshaking allow the printer to interface with most computers and terminals. Communication speeds are adjustable from 110 to 9600 baud. For 120/240 VAC operation.

Kit H-125, Dot Matrix Printer, Shpg. wt. 85 lbs. ....	899.00
Z-125, Assembled Printer in H/Z-100 colors, 82 lbs. Mtr. Frt. ....	1499.00
HDC-125, Protective Dust Cover for H/Z-125, Shpg. wt. 1 lb. ....	16.00
HCA-9, Printer Stand for H/Z-125, Shpg. wt. 21 lbs. ....	99.00

## Letter-quality documents from a Diablo Printer

**Daisy-wheel printer:** This proven printing mechanism produces the highest print quality for your word processing programs. A versatile printer, the WH-54B prints the entire 96-character ASCII set, including upper and lower case. It prints at speeds up to 35-40 characters per second in both directions. And, it accepts forms up to 15½ inches wide while being able to accommodate forms up to 27/1000 inch thick with a single adjustment.

**Includes:** The WH-54B printer has a parallel interface, plus a parallel cable, for connecting to computers and a printer buffer that holds 768 characters. Other features include a friction platen, LED condition indicators, and operator control panel. The WH-54B comes with an Elite 12 print wheel with an unslashed zero (HCS-22) and a film ribbon cartridge (HCS-51). Replacement print wheel and ribbons are found on page 56. The printer uses 120/240 VAC, 50/60 Hz and measures 9¼" H x 23½" W x 15¾" D (23.5 x 59.7 x 40 cm).

WH-54B, Assembled Diablo Printer, Shpg. wt. 70 lbs. Motor Freight . . . 1999.00



## More high-performance printers that excel at graphics and letter-quality printing

### 1 Economical Diablo printer with quality features

**Daisy wheel printer:** This Diablo printer produces letter-quality documents at a minimum speed of 20 characters per second. It has bi-directional printing using a 98 character printer wheel that can be exchanged without removing the ribbon cartridge. The printer includes many features including: page formatting, graphics, horizontal/vertical tabbing and proportional spacing. The Diablo 620 printer works only with parallel outputs.

WH-55, Assembled printer, Shpg. wt. 48 lbs. .... 1199.00  
HCA-2, Printer Stand for WH-55, Shpg. wt. 28 lbs. .... 99.00

### 2 Advanced MPI-150 Impact Matrix Printer

**Outstanding features:** Allows printing of up to 6120 individually addressable dots per square inch for exceptional graphics and special character resolution. Features 150 cps logic seeking impact printing, wide carriage, 1K print buffer, large selection of print capabilities, and custom character set development. AP-PAK.

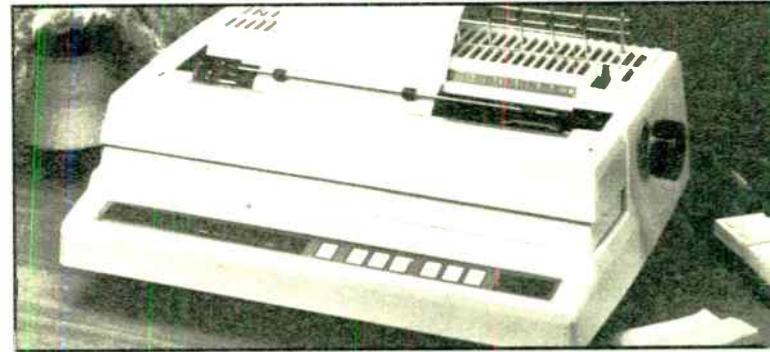
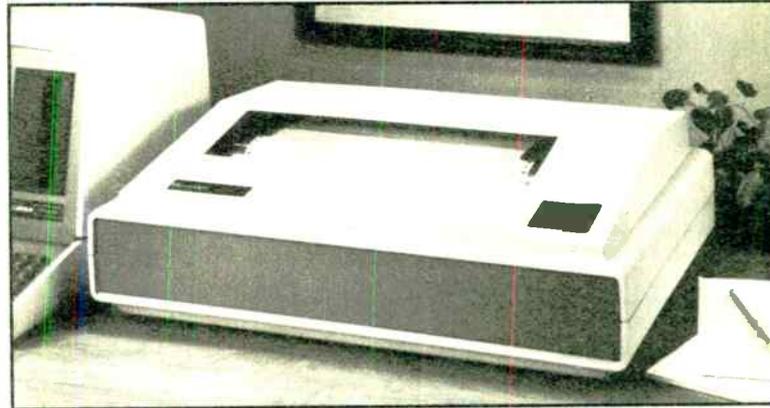
MPI-150, Impact Matrix Printer, Shpg. wt. 35 lbs. .... 995.00

### 3 MPI-99 Impact Matrix Printer solves needs

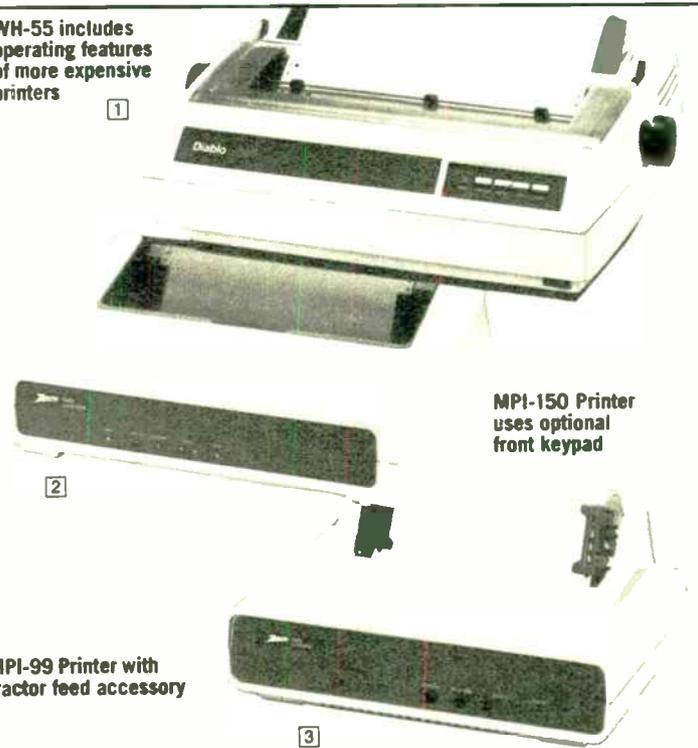
**Advanced:** Speeds through data at 100 cps and connects to computers through either a serial RS-232C or parallel Centronics interface. Prints bi-directionally with a 7 x 9 or 11 x 9 dot matrix. Full upper and lower case 96-character ASCII set with descenders and high resolution dot-addressable graphics. Needs AP-PAK.

MPI-99, Impact Matrix Printer, Shpg. wt. 11 lbs. .... 599.00

More accessories for the WH-55 and MPI printers (AP-PAKS) are located on page 42.



WH-55 includes operating features of more expensive printers



MPI-150 Printer uses optional front keypad

MPI-99 Printer with tractor feed accessory



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# High-quality supplies and accessories for your Heathkit/Zenith computers and peripherals

## Pre-wired, 10-foot RS-232 cables (connects pins 1-8, 20):

HCA-10, Male-to-Male Cable, Shpg. wt. 1 lb. ....	20.00
HCA-11, Male-to-Female Cable, Shpg. wt. 1 lb. ....	20.00
HCA-12, Female-to-Female Cable, Shpg. wt. 1 lb. ....	20.00

## Pre-wired, 10-foot special application cables:

<b>Votrax Cable.</b> Connects H/Z-89 to WH-12 Type-N-Talk Speech Synthesizer.	
HCA-13, Shpg. wt. 1 lb. ....	20.00
<b>Parallel Cable.</b> Connects H/Z-89 with Z-89-11 Input/Output Board to MX-80.	
HCA-14, Shpg. wt. 1 lb. ....	25.00
<b>Bisynchronous Modem Cable.</b> For use with Z-89-11 Multi-Mode I/O Board.	
HCA-19, Shpg. wt. 1 lb. ....	20.00
<b>Parallel Cable.</b> Connects H/Z-100 Series Computers to MX-80A Printer.	
HCA-20, Shpg. wt. 1 lb. ....	25.00

## Prewired, 10-foot IBM compatible peripheral cables for HS/Z-150 and HS/Z-160 Computers:

HCA-51, Male-to-Female Cable, Shpg. wt. 1 lb. ....	30.00
HCA-52, Female-to-Female Cable, Shpg. wt. 1 lb. ....	30.00
HCA-53, Parallel Cable, Shpg. wt. 1 lb. ....	30.00

## Quality printer paper at economical prices

<b>Premium 8.5" x 11" One-Part, Fan-Fold Paper.</b> Continuous 2700 sheets.	
HCS-1, Shpg. wt. 28 lbs. ....	32.00
<b>Standard 8.5" x 11" One-Part, Fan-Fold Paper.</b> Continuous 3200 sheets.	
HCS-2, Shpg. wt. 31 lbs. ....	32.00
<b>Standard, 14.875" x 11" One-Part, Fan-Fold Paper.</b> Continuous 3200 sheets.	
HCS-3, Shpg. wt. 47 lbs. ....	42.00
<b>Bond Form-Feed 8.5" x 11" One-Part, Fan-Fold Paper.</b> Continuous 1000 sheets.	
HCS-4, Shpg. wt. 13 lbs. ....	25.00

## Durable printwheels for Diablo 1640 and 630 printers:

<b>Courier 10 (Diablo 38100).</b> Pica typeface with slashed zero.	
HCS-20, Shpg. wt. 1 lb. ....	8.00
<b>Courier 12 (Diablo 38107).</b> Elite typeface with unslashed zero.	
HCS-21, Shpg. wt. 1 lb. ....	8.00
<b>Elite 12 (Diablo 38102).</b> Pica typeface with unslashed zero.	
HCS-22, Shpg. wt. 1 lb. ....	8.00
<b>General Scientific (Diablo 38141).</b> Includes Greek and mathematical symbols.	
HCS-23, Shpg. wt. 1 lb. ....	8.00
<b>APL-10 Computer Language Font (Diablo 38150).</b>	
HCS-24, Shpg. wt. 1 lb. ....	8.00
<b>Prestige Elite Legal 12A (Diablo 38105).</b> Legal symbols with ®, ®, ™.	
HCS-26, Shpg. wt. 1 lb. ....	8.00
<b>Courier Legal 10 (Diablo 38104).</b> Pica typeface with legal symbols.	
HCS-27, Shpg. wt. 1 lb. ....	8.00

## High-quality, long-life printer ribbons:

<b>Plug-In Cloth Ribbon Cartridges for Diablo 1640 and 630 Printers.</b>	
HCS-50, Shpg. wt. 1 lb. .... Package of three, 18.00	
<b>Plug-In Film Ribbon Cartridges for Diablo 1640 and 630 Printers.</b>	
HCS-51, Shpg. wt. 1 lb. .... Package of three, 18.00	
<b>Ribbons for H/WH-14 and ASR-33 Dot Matrix Printers.</b>	
HCS-52, Shpg. wt. 1 lb. .... Package of three, 8.00	
<b>Ribbons for WH-24 (TI 810) and H-36 (LA-36) Printers.</b>	
HCS-53, Shpg. wt. 1 lb. .... Package of three, 18.00	
<b>Plug-In, No-Mess Ribbon Cartridge for MX-80 Printer.</b>	
HCS-55, Shpg. wt. 1 lb. .... Each, 14.00	
<b>Plug-In, Ribbon Cartridge for H/Z-25, H/Z-125 High-Speed Dot Matrix Printers.</b>	
HCS-56, Shpg. wt. 3 lbs. .... Package of two, 20.00	

## Helpful accessories for your computer system:

<b>Bi-directional Tractor Feed Assembly.</b> For WH-54B and WH-44 Printers.	
HCA-1, Shpg. wt. 9 lbs. ....	259.00
<b>5.25" Floppy Disk Storage Cabinet.</b> Plastic cabinet protects 50 disks.	
HCA-15, Shpg. wt. 2 lbs. ....	24.00
<b>Surge Suppressor.</b> Protects computer equipment from voltage surges and spikes.	
HCA-16, Shpg. wt. 1 lb. ....	65.00
<b>Paper Tractor.</b> Turns tractor feed printer into a friction feed system.	
HCA-17, Shpg. wt. 1 lb. ....	12.00
<b>8" Floppy Disk Storage Cabinet.</b> Plastic cabinet protects 50 8" disks.	
HCA-18, Shpg. wt. 5 lbs. ....	30.00

## Accessories for the MPI-99 and MPI-150 Printers:

<b>Ribbon Cartridge.</b> Replacement cartridge replaces easily without opening case.	
MPI-99-1, Shpg. wt. 1 lb. ....	12.00
<b>Single-Sheet Feeder Attachment.</b> For inserting paper from the front of printer.	
MPI-99-2, Shpg. wt. 2 lbs. ....	35.00
<b>Sound Cover Attachment.</b> For a quieter operating printer.	
MPI-99-3, Shpg. wt. 3 lbs. ....	35.00
<b>Ribbon Cartridge.</b> Replacement ribbon snaps into printer with disassembling.	
MPI-150-1, Shpg. wt. 1 lb. ....	20.00
<b>Serial Adapter.</b> Allows asynchronous serial data transfer up to 9600 baud.	
MPI-150-2, Shpg. wt. 1 lb. ....	110.00
<b>Status Keypad.</b> For front panel programming of font and pitch changes.	
MPI-150-3, Shpg. wt. 2 lbs. ....	130.00
<b>64K Buffer Memory.</b> Expands print buffer to 68K for high-speed printing tasks.	
MPI-150-4, Shpg. wt. 1 lb. ....	259.00

## Graphics Applications Package for the MPI-99/150:

<b>H/Z-100 AP-PAK.</b> Allows printing of any H/Z-100 character. Includes cable.	
MPA-1, Shpg. wt. 1 lb. ....	75.00
<b>H/Z-89 AP-PAK.</b> Allows printing of any H/Z-89 character. Includes cable.	
MPA-3, Shpg. wt. 1 lb. ....	75.00
<b>Z-90 AP-PAK.</b> Allows printing of any Z-90 character. Includes interface cable.	
MPA-4, Shpg. wt. 1 lb. ....	75.00

## Accessories for the WH-55 Diablo 620 Printer:

<b>Tractor Feed.</b> Improves registration in word processing, graphics, and others.	
WH-55-1, Shpg. wt. 6 lbs. ....	149.00
<b>Courier 12 Printwheel.</b> Elite typeface with unslashed zero.	
WH-55-2, Shpg. wt. 1 lb. ....	8.00
<b>Elite 12 Printwheel.</b> Pica typeface with unslashed zero.	
WH-55-3, Shpg. wt. 1 lb. ....	8.00
<b>Courier 10 Printwheel.</b> Pica typeface with slashed zero.	
WH-55-4, Shpg. wt. 1 lb. ....	8.00
<b>Plug-In Ribbon Cartridge.</b> Simply snap in and out for easy replacement.	
WH-55-5, Shpg. wt. 2 lbs. .... Package of three, 25.00	

## Reliable, high-capacity 5.25" and 8" floppy disks:

<b>5.25" Hard-Sectored, Floppy Disks.</b> 48 TPI. 100 kilobyte capacity.	
HCS-70, Shpg. wt. 1 lb. .... Package of ten, 40.00	
<b>5.25" Soft-Sectored, Single-Sided, Double-Density Floppy Disks.</b> 48 TPI. 160KB.	
HCS-66, Shpg. wt. 1 lb. .... Package of ten, 45.00	
<b>5.25" Soft-Sectored, Double-Sided, Double-Density Floppy Disks.</b> 48 TPI. 320KB.	
HCS-71, Shpg. wt. 1 lb. .... Package of ten, 50.00	
<b>5.25" Soft-Sectored, Double-Sided, Double-Density Floppy Disks.</b> 96 TPI. 640KB.	
HCS-68, Shpg. wt. 1 lb. .... Package of ten, 55.00	
<b>8" Soft-Sectored, Single-Sided, Single-Density Floppy Disks.</b> 250KB capacity.	
HCS-69, Shpg. wt. 2 lbs. .... Package of ten, 55.00	
<b>8" Soft-Sectored, Single-Sided, Double-Density Floppy Disks.</b> 500KB capacity.	
HCS-64, Shpg. wt. 2 lbs. .... Package of ten, 60.00	
<b>8" Soft-Sectored, Double-Sided, Double-Density Floppy Disks.</b> 1MB capacity.	
HCS-65, Shpg. wt. 2 lbs. .... Package of ten, 70.00	

# The Heathkit Online Catalog

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The Heathkit Online Catalog is a menu-driven system that allows you to browse our 17 major product categories that make up the over 400 kits in the Heathkit line. While not intended to replace the printed catalog you're holding, you have instant electronic access to bargains, specials and new products without waiting on the postman. You can even place your order online using your Visa, MasterCard or Heath Revolving Charge.

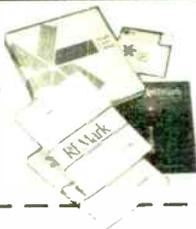
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Included with your membership is the exclusive REMark magazine which you'll receive monthly. In it you'll be kept informed of new Heath/Zenith computer products. You'll be kept in touch with other members through REMark's open forum. Here members share hardware modifications, improvements to software programs and ideas on other computer topics.

Another exclusive is access to the HUG Bulletin Board. With a HUG membership, a modem program and a CompuServe time-sharing membership, you can receive the latest news on Heath Zenith computer developments and HUG activities seven days a week.

Also receive a fully indexed REMark (Jan.) and an official HUG Identification Card.

You'll find a HUG application enclosed with each Heath computer. A fully-assembled Z-89 comes with a free one-year HUG membership application.

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 Microsoft COBOL                       Microsoft FORTRAN  
 Microsoft MACRO-80

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**A wide variety of software for all Heathkit/Zenith computers...comprehensive, powerful and easy to use**

### **For the HS-151 Personal and the HS-161 Portable Computer**

You have access to a tremendous amount of available IBM software. Of this software, Heathkit offers the powerful and versatile MS<sup>®</sup>-DOS operating system and the popular BASIC programming language. Other software choices, on pages 45 and 46, include PeachText 5000<sup>\*</sup> and Multiplan<sup>\*</sup> office productivity packages. The Word, a word processing program, is also part of the available software. A complete line of nine business and personal accounting programs is listed and includes a self-training series to show how the whole system operates. A CPS communications program rounds out the list of new computer software.



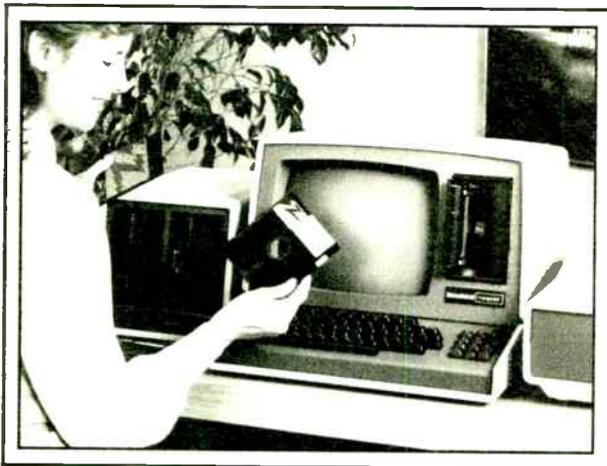
### **For the H-100 All-In-One and Low-Profile Computers**

You'll find an ever-expanding amount of quality software. On pages 47 through 51, there's software for the H/Z-100 Computer's powerful and tremendously fast 16-bit microprocessing side including: office productivity, data base management, accounting, communications, graphics, education, operating systems, languages and utility programs. On pages 54 through 58, you'll find 8-bit software that's fully compatible for running on all H/Z-100 Computers. Be sure to see the H/Z-100 Software Directory on page 55 about even more 16-bit software.



### **For the 8-bit H-89 and Z-90 Computers**

A complete line of software is available for all models of these all-in-one computers. In the home or in the office, Heathkit has 8-bit software solutions on pages 54 through 58 to meet your everyday needs. You'll find several operating systems and many languages to fill your requirements. A wide variety of applications and utility programs are also available. Join HUG (pg. 43) and have access to even more choices of 8-bit software.



\*MS is a registered trademark of Microsoft Corp. Peachtext 5000 is a trademark of Peachtree Software, Inc. MS is a registered trademark of Microsoft Corp





# Start with these 16-bit software selections for the new Personal and Portable computers

With their IBM compatibility, the HS-151 Personal and the HS-161 Portable Computers provide an access to most of the 16-bit software developed for the IBM Personal Computer. To start you on your way, Heathkit offers selections from operating systems, languages, office productivity programs, communications, word processors and accounting programs.

## Use the advanced MS\*-DOS Version 2 operating system

- Includes many new enhancements for a more flexible and powerful disk operating system

**New additions:** MS-DOS Version 2 combines many new features with the efficient disk handling capability and peripheral support of previous versions. Some of these enhancements are subdirectories, input/output redirection, pipes and filters. Standard with this product are data encryption program facilities, a print spooler, an ANSI device driver, a character font editor, a graphics screen dump and a solid state memory driver. Automatically, the current time and date can be recorded to the disk during bootup and updated for rebooting. Custom command prompts and user installable device drivers add convenience as well as ease of use to this disk operating system. Plus, you can use and reassign up to four 32 megabyte drives while using this versatile and powerful operating system.

**Hardware Requirements:** To use MS-DOS Version 2, an HS/Z-150 Personal or HS/Z-160 Portable computer with one disk drive is needed.  
**OS-63-50, MS-DOS, Version 2, Shpg. wt. 5 lbs. .... 150.00**

## Create useful programs with high-level GW-BASIC

- Includes more commands and features than previous versions of BASIC

**Added new commands:** To better assist you while creating and writing programs, GW-BASIC features many new commands and enhanced features. This high-level programming language provides a full screen editor with extensive program editing capabilities. You can use four variable types: integer (from -32768 to +32767), string (up to 255 characters), single precision floating point (7 digits) double precision floating point (16 digits). A trace facility, along with error trapping, allows easier debugging. Other features include PEEK and POKE for reading from and writing to memory, automatic line number generation and renumbering including automatic changing of referenced line numbers.

**More features:** Format outputs using a complete print facility including asterisk fill, floating dollar sign, scientific notation, trailing sign and comma insertion. With GW-BASIC, have direct access to 65535 input/output ports and use arrays with up to 255 dimensions. Trap the occurrence of a specific communication event by specific line number with event trapping. Use advanced graphic techniques including LINE, CIRCLE, GET, PUT and DRAW statements.

**Hardware and software requirements:** To use GW-BASIC, an HS/Z-150 or HS/Z-160 Computer needs one 5.25" disk drive and MS-DOS.  
**MS-5063-1, GW-BASIC, Shpg. wt. 3 lbs. .... 175.00**

## Popular FORTRAN for science and engineering programs

- Rigorous rules of syntax for scientific and mathematical uses

**MS-FORTRAN:** FORTRAN from Microsoft\* conforms to Subset FORTRAN as described in ANSI X3.9-1978 and includes extensions to the subset language plus some of the features of the full ANSI standard, sometimes referred to as FORTRAN 77. This programming language allows the user to fully define the characteristics of a solution to a problem in a series of precise statements.

**Hardware and software requirements:** To run FORTRAN on either the HS/Z-150 Personal or the HS/Z-160 Portable Computers, one 5.25" disk drive (two are recommended), a minimum of 192 KB of RAM and MS-DOS are required.  
**MS-463-2, Microsoft FORTRAN, Shpg. wt. 4 lbs. .... 195.00**

## Create high-level programs with Pascal Compiler

- Very useful language for large applications program development

**Microsoft Pascal Compiler:** This programming language accepts programs written according to the ISO standard and those written in the full MS-Pascal language. It uses common English statements and conventional mathematical symbols.

**Hardware and software requirements:** The MS-Pascal Compiler can be used with the HS/Z-150 and HS/Z-160 Computers that have one 5.25" disk drive and have at least 192 KB of RAM memory. MS-DOS is needed as the operating system.  
**MS-463-5, Microsoft Pascal Compiler, Shpg. wt. 4 lbs. .... 295.00**



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## Word, a new and powerful word processing package

- Combines uniquely powerful features with exceptional ease of use

**Office, school, personal tool:** Word is a versatile software package that can be used to produce letters, memos, reports, brochures, pamphlets, and book-length manuscripts. It can be used for virtually any purpose requiring written material. You can type and correct documents easily and efficiently. Then, with a few key-strokes, turn a rough draft into a final copy with a polished appearance. Word helps you along in your writing tasks with ease-of-use features like clearly listing the full names of command options at the bottom of the screen. And, when you're in doubt, a help command will come to your rescue.

**Hardware and software requirements:** Use Word for creating all your documents on an HS-151 Personal or HS-161 Portable Computer using one 5.25-inch disk drive, 128 KB of memory and the MS-DOS operating system.

**MS-5063-9, Word, Shpg. wt. 3 lbs. .... 375.00**

## Multiplan\*, a sophisticated electronic spreadsheet

- A second-generation spreadsheet that's as easy to use as it is useful

**Very powerful and sophisticated:** Multiplan is a giant 255 row by 64 column electronic worksheet that allows you to explore alternatives and help you make better business decisions. With its instant calculating power, Multiplan will show the results of any "what-if" entries throughout the worksheet or in any related worksheets. As a result, you can analyze and forecast faster.

**Easy to use:** Plain and simple English is the language of Multiplan. And all prompts are full length words or phrases for easier understanding.

**Hardware and software requirements:** To use Multiplan on an HS/Z-150 or HS/Z-161 Computer, one 5.25" disk drive and MS-DOS are needed.

**MS-5063-7, Multiplan, Shpg. wt. 3 lbs. .... 250.00**

## Increase office production with PeachText 5000\*

- Five integrated office productivity software programs in one low-cost package

**Complete productivity system:** PeachText 5000 is a completely integrated personal software system consisting of word processing, financial modeling and simple data base management. Increase your efficiency and reduce costs with five powerful, interactive applications programs that feature menu-driven operations, easy-to-use documentation and quick access to help messages.

**Word processing:** From the main menu, you can access the PeachText\* word processor which offers the flexibility and control you need for efficient creating and writing of a variety of documents. Includes a Spelling Prefreader and a Random House Electronic Thesaurus\* with access to 26,000 synonyms.

**Financial modeling:** PeachCalc\* turns your computer into an electronic spreadsheet for fast data analysis that can be merged with documents. It can contain up to 254 rows and 64 columns of text, numbers and formulas.

**Data management:** A list manager program provides control over the design and use of mailing lists, labels, files, and reference aids.

**Hardware and software requirements:** The HS/Z-150 Personal and HS/Z-160 Portable Computers are capable of running the PeachTree 5000 software. Both need two 5.25" disk drives and the MS-DOS operating system.

**RS-463-75; PeachTree 5000 Package, Shpg. wt. 3 lbs. .... 395.00**

## CPS for Personal Computer communications capability

- Take maximum advantage of information services, time sharing systems, computerized bulletin boards, etc.

**Communications software:** CPS turns your Personal or Portable Computer into an enhanced communications device. CPS offers many valuable features to simplify connections to time sharing services or other computers.

**Hardware and software requirements:** To use CPS, an HS/Z-150 or HS/Z-160 Computer needs 128 KB of memory and one 5.25" disk drive. The MS-DOS operating system is also needed along with a compatible modem.

**CS-5063-7, CPS software, Shpg. wt. 2 lbs. .... 40.00**

\*MS, Microsoft and Multiplan are trademarks of Microsoft Corp. PeachText 5000, PeachText and PeachCalc are trademarks of PeachTree Software, Inc. Random House Electronic Thesaurus is a trademark of Random House, Inc.



# Open the door to computerized accounting with the BPI family of accounting programs

- All packages can work together as a system or used individually



Run these programs on a Personal or Portable Computer equipped with two 5.25" disk drives, a minimum of 192 KB RAM, a compatible monitor and a printer that can print a minimum of 80 columns. Needs MS\*-DOS and GW\* BASIC.

## General Accounting is more than a general ledger

- Has all the features you'll need to run a business in one program

The General Accounting system offers flexibility, fast data entry, informative reports, accuracy and practice data with which to learn the system. Tailor this system to your company's needs with detailed accounts receivable and payable ledgers. Produce single or multiple income statements for up to as many as ten departments or stores. Set up a payroll ledger and print out checks automatically. To reduce the number of data entries, single transactions are made on all appropriate ledgers. Even enter regular monthly entries by a single command. Reports generated are: a balance sheet, a trial balance, income statements, four different ledgers, journals and schedules. End of month procedures clear the data disk of current transactions and close accounts for the current period.

BP-5063-1, Shpg. wt. 3 lbs. .... 595.00

## Self-Training Series for BPI General Accounting

- Learn how to operate the General Accounting system

This self-training series consists of two disks and a guide to help both the first-time or inexperienced user and the experienced user become fully acquainted with this accounting system. The training disks contain eight lessons on the system's basics. The lessons cover use of the keyboard and the General Accounting commands and features. A companion guide lists all the commands and gives a brief description of each one. The guide also contains completed worksheets for a sample company. For reference purposes, the guide includes examples of trial balances, balance sheets, income statements, and standard entries to help you along. A quick reference card is also included for your convenience.

BP-5063-71, Shpg. wt. 3 lbs. .... 69.00

## Accounts Receivable offers choice of account detailing

- User can choose either balance forwarding or open item accounts

This Accounts Receivable program details each item on the receivable ledger with amounts and dates. This allows you to print an alphabetical listing of all accounts, cross-indexed to their account numbers, or analyze the account at any time. The system automatically produces an aged accounts receivable report for early account collection and business planning. This program automatically checks for valid account numbers and balancing entries. On a floppy diskette, you can enter up to 1000 customer accounts with each account holding up to 360 transactions per billing period. And, any number of customers can be designated to receive up to 100 repetitive charges in a period.

BP-5063-2, Shpg. wt. 3 lbs. .... 595.00

## Accounts Payable computerizes vendor control

- Eliminates time spent on figuring payments and when they are due.

Accounts Payable Allows you to choose between two different accounting methods, cash or accrual. When using the accrual method, you can maintain two open fiscal periods. This accounting program offers three check printing options, including: payment of individual vouchers, individual vendors, or all open vouchers due on a date that you select. You can maintain vendor files dealing with specific information such as name and address, regular due date, discount percentage, discount due date and general ledger account distribution. It is even possible to assign general ledger account prompts to appear on the screen as data for distributing invoice amounts to accounts.

BP-5063-3, Shpg. wt. 3 lbs. .... 595.00

## Payroll program simplifies your company's payday

- Use several options to tailor a payroll system to your company

Payroll offers a choice of three principal methods by which you can pay your employees: salary, by the hour, or by commission. When using pay by commission,

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this accounting program allows you to figure base pay plus percentage of sales, base pay plus piece rate, it allows pay drawn against commission, and allows you to calculate and manually enter commissions. You can specify up to nine deductions including FICA, federal income tax and state income tax, plus six optional deductions. Pay employees each week, every two weeks, twice a month, or once a month. Then print paychecks and a check register listing all check numbers and amounts for the current pay period. Also print out W-2 forms at the end of the year.

BP-5063-4, Shpg. wt. 3 lbs. .... 595.00

## Inventory Control for versatile inventory management

- Made to track back orders and to cost your existing inventory

With Inventory Control, you can choose one of three accounting methods to cost your inventory: first-in, first-out; last-in, first-out; or average. Establish up to ten departments in your company, each with its own sales, cost of sales, inventory overage and inventory shrinkage accounts. Enter purchase orders as quickly and easily as you make journal entries and produce single or consolidated income and expense statements. Inventory Control automatically creates back orders and tracks low balance inventory items. List your inventory by twelve different methods, such as item number, department number, description or vendor to name just a few. One thousand accounts are available in the Inventory Control System.

BP-5063-5, Shpg. wt. 3 lbs. .... 795.00

## Job Costing for quick and accurate job estimates

- Keep track of job costs and print out up-to-date reports

With Job Costing, you can report job income by the completed job or by percentage of completion. Keep more accurate track of costs for each job and print out a status report that compares actual to estimated costs and quantities on a percentage of completion basis. Also, be able to obtain job profit and loss reports in print that provide a monthly statement of job income and expenses. With this system, you establish coded names for jobs and also parts of jobs. Then you estimate their cost by entering quantities, rates and dollar amounts. Print out a job estimate that shows a rate per unit measure, the number of units, and the estimated dollar amount to do the job. Keep on top of jobs and all current activity.

BP-5063-6, shpg. wt. 3 lbs. .... 795.00

## Information Management, a powerful and flexible tool

- Enables you to store, retrieve, analyze and report information

Information Management lets you manipulate data in ways you've never thought possible. This software program enables you to quickly and easily design data bases that are compatible with your needs both at home and in the office. Store large amounts of information and design your own files and reports. Create math formulas and employ statistical analyses, and then display the results in graph, table, or chart form. Edit information in a file at any time without rebuilding it. Use this program to search, retrieve and compare information using any criteria you desire. Then display and printout all your information in any format you choose. Also, merge data and text files. In addition to being a computerized filing system, Information Management is also a word processing system for designing your own reports which can be merged with data files.

BP-5063-7, Shpg. wt. 3 lbs. .... 425.00

## Personal Accounting manages your own finances

- Record daily transactions, balance accounts, and print reports

Personal Accounting enables you to take advantage of computerized accounting for your own personal finances. Set up accounts to handle your assets, liabilities, net worth, income and expenses. With Personal Accounting, you can plan a budget for income and expenses. Use this program to figure your checkbook balance when the monthly statement arrives. Other uses include keeping track of checks and deposits in up to ten separate accounts. Likewise, record your credit card charges in up to ten separate credit card accounts. Even use this program to tally other financial incomes like interest from savings accounts. Available are printed reports on checks written and deposits made for each checking account plus a list of outstanding checks and deposits in transit. Print out an amortization schedule on which the system calculates the interest and principal portions of each payment on a loan or mortgage.

BP-5063-8, Shpg. wt. 3 lbs. .... 195.00

\*MS and GW are trademarks of Microsoft Corporation

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# For your H/Z-100 Computer, a wide variety of software that's both powerful and easy to use



Besides supporting your H/Z-100 Computer with quality hardware and peripherals, Heathkit also offers a whole range of quality software from operating systems, to languages, to utility and applications software. On pages 44 through 51, you'll find powerful and fast-running software for the 16-bit side of the H/Z-100 Computer. This includes CP/M\* and

MS\*-DOS/Z-DOS\* operating systems, seven programming languages and several very useful utility programs. Among the applications software, you'll find office productivity, word processing and mailing, data base management, accounting, communications, graphics and educational programs. On pages 54-58, you'll find 8-bit software that'll also run on the H/Z-100. All of these packages are supplied on high-quality soft-sectored, 48 TPI, 5.25" floppy diskettes. The Software Directory on page 55 offers even more options.



## GrafTalk\* for easy and exciting graphics

- An interactive language that allows you to do a lot of different things with very little effort



**Sophisticated and powerful:** Use GrafTalk to produce bar, pie, line and symbol charts almost instantly. An interactive program, you talk to it in English-language-like commands and the program responds immediately. For the novice, no previous experience with computers or programming is required to produce complete, meaningful graphs. Yet, GrafTalk still retains the flexibility required by the more experienced user. Included is a valuable screen-oriented editor for developing graphics.

**Hardware and software requirements:** To run GrafTalk, an H/Z-100 requires two 5.25-inch disk drives and the MS-DOS/Z-DOS operating system. A color or monochrome video display is needed (if using a Low-Profile model) for program viewing, and a printer or plotter is needed for copies of CRT displays.

RG-463-1, Shpg. wt. 5 lbs. .... 449.00



## CPS\*-86: Computerized Phone System

- A 16-bit software system to simplify and enhance the use of your H/Z-100 as a data communications device
- Take advantage of many time sharing systems



**Computer phone system:** With this software and a modem, you can use your H/Z-100 Computer to access the many information services, computerized bulletin boards and other time sharing systems currently available to the public. Even communicate with other computer users whether or not they are using CPS-86.

**Special features:** One valuable feature is an onscreen time clock that shows the amount of time elapsed since log-on. Another allows you to transfer files using the CompuServe or XMODEM protocol, or no protocol at all. With memory image capability, an entire data communication session up to 65 KB can be copied into memory as received.

**Hardware and software requirements:** This software package is usable on an H/Z-100 Computer with 128 KB of RAM and at least one disk drive. CPS must be run using the MS-DOS/Z-DOS operating system, version 1.25 or higher.

CB-463-7, Shpg. wt. 3 lbs. .... 40.00



## CPS: 8-bit computer phone system software

- Communicate with other microcomputer users as well as information network and time sharing services
- Has many valuable features not found in other programs



**Phone system software:** With CPS, you'll be able to use your H/Z-100 Computer as a data communications device to take advantage of the many offerings of information services and time sharing systems. You'll also be able to communicate with other microcomputer users, whether or not they are also using CPS. Although this software is most often used as a modem support program, it'll function with any type of data communications link that utilizes baud rates from 50 to 9600 and control codes.

**Many features:** Among its many features, CPS offers an onscreen clock showing how much time has elapsed since it received its first character and automatic log-in of account numbers and passwords for MicroNET subscribers.

**Hardware and software requirements:** To run this 8-bit version of CPS, an H/Z-100 needs 128 KB of memory and one disk drive. The CP/M operating system, version 2.2 or later, is also required for proper operation.

CB-253-7, Shpg. wt. 1 lb. .... 40.00

All 16-bit software that runs on the H/Z-100 Computer is also capable of running on the expanded ETA-100 Learning Computer (pg. 79).

## 16-bit MS-DOS/Z-DOS and standard 8-bit CP/M



- Two operating systems that offer disk file handling efficiency and versatile peripheral support

**MS-DOS/Z-DOS:** This fast and flexible operating system is supplied with all kit H-100 Computers. It allows you to run all available 16-bit software for the H/Z-100 Computer from languages to applications programs. This operating system permits a multitude of peripheral and accessory alternatives as supported by the H/Z-100 System's hardware. It also has device-independent input/output, advanced error recovery, variable length records and full program locatability. Plus, this system enables you to create, analyze and manipulate files using extensive utility tools. See page 59 for information about the EC-1121 course.

**CP/M:** This widely used operating system is a key to one of the largest applications software bases available. Its logical structure and flexibility are the reasons for its popularity. CP/M supports many different disk drives and peripherals and includes fast and easy-to-use software development tools. It comes with its own assembler, editor and debugger plus other common utilities. To learn more about CP/M, see EC-1120 on page 60 for a full explanation.

OS-63-4, MS-DOS/Z-DOS, Version 1.25, Shpg. wt. 5 lbs. .... 150.00

OS-53-2, CP/M, Version 2.2, Shpg. wt. 5 lbs. .... 150.00

## CP/M-86\*, a 16-bit operating system for the H/Z-100

- Efficient and powerful, CP/M-86 manages the full 768 kilobytes of the H/Z-100 Computer's memory



**New operating system:** Designed for the 8086/8088 microprocessor, CP/M-86 is an efficient and powerful operating system that supports small to complex applications programs. Since it has a file structure compatible with that of 8-bit CP/M (above), application programs can be easily converted for running under the CP/M-86 operating system.

**Extended capabilities:** CP/M-86 is able to manage up to a full megabyte of memory which allows software programs to take full advantage of the H/Z-100's 8088 address space. All H/Z-100 5.25-inch, 8-inch and Winchester disk drives are supported under this disk operating system. And, all necessary utility programs are included for creating and editing text and data files.

OS-63-2, CP/M-86, Version 1.2, Shpg. wt. 3 lbs. .... 250.00

## Use Z-Chart\* to graph your company's data to help make better and faster business decisions

- Design and display bar, pie, side bar, line, multiple pie, trend line and three-dimensional bar charts
- Create graphs with data entered from other software programs
- Display business graphs on-screen or optional printer or plotter
- Create a slide presentation of graphs with multiple screen displays

**Three step process:** Create business graphs in three steps: gather data, design the graph and then display the graph. It's that easy with Z-Chart whether you're a novice or an expert computer user. And, with its many options, this series of programs provides a wide range of possible graph representations.

**Fast and friendly:** Written in Z-BASIC and 8086 assembly language, Z-Chart runs very efficiently on the H/Z-100 Computer. And, Z-Chart is friendly with its menu-oriented screens that help you create informative business graphs. Also, Z-Chart often prevents you from typing in erroneous entries.

**Hardware and software requirements:** Running Z-Chart requires an H/Z-100 Computer with 128 KB of memory and at least one 5.25-inch drive. MS-DOS/Z-DOS and Z-BASIC are also needed to successfully operate Z-Chart.

CB-463-11, Shpg. wt. 3 lbs. .... 150.00

\*MS is a trademark of Microsoft Corp. CP/M and CP/M-86 are registered trademarks of Digital Research, Inc. Z-DOS and Z-Chart are trademarks of Zenith Data Systems Corp. GrafTalk is a trademark of Redding Group. CPS is a trademark of Robert Mathias.



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## Zenith Local Area Network connects H/Z-100s

- ZLAN software allows shared computing among many H/Z-100 Computers



**Added dimension:** ZLAN, Zenith Local Area Network, significantly increases the computing power of your H/Z-100 Computer and provides a basis for convenient future growth. It does this by creating a fast and efficient communication network between H/Z-100s using 5.25-inch disk drives and one or more H/Z-100s equipped with a Winchester drive. In this way, each H/Z-100 in the network functions as if it had all the capacity of its own hard disk without conflict and almost transparently to one another.

**Increased ability:** Besides increasing an H/Z-100's power, ZLAN simplifies the use of commonly shared information and data by eliminating the need to keep multiples of disk copies. Commonly used tables, data, etc. can now be permanently stored at one location to be conveniently accessed by users as they need them. And, ZLAN provides a means for sharing computing resources through batch processing. Users can participate in the network while using the computer as an independent work unit.

**What you need:** To establish a ZLAN network, you'll need at least one H/Z-100 Computer with a Winchester hard disk drive as well as a Z-205 (256 KB memory upgrade board, page 33) and a ZLAN Card (NET-100-1, below) installed. You'll also need at least one H/Z-100 with a 5.25-inch floppy disk drive and a ZLAN Card installed. Other H/Z-100s added into the network must also have this hardware combination, one disk drive and ZLAN card.

**CB-463-14**, Shpg. wt. 4 lbs. .... **899.00**

## Local Area Network Interface Card

The Zenith Local Area Network Card is used with ZLAN (above) to form a communication network of H/Z-100 Computers that can transfer data at a rate of 2.5 megabits per second. Hybrid drivers on the card enable your H/Z-100 Computer to interface up to 255 similarly configured computers through standard RG-62A coaxial cable up to a maximum distance of 2000 feet. This card is completely assembled and tested and can be placed in any vacant S-100 card slot in your H/Z-100 Computer.

**NET-100-1**, Shpg. wt. 3 lbs. .... **499.00**



## Pascal/MT + programming language for CP/M\*

- A full implementation of standard Pascal with several added enhancements



**Pascal/MT +:** This 8-bit software system is useful for both data processing applications and for real-time control applications. With its added enhancements, Pascal/MT + becomes more suitable for commercial programming

by increasing its power to develop high-quality, efficiently maintainable software. These additions: enhanced I/O, additional data type access to the run-time system, and modules and classes.

**DR-253-5**, Shpg. wt. 5 lbs. .... **349.00**

\*CP/M is a registered trademark of Digital Research, Inc.

## Microsoft\* BASIC-80: an excellent 8-bit interpreter

- Features a full set of built-in functions and a group of special functions



**BASIC-80:** An extensive application of 8-bit BASIC, Microsoft BASIC-80 has many enhancements including sequential and random file manipulation. Plus, this programming language has direct access to CPU ports and memory locations. Commands and statements include an IF-THEN-ELSE control structure which allows execution of conditional statements. String and numeric variables can be used while a full range of logical and mathematical operators are available for additional user convenience. Extensive editing and output capabilities are also available with this interpreter.

**What you need:** To run BASIC-80, an H/Z-100 Computer requires one 5.25-inch disk drive and the CP/M (Version 2.2) operating system.

**MS-253-1**, Version 5.22, 3 lbs. .... **175.00**

## Multiplan\*: a sophisticated 16-bit electronic spreadsheet



- Powerful modeling and presentation capabilities for use in business environments
- Easy to learn and to use with on-line references and plain-English commands

### Make better, faster decisions:

Multiplan software helps you to make better business decisions. With it, you can explore alternatives faster. Multiplan is a giant worksheet grid of up to 255 rows long and 63 columns wide. It can be set up with titles and numbers; and any entry can be a number, word or formula. However, Multiplan's real power lies in its ability to automatically perform calculations. Because this program remembers the relationship between entries on the worksheet, "what if" questions can be easily answered to test out plans and prepare forecasts. When you make a change you immediately see the results of that change throughout the worksheet and any related worksheets.

**Design a worksheet:** Among its many options, Multiplan allows you to change the screen display around, like widening or shrinking columns. Use lower or upper case in your titles. Center titles or left/right justify them as you see fit. You can also align text to the left and numbers to the right. Text can be easily moved and inserted. Or, erase data as desired. You can use any arithmetic operation plus: Boolean algebra, trigonometric functions, scientific notation, rounding off, and dollar and percent formats.

**Plain English:** That's all you need to know to interact with this versatile and easy to use electronic spreadsheet. It takes commands in plain English and it will prompt you as you go, telling you what to do next. And, a help key is also available for reminders of how to do an operation.

**What you need:** Running Multiplan on an H/Z-100 Computer requires one 5.25" disk drive and the MS-DOS/Z-DOS operating system. An optional printer is needed for printouts of reports.

**MS-463-7**, Shpg. wt. 6 lbs. .... **250.00**

\*MS, Microsoft and Multiplan are trademarks of Microsoft, Inc.

## Languages and compilers for all programming situations



For home, hobby, scientific, mathematical or business-related uses, you'll find a programming language or compiler below to fit your specific needs. They meet the experience level and the needs of both the sophisticated and the entry

level user. This software includes easy-to-read manuals with instructions in their use and operation.

## Z-BASIC: a 16-bit interpreter

**High-level color language:** This easy-to-use programming language comes with many more commands and features than previous versions of BASIC. It is designed both for users with little programming experience and very experienced computer programmers. An H/Z-100 Computer, one 5.25-inch disk drive and MS-DOS/Z-DOS are required.

**MS-463-1**, Shpg. wt. 5 lbs. .... **175.00**

## FORTRAN for science and math

**For scientists and engineers:** Rigorous rules of syntax permit the user to fully define the characteristics of the solution to a problem in a series of precise statements. FORTRAN requires one 5.25-inch disk drive (two are recommended), 192 KB of RAM and MS-DOS/Z-DOS to operate successfully.

**MS-463-2**, Shpg. wt. 4 lbs. .... **195.00**

## COBOL Compiler for business use

**Powerful business language:** This business-oriented programming language has many standard features plus extensions designed to make it more useful. Its many utilities also extend the versatility of this language. This compiler is certified to be in compliance with the ANSI X3.1978 standard. To run this programming language, an H/Z-100 Computer requires one 5.25-inch disk drive (two are recommended), 128 KB RAM and MS-DOS/Z-DOS.

**MS-463-3**, Shpg. wt. 3 lbs. .... **395.00**

## Z-BASIC Compiler increases program execution speed

**Complementary program:** Use the Z-BASIC Compiler with the Z-BASIC Interpreter (on this page) to provide yourself with an extremely powerful BASIC programming environment. With the Interpreter, you can quickly run and debug your programs. Then compile your programs with the Z-BASIC Compiler to increase their execution speed and reduce the amount of memory space required to store the programs. The Compiler requires an H/Z-100 Computer with one 5.25-inch disk drive and MS-DOS/Z-DOS.

**MS-463-4**, Shpg. wt. 3 lbs. .... **250.00**

## Pascal: high-level programming

**Pascal Compiler:** This highly extended version of the Pascal language makes for easier systems programming and applications programming. Some of these extensions are: structured constants, super arrays, variable length strings, string reads, separate compilation and more. Requires an H/Z-100 with one 5.25" drive, 192 KB RAM and the MS-DOS/Z-DOS operating system.

**MS-463-5**, Shpg. wt. 4 lbs. .... **295.00**

Z-DOS is a trademark of Zenith Data Systems Corp.

## PeachText 5000\* to increase your personal productivity



- Efficient and standardized to meet all business needs
- Five interrelated business programs accessible through a main menu
- Comprehensive manuals

**Productivity system:** PeachText 5000 is a complete system designed to increase your personal productivity in word processing, financial modeling and simple data base management. At your fingertips, you have powerful applications with menu-driven features and quick access to help prompts.

**Word processing:** PeachText 5000 is based upon its PeachText\* word processing system which features sophisticated print and edit capabilities for creating and manipulating a variety of documents. Included with PeachText is the Random House Electronic Thesaurus\* containing more than 4,400 indexed words and 26,000 synonyms. A spelling checker is also included with an alterable 21,000-word dictionary.

**Financial modeling:** Part of PeachText 5000 is PeachCalc,\* a flexible worksheet that can be merged with your documents. It has 254 rows and 64 columns that can contain text, numbers and formulas. Features variable width columns, protected blocks and built-in help menus.

**Data management:** With the 5000 package comes a simple-to-use module, List Manager. It provides complete control over the design and use of mailing lists, labels and other files.

**What you need:** To run PeachText 5000, an H/Z-100 Computer will need two 5.25-inch disk drives and the MS-DOS/Z-DOS\* operating system.

RS-463-75, Shpg. wt. 3 lbs. .... 395.00

**SAVER!** Verifiable H-100 kit computer owners can save \$120. Show your sales receipt ... **ONLY 275.00**

## WordStar\* for outstanding word-processing performance



- See on-screen exactly what will be printed out
- Complete with extensive help menus and prompts
- Use with MailMerge and SpellStar for increased capability

**Best seller:** Heading the list of word processors is WordStar which offers outstanding performance and increased capability with several levels of selectable help menus.

**New features:** Besides its many familiar features, Version 3.3 of WordStar adds a number of new capabilities to the H/Z-100 Computer. One is an increased support of the H/Z-100's function and numeric keypad keys. Another is an increased number of supported printers including the capability for user-defined printer drivers. Version 3.3 also has the ability to use the H/Z-100's optional 256 KB RAM board as a RAMdisk.

**What you need:** To run WordStar, an H/Z-100 Computer needs one disk drive and the MS-DOS/Z-DOS operating system. A printer is needed for documents.

MP-463-10, Version 3.3, Shpg. wt. 4 lbs. ... 399.00

\*PeachText 5000, PeachText and PeachCalc are trademarks of PeachTree Software, Inc. Random House Electronic Thesaurus is a trademark of Random House, Inc. MS is a trademark of Microsoft, Inc. Z-DOS is a trademark of Zenith Data Systems Corp. Wordstar is a trademark of MicroPro International Corp.

## LOTUS 1-2-3\* provides spreadsheet, a data base and graphics



- Uses a very large and very advanced worksheet
- Has powerful and highly flexible graphics capabilities
- Displays over 200 on-screen help messages on command
- One of the most powerful programs for the H/Z-100

**Top-seller:** Popular LOTUS 1-2-3 is the fastest and most complete spreadsheet software on the market. If your primary need is spreadsheet analysis and graph generation, then make 1-2-3 your choice.

**Spreadsheet:** One of the largest spreadsheets available, 1-2-3 provides you with a maximum of 256 columns by 2048 rows for a worksheet with over half a million cells. Functions in 1-2-3 let you issue any of a series of commands or enter formulas into cells. For your convenience, a list of common accounting, mathematical, logical and statistical functions can be chosen from a prepared list.

**Database management:** 1-2-3 is a program that includes many data base commands and thus can be used as a data base. It features up to 2048 records and up to 256 fields in each record.

**Graphics:** 1-2-3 offers many flexible printing options and impressive graphing capabilities.

**What you need:** An H/Z-100 Computer needs two 5.25-inch disk drives and 192 KB of RAM to run LOTUS 1-2-3. The MS-DOS/Z-DOS operating system is also required. A printer is needed for documents.

LS-463-1, Shpg. wt. 4 lbs. .... 495.00

## MailMerge\* provides names and addresses for WordStar files



- Turn form letters into personalized letters
- Print out mailing labels in any desired format

**Powerful file merging tool:** MailMerge enables you to combine files containing names and addresses with WordStar letter text files, and more.

**What you need:** You need an H/Z-100 Computer, WordStar 3.3, the MS-DOS/Z-DOS operating system and a printer (letter quality recommended).

MP-463-11, Version 3.3, Shpg. wt. 3 lbs. ... 139.00

## SpellStar\* checks for spelling errors and typos in WordStar files



- Dictionary contains approximately 20,000 words
- Add to the dictionary or create your own

**Spelling checker:** Checks and automatically corrects spelling and typographical errors at thousands of words per minute.

**What you need:** An H/Z-100 Computer using the MS-DOS/Z-DOS operating system and WordStar 3.3.

MP-463-6, Version 3.3, Shpg. wt. 5 lbs. ... 249.00

\*LOTUS 1 2-3 is a trademark of Lotus Development Corp. MailMerge and SpellStar are trademarks of MicroPro International Corp.



## SuperSort\* for powerful yet easy-to-use sorting



- Provides many sorting and merging features other than specific order file sorting or merging files into one

**Benefits:** SuperSort offers superior sorting, merging and selecting power with unmatched speed and convenience. This program has the operational flexibility to perform these functions on data files compatible with BASIC, FORTRAN, COBOL and Assembler applications programs. SuperSort will also work with text editors, such as WordMaster,\* and word processors, like WordStar.

**Special features:** Among its many features, SuperSort offers sorting and merging of up to 32 input files into a single output file. With SuperSort, you can sort new records and integrate them into an already ordered master file. You can have fixed or variable length records and fields plus a different number of fields in each record.

**Output capabilities:** Select output options that let you build indexes to a file, extract fields to print a summary and rearrange fields to form a new data base. An output disk option makes it possible to sort an entire disk of data in a two-drive system without writing over the input file.

**Terminal message printouts:** Select any of five levels all the way to a detailed breakdown showing number of records input, sorted, merged, output, etc. Also request a printout of disk space usage.

**What you need:** To use the SuperSort program, you'll need an H/Z-100 Computer with one (preferably two) 5.25-inch disk drives and at least 128 KB of memory. For printouts, a line or character printer with form feed control is required. SuperSort requires the MS-DOS/Z-DOS operating system to function properly.

MP-463-1, Shpg. wt. 3 lbs. .... 199.00

## SuperCalc\* for budgeting, estimating and financial forecasting



- A powerful 16-bit electronic spreadsheet for business
- A simple and practical problem-solving tool

**Electronic spreadsheet:** SuperCalc provides a 254 row by 63 column worksheet area for all types of business and financial applications.

**Simple and practical:** SuperCalc is simple and straightforward. A command line below the work area keeps track of cell location and contents so you'll always know where you are and where you're going. A built-in help function can be called upon at any time, just press a key to display a summary of commands. A number of formatting and printing options provide versatility in designing your spreadsheet and how it is to be printed out.

**What you need:** This version of SuperCalc requires an H/Z-100 Computer with one 5.25-inch disk drive and the MS-DOS/Z-DOS operating system.

SC-463-1, Shpg. wt. 4 lbs. .... 195.00

\*SuperSort and WordMaster are registered trademarks of MicroPro International Corp. SuperCalc is a registered trademark of Sorcim Corporation.



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COMPUTERS/49

## More powerful software for the H/Z-100 Computer

On this and the preceding page are 16-bit business packages for use on your H/Z-100 Desktop Computer. Various other B-bit business software for the H/Z-100 can be found on pages 55 and 57.



### Three tools to help manage your business

Design and create your own data files using these two Condor\* data base management programs. Or, transfer data from the Peachtree\* accounting series and create data files in a Condor data base with the Pecon\* system.

#### Condor Relational Data Base Management

- A fast, easy-to-use and powerful filing system
- Allows a new user to achieve results in a short time

**Information processor:** With Condor, you can quickly and economically search, sort, merge, analyze, index, and print out your data base records. Condor can process up to 32,767 records per data base with up to 1023 bytes in a record. Under rDBMS, you can create your own help menus and produce sophisticated reports in your own format, then print them out using left or right justification.

**Requirements:** An H/Z-100 Computer, with two disk drives and a minimum of 128K RAM is needed. The MS-DOS/Z-DOS\* operating system (p. 46) is required.

CD-463-1, Condor rDBMS, Shpg. wt. 4 lbs. .... **650.00**

#### Condor File Management System – fast, easy to use

- Easily and quickly design and create data bases
- Effortlessly store, sort, and recall information

**Manage data simply:** Condor FMS is designed to provide you with a fast, easy-to-use, and powerful data base management system. Sort, merge files, analyze and print out information using plain and simple English commands. Create your own help menus to increase the programs ease of use. FMS can process up to 32,767 records per data base with up to 1023 bytes in a record.

**Requirements:** An H/Z-100 Computer with two disk drives and a minimum of 128K RAM is required. Also needed is the MS-DOS/Z-DOS operating system.

CD-463-2, Condor FMS, Shpg. wt. 4 lbs. .... **299.00**



#### Pecon Peachtree to Condor Interface System

- Another tool to use in managing your business
- Creates data bases from Peachtree packages

**Interface software:** Pecon allows the transfer of data from master and transaction files in the Peachtree accounting series to data bases that can be processed using the Condor system. Pecon is easy to use with displayed instructions and simple messages that ensure successful first-time use.

**Requirements:** AN H/Z-100 Computer with 192K and two disk drives are required to run this software. The MS-DOS/Z-DOS operating system (p. 46), a minimum of one Peachtree accounting package, and either the Condor rDBMS or Condor FMS software are also needed for proper operation

CB-463-9, Pecon Interface System, Shpg. wt. 3 lbs. .... **99.00**

50/COMPUTERS

## Use these five Peachtree accounting packages on your H/Z-100 Computer to help your business grow

Maintain a complete financial picture of your business with these five Peachtree accounting packages below. They are easy to operate, using easy-to-understand on-screen messages, and produce a broad range of comprehensive reports. Consultation with an accountant or data processing professional may be desirable to take full advantage of these accounting programs. To run the Peachtree programs, you need an H/Z-100 with 192K of RAM, two disk drives, and the MS-DOS/Z-DOS operating system. Z-BASIC is also required for these accounting programs.

### General Ledger System keeps financial records

- Security measures protect privacy of data
- Uses easy-to-follow prompts and instructions

**Financial transaction record:** The General Ledger System allows you to record the financial transactions of your company during a specified accounting period. Included are accurate and timely statements describing your company's current financial status as well as comparative data of a year ago to date. This simple and easy-to-operate system can be used with Accounts Receivable, Accounts Payable, and Sales Invoicing programs.

RS-463-1, General Ledger System, Shpg. wt. 5 lbs. .... **399.00**

### Accounts Receivable System for better control

- Maintains a complete record for each customer
- Password option prevents unauthorized access

**Up-to-date activity:** This accounting package is designed to help you obtain collections from your customers and assist in controlling your cash flow. Interfaces with General Ledger to provide automatic monthly journal entries.

RS-463-2, Shpg. wt. 4 lbs. .... **399.00**

### Accounts Payable System helps control your cash

- Stores financial transactions with each vendor

**Payable information:** Accounts Payable package maintains current and aged accounts. It keeps a complete file for each of your vendors, determines whether invoices should be paid by the due date or by the specified discount date, and automatically prints checks and a check register. Security measures are provided to protect the privacy of your data. This package is easy to operate and can also be used with the General Ledger system.

RS-463-3, Accounts Payable System, Shpg. wt. 4 lbs. .... **399.00**

### Inventory Management System controls effectively

- Straightforward updating of inventory records

**Inventory control:** This simple-to-operate and self-documenting package offers detailed control over all aspects of your inventory operations. By improving control, you reduce your dollar investment in managing your inventory and enjoy decreased response time to your customers. Can be used independently or in conjunction with Accounts Receivable and Sales Invoicing.

RS-463-5, Shpg. wt. 4 lbs. .... **499.00**

### Sales Invoicing System updates accounts packages

- Accesses and updates both Receivables and Inventory

**Systems bridge:** Actually a subsystem of the Accounts Receivable and Inventory Management systems. Provides the capability to access and update the data files of both systems. Update customer accounts with sale or return information. Update inventory with the stocked items returned or sold. Retains this data for printing invoices or credit memos. Displays warning messages when order exceeds inventory or customer credit.

RS-463-6, Sales Invoicing System, Shpg. wt. 4 lbs. .... **299.00**

Condor is a registered trademark of Condor Computer Corp. Peachtree is a trademark of Peachtree Software, Inc. Pecon and Z-DOS are trademarks of Zenith Data Systems Corp. MS-DOS is a trademark of Microsoft, Inc.

**NEW**

## Turn your H/Z-100 Computer into a learning system with ZDS Teacher and ZDS Student

Use your H/Z-100 Computer and ZDS Teacher and Student software to enter into the world of computer-assisted instruction. Offer private lessons in the classroom and let your H/Z-100 serve as a tutor and patient helper.

### Use ZDS\* Teacher to write courses and tests

- Create programs without prior programming knowledge
- Useful for any purpose involving written material

**Schoolware:** ZDS Teacher is one part of a two-program educational package that can be used for any instructional purpose that uses the written word. It lets you create and design an entire course of study for your students on the versatile H/Z-100 Desktop Computer. You select the topic, decide how the course is to be structured, write the text, and create test and quiz questions. Students then use the second half of this educational package, ZDS Student, to take your individualized course and exam questions.

**Computer learning system:** Students benefit from receiving individual learning on any subject. Use ZDS Teacher to present grammar exercises that allow students to identify parts of speech and other word usages. Measure and check each student's reading comprehension with stories and follow-up questions. Improve student's performance on verbal sections of examinations, such as the PSAT, ACT and other college entrance exams. By using this interactive program, you'll discover many more areas where the ZDS Teacher program will help and enhance your students learning ability.

**Complete control of material:** Using this educational program, you'll control the sequence in which information is presented and determine the amount of student interaction. You can include fill-in or multiple choice quiz and test questions at any desired point. At any time you can modify the course, test or correct it and even print it out on a printer.

**Hardware and software requirements:** To use ZDS Teacher on the H/Z-100 Desktop Computer, a minimum of 128 KB of RAM and one disk drive is required. Also, the MS-DOS/Z-DOS\* operating system is needed for this program.

TA-463-1, ZDS Teacher, Shpg. wt. 3 lbs. .... 299.00

**NEW**

### Use ZDS Student program for courses/tests

- Run customized instructional programs and exams
- On-disk instructions tell how to use the program

**Part two:** ZDS Student is the second part of an educational program that includes ZDS Teacher. It allows you, as the student, to take courses or programs developed by your instructor. An automatic instruction course on the supplied disk shows how to use the ZDS Student program.

**Hardware and software requirements:** To run ZDS Student on an H/Z-100 Computer, one disk drive and the MS-DOS/Z-DOS operating system is needed.

TA-463-2, ZDS Student, Shpg. wt. 2 lbs. .... 100.00

**NEW**

### H/Z-100 Remote Batch Terminal Emulator

For distributed processing, remote job entry, and more.

- Transmit and receive data over telephone lines using bisynchronous protocol
- Emulate and combine the better features of several terminals



**Batch Processors:** Add terminal capability to your microcomputer with this versatile software package. It allows the H/Z-100 Computer to emulate several IBM mainframe terminals including the 2770, 2780, 3780, 2968, and the 3741.

**Capabilities:** A baud rate of 2000, 2400, and 4800; EBCDIC or ASCII transmission code; error detection; BEI 201A3, 201C, 208A and B compatible; half or full duplex; point-to-point data link control; synchronous EIA RS-232C communications; up to 12 character terminal ID; auto-answer; and more.

**Hardware and software requirements:** On an H/Z-100 Computer, 128K RAM and one disk drive is required along with the MS-DOS/Z-DOS operating system.

WI-463-1, Terminal Emulator package, Shpg. wt. 4 lbs. .... 899.00

**NEW**

### Use Microstat to perform statistical tests

- Developed for real life applications using large data sets
- Computational algorithms selected for speed and accuracy

**Human engineered:** Microstat is designed to be flexible and fail-safe in operation and use. All algorithms have been selected with great care for complete confidence in analysis results. A wide range of statistical tests and a complete set of programs for data manipulations are offered. Most tests use data files for easy changing, sorting, merging and printing. Many tests have a number of variations of the basic test like two different regressions, three time series tests, etc. This package includes programs such as sort, rank-order, lag transformations, descriptive statistics, frequency distribution, scatterplot, correlation matrix, probability distributions, factorials, permutations, and more.

**Hardware and software requirements:** To run Microstat on an H/Z-100, the computer requires a minimum of 128 KB of RAM and two disk drives. The MS-DOS/Z-DOS operating system is also needed. A printer is required for printouts.

ES-463-1, Microstat, Version 2.3, Shpg. wt. 2 lbs. .... 249.00

\*MS is a registered trademark of Microsoft Corp. Z-DCS and ZDS are trademarks of Zenith Data Systems Corp.

**NEW**

### 3270 Emulator provides significant savings

- Allows use of H/Z-100 both as a microcomputer or as the popular IBM 3270 display station
- Runs on either leased line or dial-up configurations

**Dual operation:** With the 3270 Emulator program, your H/Z-100 can do microprocessing as well as teleprocessing resulting in substantial savings for you. The emulator is compatible with a variety of IBM or similar host computers using such display attributes as blanked, numeric-only, and protected fields.

Alaska, Hawaii and Michigan Residents: Call 616-982-3411

COMPUTERS/51

## The President's Corner

Dear Friends,

"Nothing is as consistent as change."  
I don't know who first said that, but it is certainly true.

When we introduced our first H-8 micro-processor-based computer kit back in 1977 we didn't realize it would be the forerunner of a major change in our company. Or, that computers and computer-oriented products would be responsible for more than tripling our sales in a short 5-year time frame.

We did know that the concept of a low-cost computer was powerful and appealing to our Heathkit customers. They have always been inquisitive, intensely interested and quick to experience new technology on a first-hand basis.

Change in our business was swift and sure. The newest thing on the block was computers...and tens of thousands of you took up the challenge with great gusto. In response to the interest, we've developed and introduced more than 200 new computer products and computer educational courses over the past 60 months. That's a lot of change in itself, but, other changes have also been occurring.

During that same 60 month time period, we've introduced more than 200 other Heathkit products. Products like our little robot friend, HERO 1, who continues to capture the imagination of thousands more of you...and things like satellite earth station receivers, digital weather instruments, Heath Craft Woodworks products, sophisticated security systems, real-time audio spectrum analyzers, high performance oscilloscopes, synthesized HF amateur radio receivers and state-of-the-art color television receivers. Even log splitters and solar hot water systems.

Some products experience long and successful life cycles and others are with us only a short time. Market forces and technological changes combine to determine which products will remain in the line and which ones will be replaced.

Change. It's exciting. Sometimes painful. But, it's always occurring. I'm convinced that such inevitable and continuing change is largely responsible for the vitality and excitement of our business.

Having said all that, I want to assure you we work very hard *not* to let change affect our high standards for engineering design, product quality or customer courtesy and service.

Your "finger-walking" trip through the catalog will expose you to our newest round of changes, additions and deletions. Better yet, stop in at any of the 65 Heathkit Electronic Centers located across the country for a first-hand look — where things are always changing.

Sincerely,



William E. Johnson, President



**The Heathkit Catalog is now on-line through CompuServe.  
See page 44.**

### HEATH PHONE DIRECTORY FOR ASSISTANCE AND INFORMATION

Product Orders (TOLL-FREE except Alaska, Hawaii and Michigan) (8:00 A.M. - 6:00 P.M., Eastern Time)	<b>800-253-0570</b>
Product Orders for Alaska, Hawaii and Michigan (24-hour number — sorry, toll-free service not available)	<b>616-982-3411</b>
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• Computers — Software (8 A.M. - 4:30 P.M., ET, Weekdays): Operating Systems, Languages, Utilities	<b>616-982-3860</b>
Applications Programs	<b>616-982-3884</b>
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## EASY ORDERING INFORMATION



**BY PHONE:** **800-253-0570**  
**CALL TOLL FREE!**

ORDER TOLL-FREE: 800-253-0570, using your Heath Revolving Charge or Visa or MasterCard credit cards (min. purchase \$10). Call toll-free between 8:00 A.M. and 6:00 P.M. Eastern Time Monday through Friday, Alaska, Hawaii, and Michigan orders, or after 6:00 P.M. and weekends, call 616-982-3411. For quick handling and prompt service, please fill out the order form at the right before calling. Have credit card handy.

For parts orders, please call Customer Service, 616-982-3571. For technical service, consult the phone directory below.



**BY MAIL:** Please follow these simple steps so we can handle your order quickly:

- Use the handy order form at the right.
- Write your name exactly the same way, each time you order.
- Give your complete address with full details. Include your ZIP Code and daytime phone number in case we have to call you about your order.
- For UPS deliveries to rural route or P.O. Box addresses, please give complete delivery information.
- When you fill out the form, include: 1) quantity, 2) model number, 3) description, 4) price, and 5) shipping weight. Figure out and write down the shipping and handling charges for each item from the rate chart on page 49.
- Please use separate sheet to order parts, manuals or for any correspondence.

**TERMS:**



- Heath Revolving Charge Plan. New accounts may be opened with purchases as small as \$100 with 10% down. Write to Heath Company for Heath Revolving Charge application. "Add-ons" to your account (except parts orders — see credit card plans below) require no minimum at all. Be sure to sign the charge agreement. Use credit cards for parts orders.
- MasterCard and Visa credit plans. Use the MasterCard or Visa credit cards to charge Heathkit products. Just fill in your credit card number in the space provided on the order form. Include card expiration date and sign the order form. NOTE: We now accept credit card orders for replacement parts.
- Commercial Accounts: Net 30-day terms available to companies with rated credit.
- Educational Accounts: Net 30-day terms available to Patterson-listed educational institutions. Authorized purchase order is required.

Note: All credit orders subject to Heath Credit Department approval.

### COMMERCIAL, EDUCATIONAL, AND INDUSTRIAL SALES:

For quotations or quantity discount information on any Heath product, kit or wired, write or call Marketing Services Department, 616-982-3454. For quantities of 250 or more of any Heath product, kit or wired, write or call Contract Sales Department, 616-982-3519. Private labeling, custom packaging, or design modifications can be made to meet your specific needs.

Note: Quantity discounts apply to single models only, not combination orders, special orders, or systems.

### MONEY-BACK HEATHKIT MANUAL PREVIEW

All kits come with manuals, but if you'd like to see how easy kit building is, order the manual first. We'll deduct the price of the manual when you buy the kit. Simply include a copy of your manual invoice with your order.

The typical kit assembly manual sells for \$8.00 depending on the nature of the product. Should the manual for the kit you are interested in be less than \$8.00 we'll refund the overpayment, if it is over \$8.00 we'll bill you for the balance. Add 10% for shipping and handling for each manual ordered.

Manuals are not available for the EE series of Educational courses.

Send orders for manuals on a separate sheet of paper to Heath Co., Parts Department, Benton Harbor, MI 49022.

Copies of the warranty for any customer product in this catalog costing more than \$15 may be obtained free of charge by writing the Manager of Marketing Services, Heath Company, Benton Harbor, MI 49022.



**Be part of the special group to receive this Valuable Six-Volume Desk Reference Library. Limited Time!**

Offer expires June 15, 1984.

Dear Customer:

There's a valuable offer coming your way with this special catalog!

We're happy you're a member of the Heathkit high-tech family and to show our appreciation, we want you to have this FREE six-volume Reference Library.

We think this is the handiest set available for fast answers. It includes Webster's Dictionary, a Pocket Thesaurus, Medical Dictionary, "Law for Everyone," "Word Di·vid·er" and "Secretary's/Student's Guide." Normally a \$9.95 retail value, yours FREE with the purchase of any kit from this catalog.

And what a catalog it is! Many new products, some of the most advanced we've ever offered. Because you have a kit builder's special curiosity, you can take advantage of high-tech products and features that are not available from any other company!

Be part of the excitement. New people everywhere are noticing our name because our products have amazed the world. More than ever, you'll earn respect by building Heathkit products. So look through this catalog now and order the best in high-tech.

But order soon! Take advantage of the limited-time offer on the FREE Desk Reference Library. Just fill out the order blank. Or, to save time, call our TOLL FREE order number. Use Visa, MasterCard or Heath Revolving Charge.

Happy kit building!

William E. Johnson  
President

**REMEMBER:** This special offer is good only until June 15, 1984. So place your order now!

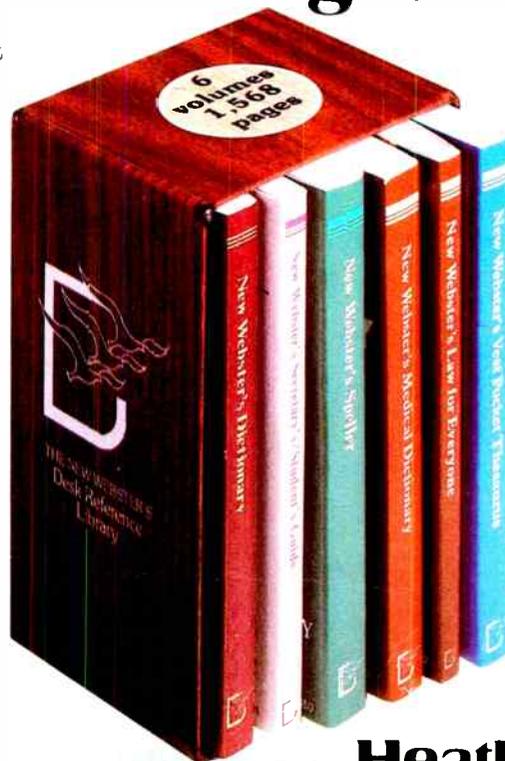


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*A special  
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# Free Library-on-a-desk Reference Package

*with any kit purchase  
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The handiest reference set you'll find. Packed with useful information. Includes dictionary, Thesaurus and word divider.

- Attractive wood-grain slip case holds six volumes
- Authoritative sources
- A thousand fast answers!

**A \$9.95  
Value**

**Heathkit**

Heath  
Company

# There's a new high-tech, state-of-the-art Heathkit product just waiting for you to enjoy building and owning!



## Heath/Zenith Microcomputer Systems Offer You Time and Dollar Savings

We offer you a complete line of microcomputers, peripherals, accessories, and problem-solving software for both the home and business. See pages 30-61 for additional information.



## 35 MHz Oscilloscope features dual-trace capability

Troubleshoot accurately with delayed-sweep function, X-Y inputs and outstanding 2 mV sensitivity.

The IO-4235 can be found on page 27.



## Redefining the leading edge in Amateur Radio technology

With the latest generation of Heath ham products coming off the line, we're putting a new meaning in "State-of-the-art."

Our ham section starts on page 88.



## Computerized Weather Station gives instant information

Displays time/date, indoor and outdoor temperatures, wind speed/direction, barometric pressure.

The ID-4001 is shown on page 4.



## The World's first sophisticated Personal and Teaching Robot

Meet HERO 1. It moves, it speaks, it sees, it hears, it learns. It's the perfect Robotics Training System for industry, schools or the individual.

See pages 68 & 69.



## Products for the Home

Displaying the time in a bright digital readout, the GC-1000 is the world's most accurate clock. This unique clock is constantly updating its time information by radio signal from the atomic time clock in Denver, Colorado. Find out more about this exciting new kit on page 2.



## Fight soaring energy costs with our Solar Water Heater

Designed to save 50% to 80% of the typical hot water bill. Qualifies for income tax credits, too.

See the NS-1100 on page 65.



## Use easy-to-build Digital Scale as a weight-loss helper

Perfect for the dieter or athlete. Twenty times more accurate than most bathroom scales.

See the GD-1186 on page 17.



The state-of-the-art GR-3000 – designed with the computerized interfascility to meet your every need for today's multi-source programming and tomorrow's advanced communication requirements. Details on page 99.



## Wireless Security

A state-of-the-art security system is now available for both a considerable savings to your pocket and ease of mind. The GDA-2800-1 wireless security system offer you the best of both worlds. Find out more about this exciting new product on page 7

## Here is what some of our recent kitbuilders say about their Heathkit experience



"I am 8 years old. This is my first electronics kit. My father and I did the clock in five nights. The directions were understandable even to me. It was fun!"

Joel Sumner  
Succasunna, NJ



"I have built Heath audio and amateur radio equipment since the early '50's... Your design technology, quality of components and instructions, and customer service are better than ever."

Roger Stachour  
Grundy Center, IA



"As an electrical engineer, I recognize the superior engineering that went into the design and preparation of this kit. The troubleshooting section was especially useful..."

J. Wayne Morris  
St. Albans, WV



"I just must tell you how very pleased, even amazed, I am at the quality of instruction in your Automotive Electrical Course. I wish I could tell everyone."

John J. Sullivan  
Newport News, VA

...and they are just four of the thousands of satisfied kitbuilders who have enjoyed the new "American High-Tech" by Heath. Now is your chance to participate with our family of kitbuilders at a special savings.

### Remember our pledge: We won't let you fail!

Along with the latest state-of-the-art design and the newest space age technology, you still get the finest kit components money can buy, the famous step-by-step Heathkit assembly and instruction manuals and technical help whenever you need it.



Everything we do at Heath is aimed to keep our customers happy — and to make your kit-building experience successful.

Each kit is test-built to ensure kitbuilding ease, and Heathkit products are backed by expert technical consultation, available by phone or mail. And there are service technicians at the factory and at Heathkit Electronic Centers\* throughout the country ready to serve you in any way they can.

At Heath, the customer still comes first. That's what keeps satisfied customers coming back to try new kitbuilding experiences.

\*Units of Veritechnology Electronics Corporation



### Exciting things are happening at Heath Company

Heath Company has always strived to serve their customers in the most convenient way possible. This commitment has led to our adoption of two unique service features.

Recently we have expanded and computerized our warehousing facilities. Doing so has enabled us to process your kit order quicker and more accurately.

Our computer-oriented customer can now use our Online Catalog (GO HTH) on CompuServe.™ This allows reliable delivery of the latest in exciting kit products, as well as a convenient way to place your order. This service is a supplement to your colorful 104-page Heathkit Catalog, the tool designed to bring you a magnitude of information from the kit electronics leader.



# HOW TO FIGURE YOUR SHIPPING AND HANDLING CHARGES

1. Find your zone number using the Zone Chart at the right.
2. Locate the shipping weight of the item in the first column of the Rate Chart.
3. Determine the shipping charge for the area.

## ZONE CHART

Your zone is indicated by the first three digits of your ZIP Code

Zip Code Prelims	Zone										
006-009	8	260-261	3	363-369	5	476-477	4	598-599	7	820-822	5
010-069	5	262-278	4	370-386	4	478	3	600-609	2	823-826	6
070-089	4	279	5	387	5	479-489	2	610-619	3	827	5
090-099	5	280-283	4	388	4	490-491	1	620-623	4	828-832	6
		284-285	5	389-397	5	492	2	624-628	3	833	7
100-108	5	286-293	4			493-495	1	629-668	4	834	6
109	4	294-295	5	400-406	3	496-499	3	669-679	5	835-838	7
110-119	5	296-297	4	407-409	4			680-687	4	840-847	6
120-123	4	298-299	5	410-412	3	500-516	4	688-693	5	850-864	7
124-126	5			413-422	4	520-524	3			865-884	6
127-128	4	300-303	4	423	3	525	4	700-722	5	890-898	7
129	5	304	5	424-426	4	526-528	3	723-727	4		
130-152	4	305-307	4	427-432	3	530-534	2	728-768	5	900-921	8
153	3	308-329	5	433-436	2	535-539	3			922-928	7
154-160	4	330-334	6	437-457	3	540	4	770-778	5	930-934	8
161	3	333-338	5	458	2	541-546	3	779-789	6	935	7
162-163	4	339	6	460-462	3	547-548	4	790-792	5	936-960	8
164-165	3	340	6	463-464	2	549	3	793-799	6	961	7
166-199	4	350-352	4	465-466	1	550-566	4			962-976	8
				467-469	2	567	5	800-803	5	977-979	7
200-232	4	355-359	4	470-472	3	570-572	4	804-805	6	980-987	8
233-237	5	360-361	5	473	2	573-588	5	806-807	5	988-994	7
238-259	4			474-475	3	590-597	6	808-816	6	995-999	8

## The following notice is required by the Fair Credit Billing Act:

### IN CASE OF ERRORS OR INQUIRIES ABOUT YOUR BILL

The Federal Truth in Lending Act requires prompt correction of billing mistakes.

1. If you want to preserve your rights under the Act, here's what to do if you think your bill is wrong or if you need more information about an item on your bill:

a. Do not write on the bill. On a separate sheet of paper write (you may telephone your inquiry but *doing so will not preserve your rights under this law*) the following:

- i. Your name and account number (if any).
- ii. A description of the error and an explanation (to the extent you can explain) why you believe it is in error.

If you only need more information, explain the item you are not sure about and, if you wish, ask for evidence of the charge such as a copy of the charge slip. Do not send in your copy of a sales slip or other document unless you have a duplicate copy for your records.

iii. The dollar amount of the suspected error.

iv. Any other information (such as your address) which you think will help the creditor to identify you or the reason for your complaint or inquiry.

- ii. Send your billing error notice to the address on your bill which is listed after the words "Send inquiries to:"

Mail it as soon as you can, but in any case, early enough to reach the creditor within 60 days after the bill was mailed to you. If you have authorized your bank to automatically pay from your checking or savings account any credit card bills from that bank, you can stop or reverse payment on any amount you think is wrong by mailing your notice so the creditor receives it within 16 days after the bill was sent to you. However, you do not have to meet this 16-day deadline to get the creditor to investigate your billing error claim.

2. The creditor must acknowledge all letters pointing out possible errors within 30 days of receipt, unless the creditor is able to correct your billing during that 30 days. Within 90 days after receiving your letter, the creditor must either correct the error or explain why the creditor believes the bill was correct. Once the creditor has explained the bill, the creditor has no further obligation to you even though you still believe there is an error, except as provided in paragraph 5 below.

3. After the creditor has been notified, neither the creditor nor an attorney nor a collection agency may send you collection letters or take other collection action with respect to the amount in dispute; but periodic statements may be sent to you, and the disputed amount can be applied against your credit limit. You cannot be threatened with damage to your credit rating or sued for the amount in question, nor can the disputed amount be reported to a credit bureau or to other creditors as delinquent until the creditor has answered your inquiry. However, you remain obligated to pay the parts of your bill not in dispute.

4. If it is determined that the creditor has made a mistake on your bill, you will not have to pay any FINANCE CHARGES on any disputed amount. If it turns out that the creditor has not made an error, you may have to pay FINANCE CHARGES on the amount in dispute, and you will have to make up any missed minimum or required payments on the disputed amount. Unless you have agreed that your bill was correct, the creditor must send you a written notification of what you owe; and if it is determined that the creditor did make a mistake in billing the disputed amount, you must be given the time to pay which you normally are given to pay undisputed amounts before any more FINANCE CHARGES or late payment charges on the disputed amount can be charged to you.

5. If the creditor's explanation does not satisfy you and you notify the creditor in writing within 10 days after you receive this explanation that you still refuse to pay the disputed amount, the creditor may report you to credit bureaus and other creditors and may pursue regular collection procedures, but the creditor must also report that you think you do not owe the money, and the creditor must let you know to whom such reports were made. Once the matter has been settled between you and the creditor, the creditor must notify those to whom the creditor reported you as delinquent of the subsequent resolution.

6. If the creditor does not follow these rules, the creditor is not allowed to collect the first \$50 of the disputed amount and FINANCE CHARGES, even if the bill turns out to be correct.

7. If you have a problem with property or services purchased with a credit card, you may have the right not to pay the remaining amount due on them, if you first try in good faith to return them or give the merchant a chance to correct the problem. There are two limitations on this right:

- a. You must have bought them in your home state or if not within your home state within 100 miles of your current mailing address; and
- b. The purchase price must have been more than \$50.

However, these limitations do not apply if the merchant is owned or operated by the creditor, or if the creditor mailed you the advertisement for the property or services.

## RATE CHART

Shpg. wt	Zone								UPS 2nd Day AIR SERVICE	
	Zone 1 & 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	
1	\$1.29	\$1.32	\$1.36	\$1.40	\$1.46	\$1.52	\$1.59	\$3.00	\$4.53	
2	1.31	1.34	1.38	1.44	1.51	1.63	1.71	4.00	5.71	
3	1.46	1.55	1.66	1.79	1.96	2.15	2.36	5.00	6.89	
4	1.54	1.67	1.82	1.98	2.22	2.46	2.74	6.00	8.07	
5	1.63	1.78	1.97	2.18	2.42	2.78	3.13	6.50	9.25	
6	1.71	1.90	2.12	2.37	2.72	3.09	3.51	7.50	10.43	
7	1.80	2.02	2.28	2.57	2.98	3.41	3.90	8.50	11.61	
8	1.88	2.13	2.43	2.76	3.23	3.72	4.28	9.50	12.79	
9	1.97	2.25	2.58	2.96	3.48	4.04	4.67	10.50	13.97	
10	2.05	2.36	2.73	3.15	3.73	4.35	5.05	11.50	15.15	
11	2.14	2.48	2.89	3.35	3.99	4.67	5.44	12.50	16.33	
12	2.22	2.60	3.04	3.54	4.24	4.98	5.82	13.50	17.51	
13	2.31	2.71	3.19	3.74	4.49	5.30	6.21	14.50	18.69	
14	2.39	2.83	3.35	3.93	4.75	5.61	6.59	15.50	19.87	
15	2.48	2.94	3.50	4.13	5.00	5.93	6.98	16.50	21.05	
16	2.56	3.06	3.65	4.32	5.25	6.24	7.36	17.50	22.23	
17	2.65	3.18	3.81	4.52	5.51	6.56	7.75	18.50	23.41	
18	2.73	3.29	3.96	4.71	5.76	6.87	8.13	19.50	24.59	
19	2.82	3.41	4.11	4.91	6.01	7.19	8.52	20.00	25.77	
20	2.90	3.52	4.26	5.10	6.26	7.50	8.90	21.00	26.95	
21	2.99	3.64	4.42	5.30	6.52	7.82	9.29	22.00	28.13	
22	3.07	3.76	4.57	5.49	6.77	8.13	9.67	23.00	29.31	
23	3.16	3.88	4.72	5.69	7.02	8.45	10.06	24.00	30.49	
24	3.24	3.99	4.88	5.88	7.28	8.76	10.44	25.00	31.67	
25	3.33	4.10	5.03	6.08	7.53	9.08	10.83	26.00	32.85	
26	3.41	4.22	5.18	6.27	7.78	9.39	11.21	27.00	34.03	
27	3.50	4.34	5.34	6.47	8.04	9.71	11.60	28.00	35.21	
28	3.58	4.45	5.49	6.66	8.29	10.02	11.98	29.00	36.39	
29	3.67	4.57	5.64	6.86	8.54	10.34	12.37	30.00	37.57	
30	3.75	4.68	5.79	7.05	8.79	10.65	12.75	31.00	38.75	
31	3.84	4.80	5.95	7.25	9.05	10.97	13.14	32.00	39.93	
32	3.92	4.92	6.10	7.44	9.30	11.28	13.52	33.00	41.11	
33	4.01	5.03	6.26	7.64	9.55	11.60	13.91	34.00	42.29	
34	4.09	5.15	6.41	7.83	9.81	11.91	14.29	35.00	43.47	
35	4.18	5.26	6.56	8.03	10.06	12.23	14.68	36.00	44.65	
36	4.26	5.38	6.71	8.22	10.31	12.54	15.06	36.50	45.83	
37	4.35	5.50	6.87	8.42	10.57	12.86	15.45	37.50	47.01	
38	4.43	5.61	7.02	8.61	10.82	13.17	15.83	38.50	48.19	
39	4.52	5.73	7.17	8.81	11.07	13.49	16.22	39.50	49.37	
40	4.60	5.84	7.32	9.00	11.32	13.80	16.60	40.50	50.55	
41	4.69	5.96	7.48	9.20	11.58	14.12	16.99	41.50	51.73	
42	4.77	6.08	7.63	9.39	11.83	14.43	17.37	42.50	52.91	
43	4.86	6.19	7.78	9.59	12.08	14.75	17.76	43.50	54.09	
44	4.94	6.31	7.94	9.78	12.34	15.08	18.14	44.50	55.27	
45	5.03	6.42	8.09	9.98	12.59	15.38	18.53	45.50	56.45	
46	5.11	6.54	8.24	10.17	12.84	15.69	18.91	46.50	57.63	
47	5.20	6.66	8.40	10.37	13.10	16.01	19.29	47.50	58.81	
48	5.28	6.77	8.55	10.56	13.35	16.32	19.68	48.50	59.99	
49	5.37	6.89	8.70	10.76	13.60	16.64	20.07	49.50	61.17	
50	5.45	7.00	8.85	10.95	13.85	16.95	20.45	50.50	62.35	
Add 105	11 lb	14 lb	19 lb	24 lb	37 lb	39 lb	48 lb	1.25 lb	1.48 lb	

For weights over 50 lbs and up to 70 lbs

## SPECIAL SHIPPING AND HANDLING:

- **MOTOR FREIGHT ITEMS** - Items indicated Motor Freight exceed weight or size limitations of UPS or Parcel Post. Examples are TV's, some speaker systems, garage door mechanisms, antennas, etc. They are shipped with freight charges collect. If one item on your order is Motor Freight, all items will be shipped Motor Freight. Consult your local motor freight carrier for charges and type of service available in your area before ordering.
- **APD/FPO Shipments** - Use the following Zones to estimate costs: West Coast - Zone 8; East - Zone 5; Miami - Zone 6. PAL (Airlift Military) carries packages by air transport for a fee of \$1.00 per package plus postage. Parcel must weigh less than 30 lbs. and not exceed 60" in length and girth.
- **SAM** - Parcel must weigh less than 15 lbs. and not exceed 60" in length and girth. Check with your local postmaster for exceptions to certain APO or FPO numbers.

## Heath offers a full line of software for your H/Z-89 or Z-90 All-In-One Computer



For use in the office or in the home, Heath has software solutions for your everyday needs that are ready to run on your Heathkit/Zenith computer. Many of these software programs are menu-driven and use easy-to-understand common English commands for easier use.

You'll find a wide variety of software programs on this and the following pages. They include: operating systems, programming languages, utility and applications programs. For an even greater selection of software programs, there's the Heath User's Group (HUG) on page 43 with its software library of over 700 programs.

All these software packages come with easy-to-understand instruction manuals and are fully indexed to make it easy to locate specific information. Many include glossaries of terms and appendices filled with useful information. All software is subjected to stringent tests to ensure quality and user satisfaction.

Powerful 16-bit software for the H/Z-100 computer is found on pages 47 thru 51. And, software for the H/Z-100's 8-bit side is found on pages 54 thru 57.

### World popular CP/M\*-80 operating system provides a common hardware interface

- Most popular operating system available for microcomputers
- More applications software available than any other system

**Industry standard:** The CP/M operating system provides a common interface to a large variety of computer hardware. And, it provides a general environment for program development, editing, operation, and storage which frees the user from having to understand the details of underlying hardware. This has brought about a vast production of software programs... more languages, utilities and applications software programs than any other disk operating system.

**Comprehensive file management:** CP/M can accommodate files up to 8 megabytes and can access them both sequentially and randomly. In the CP/M operating system, files are named for easier location and are allocated dynamically. Distinct programs can be stored in both source and machine executable form.

**Disk management:** The Basic Input/Output System (BIOS) of CP/M provides the operations to access up to two disk drives, 5.25-inch and/or 8-inch, or a Winchester hard-disk system. The Basic Disk Operating System (BDOS) controls one or more disk drives containing independent file directories. BDOS implements disk allocation strategies which provide fully dynamic file construction while minimizing head movement across the disk during the access of a file. A Console Command Processor has five commands that control input and output of programs.

**Utilities:** CP/M includes standard programs like: an 8080 assembler, an editor, a debugger, a hardware configuration utility, a file copy program, a system and disk status utility, plus others. Special programs include, a disk duplication and verification utility, disk formatting utility and many more.

**Hardware requirements:** To run this version of CP/M on an H/Z-89 or Z-90 Computer, at least 48K or RAM is needed. Although one disk drive is also needed, two drives are highly recommended. In turn, CP/M supports the H/WH-17, H/Z-37, H/Z-47, Z-67 and the H-77/Z-87 Floppy Disk Systems.

**HOS-8917-2**, CP/M-80 on hard-sectored 5.25" disk, Shpg. wt. 5 lbs. ... **150.00**

**HOS-8937-2**, CP/M-80 on soft-sectored 5.25" disk, Shpg. wt. 5 lbs. ... **150.00**

\*CP/M is a registered trademark of Digital Research Corp

### Heath Disk Operating System is user-oriented and simple to operate with built-in error reporting

- Offers many of the functions of large commercial computers
- Designed for the efficient use of memory and disk space
- Recognizes and reports many command and reference errors

**Simplified system:** HDOS provides a complete environment for program construction, storage, and editing. It also provides assembly and checkout facilities. The HDOS system has a high degree of flexibility and is structured to function with many commands executed on an internal basis. This relieves the user from having to consciously command each step of a program sequence. Increased system discipline, and the ability of HDOS to recognize and report all command and reference errors saves operators time, reduces mistakes and helps prevent inadvertent loss of valuable data. An easy-to-use Benton Harbor BASIC programming language is included along with ASM Assembly Language, a two-pass 8080 assembler. Also included are several utilities.

**Hardware requirements:** An H/Z-89 or Z-90 Computer using HDOS must have a minimum of 48K RAM and one disk drive. However, two disk drives are recommended. HDOS supports all Heathkit/Zenith disk systems except the Z-67.

**HOS-817-1**, HDOS on hard-sectored 5.25-inch disk, Shpg. wt. 5 lbs. ... **150.00**

### UCSD P-System for program flexibility, clear readability, and reliable execution

**The UCSD P-System**, Version IV, is an operating system designed around a high-level programming language with a complete environment for easy program development and execution in small computers. With its built-in Pascal Compiler, large tasks can be divided into manageable smaller, easier tasks.

**Hardware requirements:** An H/Z-89 or Z-90 Computer requires a minimum of 48K RAM, but, 64K is highly recommended. Two soft-sectored disk drives are also needed to run the P-System and the Pascal Compiler.

**HOS-8937-3**, UCSD P-System on soft-sectored 5.25" disk, 7 lbs. .... **495.00**



## SOFTSTUFF

Quality software tools to fit your budget

**H00S - CP/M\*-80 File Converter:** Easily transfers HDOS text files to CP/M-80 disks, and vice versa, to effectively double the information handling ability of your H/Z-89 Computer. Requires 48K RAM, two disk drives, and HDOS and CP/M.

**SF-8512**, on hard-sectored 5.25" disk, Shpg. wt. 1 lb. .... **30.00**

**Typing Tutor:** This educational program helps you learn faster and more efficient touch typing. Uses the H/Z-89's own typewriter-style keyboard. It requires an H/Z-89 Computer with 48K RAM and one hard-sectored disk drive.

**SF-9018**, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... **40.00**

**PIE Full-Screen Text Editor:** Access a file and then make changes anywhere on the H/Z-89's video screen. Special user-defined function keys are used to perform character, word and line insertions and deletions. Requires an H/Z-89 with 48K RAM and one disk drive with HDOS or CP/M-80.

**SF-9200**, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... **50.00**

**HDOS, CP/M CPS:** Computerized Phone System permits the transfer of data over a telephone between your H/Z-89 Computer and time-sharing services. H/Z-89 needs 48K RAM, one disk drive, HDOS or CP/M operating systems, and a modem.

**SF-9503**, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... **40.00**

**CP/M Z-90 CPS:** Computerized Phone System program for your Z-90 Computer. Z-90 needs 48K RAM, one soft-sectored disk drive, and a modem.

**SFS-9103**, on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... **40.00**

## SuperCalc\* – one of the most versatile and comprehensive electronic spreadsheets available

**Decision-making tool:** Quickly and easily calculate "what if" and "now what" questions on a spreadsheet covering 63 columns and 254 rows. Worksheet uses self-explanatory error messages and a help function key that lists choices. Other attractive features include powerful editing capabilities and cell protection.

**Hardware and software requirements:** This version of SuperCalc needs an H/Z-89 or Z-90 Computer with 48K of RAM, one disk drive, and the CP/M\* operating system. For printouts, a printer is also needed.

HSC-817-1, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 195.00

HSC-837-1, on soft-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 195.00

## Powerful WordStar\* word processing system features versatility, convenience and multi-level help messages

**Dynamic system:** WordStar is a screen-oriented word processor that lets you create and format text in any form you desire. Powerful editing commands let you insert, delete and move text within a file as well as copy or read text from other files. Choose either a ragged or justified right margin, or mix them together. You control the page length, top and bottom margins, heading/footer/page number locations and other pagination directives. Most of these formatting functions take place immediately so that you see on the screen what will actually be printed. Four user-selectable help levels reduce manual references.

**Advanced output capabilities:** Additional enhancements can be added to your file as it is printed out. Some of these options are: boldface, double strike, underline, strikeout, subscripts, superscripts, variable character pitch and variable line height. And, alternate type style or ribbon color change are possible when using a daisy-wheel printer. WordStar also supports simultaneous printing and editing on systems with 64K RAM. Other utility and applications programs can even be executed during its use, with an automatic return to WordStar. Use MailMerge and extend the capabilities of your word processor.

**Hardware and software requirements:** To run WordStar on an H/Z-89 or Z-90 Computer, 48K RAM and two disk drives are needed. CP/M-80 is the required operating system. A letter quality printer is recommended for documents. To run this soft-sectored version of WordStar on an H/Z-100 Computer two disk drives are needed along with the CP/M operating system for the H/Z-100.

HMP-817-2, Vers. 3.3 on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 395.00

HMP-837-2, Vers. 3.3 on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 395.00

## Use MailMerge\* to add mailing list and file merging capabilities to WordStar word processing

**Powerful file merging:** With MailMerge, you can combine a file containing names and addresses with a file in WordStar containing a letter text. Automatically, data can be inserted where variables are specified, even in mid-paragraph. In this way, personalized letters can be created with special salutations and closing for each letter. As data is merged, paragraphs are automatically reformed by the MailMerge program. This program supports multiple printing of the same file or automatic chain printing of many files. MailMerge also supports the printing of files nested within each other up to eight levels deep.

**Hardware and software requirements:** The MailMerge program can be run on an H/Z-89 or Z-90 Computer having 48K RAM and two disk drives. The CP/M operating system and WordStar software are needed. To use MailMerge on an H/Z-100 Computer, two disk drives and the CP/M operating system for the H/Z-100 are required along with WordStar.

HMP-817-3, Vers. 3.3 on hard-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 135.00

HMP-837-3, Vers. 3.3 on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 135.00

## Easy-to-use Magic Wand\* places excellent power and outstanding versatility at your fingertips

**Comprehensive range of functions:** Magic Wand combines the most-asked-for features in a word processor with a very easy to handle price. In creating and editing documents, you can move the cursor around the screen with single key-stroke commands. To replace characters, you can simply type over them. You can also delete text by characters, words, lines or blocks with checks in line and block deletions to prevent an accidental erasing. Other editing features include single and multiple search and replacements, block moves and copying, and two ways to insert text. Even examine the disk directory while editing. For your convenience, Magic Wand also features forward and reverse scrolling.

**Smooth print control:** You can set your print requirements with commands from the keyboard when its time to print your document or embed them while you are writing it. You control the margins, page length, paragraph indentation, text alignment (left or right justified, or ragged), hyphenation and line spacing (single-, double-, and 1½ spaced). On capable printers, you can underscore words or sentences, use boldface or overstrikes, and add superscripts and subscripts.

**Additional features:** With Magic Wand, you can define up to 128 variables of up to 55 characters each that can be used for repetitive jobs. Another feature allows you to set up data files to be used as variables in form letters. And merge with Magic Spell to automatically proof read your documents.

**Hardware and software requirements:** To run Magic Wand, an H/Z-89 or Z-90 computer requires 48K of RAM, one disk drive and the CP/M operating system. A letter quality printer is also recommended for printed documents. An H/Z-100 Computer needs one disk drive and the H/Z-100 CP/M operating system.

HRS-817-9, on hard-sectored 5.25" disk, Shpg. wt. 3 lbs. .... 295.00

HRS-837-9, on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 295.00

## Magic Spell automatic proofreader checks spelling in documents written with Magic Wand

**Automated proofreading:** Magic Spell is designed to help you isolate spelling and typographical errors in Magic Wand documents. Its spelling system looks through documents of any size and compares each word to an internal 20,000 word standard usage dictionary. Amazingly fast, a typical floppy system using double-density disks can check a 10,000 word document in less than a minute.

**Extensive capabilities:** To its standard 20,000 word dictionary, you can add any number of additional words or you can build your own dictionaries. You can add, subtract or customize them to meet your needs. You may want to add foreign language terms in addition to the English words. You may even set up other dictionaries according to your specialized field. Some examples are data processing, engineering, law, medicine and science. The size of your dictionary is limited only by the available disk storage space.

**Easy to use:** One of Magic Spell's distinct advantages is that you can request all its features from a simple menu. This spelling checker also contains many reference displays that can be displayed on the screen at any time you desire. To aid in learning this automated system, four lessons are contained in the manual with detailed exercises and examples. In difficult word situations, Magic Spell allows for hyphenated words, hyphens at the end of lines, and apostrophes.

**Hardware and software requirements:** An H/Z-89 or Z-90 Computer requires 48K bytes of RAM, one double-density disk drive, CP/M-80, and Magic Wand. On an H/Z-100 Computer, one disk drive and CP/M are needed along with Magic Wand.

HIS-837-1, on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 295.00

\*SuperCalc is a trademark of Sorcim Corp CP/M is a registered trademark of Digital Research, Inc. WordStar and MailMerge are trademarks of Micropro International Corp. Magic Wand is a trademark of Peachtree Software, Inc.



## H/Z-100 Desktop Computer Series Software Directory

**H/Z-100 software locator:** The Software directory is designed to help H/Z-100 Computer users locate software products that meet their specific needs. It lists more than 475 programs that have been reported as available and able to run on the H/Z-100 family of computers.

**Contents:** This edition is divided into 21 chapters from Accounting to Word Processing. Within chapters, products are alphabetically categorized into specific product types. Each listing contains a description of the software product as provided by the vendor, vendor's name, address and phone number.

CB-463-15, H/Z-100 Software Directory, 2nd Ed. Shpg. wt. 3 lbs. .... 25.00

For Accounting, Billing,  
Engineering, Graphics...



More than 475 programs



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## Flexible C BASIC Version 2.0 programming language

- Includes a psuedo-code compiler and a run-time interpreter with extremely versatile disk file accessing facilities

**Structure:** C BASIC consists of three programs. The first is a psuedo-compiler that converts your source code into a series of coded operations and then places them in an intermediate disk file. The second, a run-time monitor, directly carries out the operations included in the intermediate file. The third and final program, called XREF.COM, produces a cross-reference listing of all variables used in a C BASIC source program. Files can also be directed to a printer.

**Expressions available:** C BASIC statements and commands include string constants, integers and real numbers, identifiers, variable and assign statements. Some extended features include the IF, THEN, ELSE and WHILE constructs, integer variables, multiple line functions, chaining with common variables, additional pre-defined functions and a cross-reference listing generator. To increase its versatility, C BASIC uses machine language linkage statements and functions...like PEEK, POKE, CALL, and SAVEMEM. Also, several control and I/O statements allow more sophisticated programming.

**Hardware and software requirements:** To run C BASIC, an H/Z-89 or X-90 Computer needs 48K of RAM, one floppy disk drive and the CP/M\* operating system. An H/Z-100 requires one disk drive and CP/M.

HCM-817-1, Vers. 5.2 on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 115.00  
HCM-837-1, Vers. 5.2 on soft-sectored 5.25" disk, Shpg. wt. 1 lb. .... 115.00

## Microsoft BASIC Interpreter provides many features

- Includes many enhancements that make it more powerful and versatile than most other BASIC languages

**Complete programming system:** An extensive implementation of BASIC, this general-purpose programming language has become one of the standards for micro-computers. This is because it provides ease of use plus features that make a microcomputer perform like a minicomputer or large mainframe.

**Interpreter's features:** An IF-THEN-ELSE control structure allows for highly structured programming including editing during programming and random or sequential filing capabilities. You get direct access to CPU ports and memory locations. And, you are provided with a wide range of logical and mathematical operators.

**Extended features:** Extensive program editing facilities include insertion and deletion along with character change and search capabilities. This version of BASIC has file management facilities that include random and sequential files plus file manipulation. Powerful string processing functions are provided plus operators, functions and commands which aren't available in most other BASICs.

**Hardware and software requirements:** To use this language, an H/Z-89 or Z-90 requires 48K RAM, one disk drive, and the HDOS or CP/M operating system.

HMS-817-1, Vers. 5.2 on hard-sectored 5.25" disk for CP/M-80, 5 lbs. 175.00  
HMS-837-1, Vers. 5.3 on soft-sectored 5.25" disk for CP/M-80, 4 lbs. ... 175.00  
H-8-21, Vers. 4.8 on hard-sectored 5.25" disk for HDOS, 3 lbs. .... 150.00

## FORTRAN for scientific and engineering programs

- Provides more power to meet your heavier mathematical and scientific programming needs

**Powerful compiler:** The many extended features of this system make it comparable to FORTRAN compilers used on large mainframes and minicomputers. It includes all the features of ANSI FORTRAN X3.9-1966, except COMPLEX data type. This means you can take advantage of the many utility and applications programs already written in the FORTRAN language.

**Many enhancements:** This version of FORTRAN features a popular compiler that can produce machine language routines at up to 1200 lines per minute in a single pass and needs less than 25K bytes of memory to compile most programs. Also featured is a relocating assembler, a cross-reference generator for sorting, and a linkage editor to generate runnable load modules.

**Additional features:** This programming language uses an extensive library of single and double precision scientific functions. With FORTRAN, you can create your own library of subroutines and easily interface with machine language subroutines. Descriptive error messages showing addresses assigned to labels, variables, and constants is another feature. FORTRAN supports an I/O device and includes sample source programs for the user's convenience.

**Hardware and software requirements:** To run FORTRAN, an H/Z-89 or Z-90 Computer needs 48K of RAM, two drives, and either HDOS or CP/M-80.

HMS-817-2, Vers. 3.4 on hard-sectored 5.25" disk for CP/M-80, 5 lbs. 195.00  
HMS-837-2, Vers. 3.4 on soft-sectored 5.25" disk for CP/M-80, 4 lbs. 195.00  
H-8-20, Vers. 3.3 on hard-sectored 5.25" disk for HDOS, 4 lbs. .... 175.00

56/COMPUTERS

## Microsoft\* BASIC Compiler speeds program execution

- Compile your programs with this MBASIC Compiler, Version 5.2, and eliminate time-consuming interpretation

**Increased execution speed:** Compiled programs are fast because the BASIC Compiler produces highly optimized machine code which is directly executed. During the compiling of a program, expressions are reordered to minimize temporary storage and, whenever possible, to transform floating point division into multiplication. Also, constant multiplications are optimally distributed to allow for a more complete and constant folding.

**To use:** Simply enter and debug your program using a BASIC Interpreter. Then enter a single command line telling the compiler what to compile and which options to use. The compiler then produces optimized machine code as a relocatable binary file. This object code is then loaded and linked with MBASIC's run-time library. Included in this library is a relocating assembler, a linkage generator, a cross-reference generator, and a library manager.

**Hardware and software requirements:** To run this compiler, an H/Z-89 or Z-90 Computer needs 48K RAM, two disk drives, and either HDOS or CP/M-80.

HMS-817-41, on hard-sectored 5.25" disk for HDOS, 4 lbs. .... 250.00  
HMS-837-41, on soft-sectored 5.25" disk for HDOS, 5 lbs. .... 250.00  
HMS-817-4, on hard-sectored 5.25" disk for CP/M-80, 4 lbs. .... 250.00  
HMS-837-4, on soft-sectored 5.25" disk for CP/M-80, 4 lbs. .... 250.00

## Powerful and versatile MACRO-80 Assembly Language

- Provides most "big computer" assembler features without sacrificing speed or memory space

**Features:** MACRO-80 supports a complete, Intel-standard macro facility which accepts Intel 8080 and Zilog 80 mnemonics. Nesting of macros is limited only by the amount of memory and conditionals, up to 255 levels, can be nested. Code is assembled in relocatable modules that are handled by a link editor.

**Utilities:** After a source program has been written, it must be assembled using the Macro Assembler. This results in a relocatable module which is loaded using the Linking Loader, LINK-80. The Loader also links these modules to any internal routines that may be needed for execution of the relocatable module. A library manager, LIB-80, is used to create and modify libraries which are then linked with compiled programs. A cross-reference facility, CREF-80, is used to generate a special listing that can be used as an important diagnostic tool. Each source statement is numbered with a Cross Reference number.

**Hardware and software requirements:** An H/Z-89 or Z-90 Computer needs 48K of RAM, one disk drive (two drives are recommended) and either HDOS or CP/M-80.

HMS-817-51, on hard-sectored 5.25" disk for HDOS, 2 lbs. .... 65.00  
HMS-837-51, on soft-sectored 5.25" disk for HDOS, 4 lbs. .... 65.00  
HMS-817-52, on hard-sectored 5.25" disk for CP/M-80, 2 lbs. .... 65.00  
HMS-837-52, on soft-sectored 5.25" disk for CP/M-80, 3 lbs. .... 65.00

## Microsoft's business-oriented COBOL Compiler

- An ideal programming language for business data processing tasks including processing disk files and data bases

**Powerful business programming language:** COBOL is designed for inventory, personnel, payroll, order entry, accounting, and forecasting applications. It supplies the tools to meet the rising challenge of information processing. These tools consist of a powerful use of disk files, easy-to-use syntax, long variable names, and readable programs. Large programs are effectively managed because data and procedures can be hierarchically structured.

**Features:** COBOL's many features include built-in utilities consisting of a compiler, linking loader, macro assembler, a library manager in CP/M, and a cross reference assembler. It has an efficient program structure that makes COBOL's programs faster to write and easier to maintain. Also, information is stored in a logical structure with direct interconnection between related pieces of data. And, a special syntax is available for versatile screen handling capability. In addition, menu-driven applications allow smooth transfer of control between programs.

**Hardware and software requirements:** To run this COBOL Compiler, an H/Z-89 or Z-90 Computer requires a minimum of 48K RAM and two disk drives. Also required is either the HDOS or CP/M-80 operating system.

HMS-817-31, on hard-sectored 5.25" disk for HDOS, 4 lbs. .... 395.00  
HMS-837-31, on soft-sectored 5.25" disk for HDOS, 4 lbs. .... 395.00  
HMS-817-3, on hard-sectored 5.25" disk for CP/M-80, 5 lbs. .... 395.00  
HMS-837-3, on soft-sectored 5.25" disk for CP/M-80, 4 lbs. .... 395.00

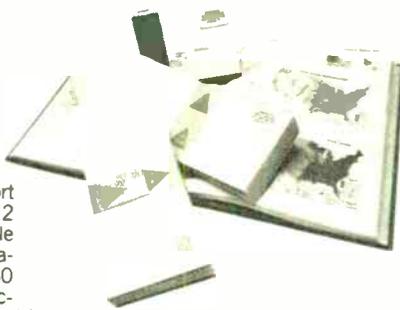
\*Microsoft is a trademark of Microsoft Inc. CP/M is a registered trademark of Digital Research, Inc.

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## SUPERSORT\* sorts about any kind of existing record

SuperSort can be used with WordStar\*, Magic Wand\* or by itself to sort, merge and select information from your data files. SuperSort offers superior power with greater convenience for the user.



**Simple sorting:** SuperSort can sort and merge 32 input files (up to 512 kilobytes) into a single master file in one simple and efficient operation at an unmatched speed of 560 records a minute. This sorter accepts a wide variety of records in which data can be justified, or include floating decimals, exponential notation, or upper and lower case letters. Data can also be in several standard formats; such as, binary, EBCDIC, BCD, ASCII, and others. With SuperSort, you can sort fixed and variable length records and fields. And, you can even have a different number of fields in each record. In using this program, you can specify up to 32 different sorting criteria; equal to, less than and others.

**More features:** To aid the user, SuperSort provides help messages that appear automatically. If an illegal instruction is entered, you get a plain English help message. Another feature lets you change record lengths by adding or subtracting fields, or rearrange fields in a record. This program also lets you convert files to a different record type. And, all files are indexed.

**Three output options:** The first is a key-only output. It permits you to build a file index for printing a summary or to form a new data base. The second is a record number output which allows the building of multiple indexes into a single file. Then another program can retrieve the records using direct access by relative record number. The third option is the pointer output. It provides still another method of building indexes so that an entirely different program can retrieve the records from the original file.

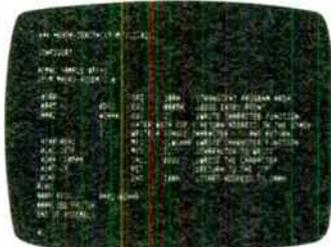
**Software compatibility:** SuperSort works with BASIC, Assembly Language, Microsoft\* FORTRAN, and Microsoft COBOL programs as well as with text editors. It may also be linked to Magic Wand, WordStar and other MicroPro programs.

**Hardware and software requirements:** An H/Z-89 requires 48K bytes of RAM and one disk drive to run SuperSort. The CP/M\* operating system is also required. An H/Z-100 requires one disk drive and the CP/M operating system.

HMP-817-1, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 195.00  
HMP-837-1, on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 195.00

## MAC\* Assembler for easier Assembly Language writing

MAC features a SID-compatible symbol table file for debugging use and has full Intel-compatible macro libraries on diskette with full documentation.



**Features:** Designed for the sophisticated Assembly Language programmer, MAC supplies many features that make your program writing easier. Some of these are: additional conditional assembly operators, title and page pseudo-operands, full Intel-compatible macro definitions, including repeating macro calls and disk macro libraries. And, MAC has the ability to generate a SID-compatible symbol table file.

**Includes:** MAC is fully compatible with CP/M's Assembly language and comes with a manual that provides a textbook study of macro assemblers. An accompanying diskette contains a variety of macro libraries for performing useful tasks.

**Hardware and software requirements:** To run this Assembler, an H/Z-89 needs 48K of RAM, one disk drive, and the CP/M operating system. For use on an H/Z-100, one disk drive and the CP/M operating system are required.

HDR-817-1, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 85.00  
HDR-837-1, on soft-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 85.00

\* SuperSort and WordStar are trademarks of MicroPro International Corp. Magic Wand is a trademark of Peachtree Software, Inc. Microsoft is a trademark of Microsoft, Inc. MAC, DESPOOL, SID ZSID, CP/M are trademarks of Digital Research, Inc.

## DESPOOL\* — a multi-tasking printer utility

- Improve your computer system's efficiency by being able to print out a file while working on another

**Time saver:** Print files while you are performing other computing operations. DESPOOL improves your computer's efficiency by allowing it to perform two tasks at the same time. Print one program through your line printer and continue to use the Assembler, Editor, BASIC, or an applications program.

**To use:** Since DESPOOL takes up very little memory space, it can be loaded and stored until needed. When you're ready to use the multi-tasking option, just type in a Control-F. When the spooler prompt appears, type in the file name, DESPOOL. The terminal instantly returns to the previous program while the specified program prints out on your line printer. As you can see, this spooler is very easy to use.

**Hardware and software requirements:** An H/Z-89 needs a minimum of 48K of RAM, one disk drive and the CP/M operating system to run DESPOOL. An H/Z-100 Computer requires one disk drive and the CP/M operating system.

HDR-817-3, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 50.00  
HDR-837-3, on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 50.00

## SID/ZSID\*: upgraded version of CP/M's DDT Debugger

SID/ZSID Debugging Utility includes both 8080-compatible SID and Z-80-compatible ZSID at substantial savings over separate prices. Use with Digital Research and Microsoft products.



**Features:** While maintaining all CP/M's DDT features, SID/ZSID allows the use of source-level names for easier program modification. You use these names instead of addresses in dumping and modifying memory, setting breakpoints and making patches to your program using symbolic Assembly Language. SID/ZSID can draw histograms of program and subroutine execution frequencies, maintain pass counts and provide a traceback of the execution path to selected breakpoints. This utility functions in a non-symbolic mode without symbol file.

**Hardware and software requirements:** SID/ZSID requires an H/Z-89 to have a minimum of 48K RAM, one disk drive, and the CP/M operating system. MAC Macro Assembler is recommended for the full use of SID/ZSID's capabilities. An H/Z-100 also requires one disk drive and the CP/M operating system.

HDR-817-2, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 125.00  
HDR-837-2, on soft-sectored 5.25" disk, Shpg. wt. 4 lbs. .... 125.00

SOFTWARE LISTING CONTINUES ON PAGE 54



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## Condor\* Relational Data Base Management for low-cost, effective information processing

- Easy data base creation and maintenance for simplified information processing without professional computer programmer assistance
- Effortless data entry and updating using self-designed screen formats with complete menu selections you tailor to your requirements
- Extensive analysis and information report writing capabilities
- Well-documented user's manual includes tutorial lessons to help you understand and learn about Condor's great flexibility

**Data management:** Condor's Relational Data Base Management System (rDBMS\*) is a series of programs designed for simple and incredibly fast information storage, sorting and filing. rDBMS allows you to design and create files of information, or data bases, for keeping records on any subject you desire. With this system you can quickly search, sort, merge, analyze, index and print out any records. Condor rDBMS is the data management system that simplifies information processing for inventory control, accounting functions, personnel reporting and many other applications.

**Fast operation:** Written in Assembly Language, rDBMS operates much faster than other data base managers. Since interpretation time is eliminated, commands and operations are quickly carried out. Therefore, you spend less time handling files within rDBMS's impressive data base capacity which can process up to 32,767 records per file with up to 1,023 bytes per record.

**Powerful:** While rDBMS is fast, it is also one of the most powerful relational data base management systems available. With this system's outstanding capabilities you can create new data bases within minutes, calculate statistics for field values within a data base and efficiently post transactions to a master file. Other features allow you to produce sophisticated reports and multi-data base relationships. This program also has an index feature for quick access to information.

**Easy to use:** Besides being powerful, rDBMS is so easy to use that a new user can achieve results within several hours. This is due to a number of built-in operator aids such as help screens, command files and user-defined messages. Help screens simplify operations, especially if the same task is often repeated. You designate what commands are to be contained in a menu which is accessible through the keyboard. The commands (listed by a number) in the menu are actually files of commands required to perform an operation. So instead of using many commands for a single task, all you do is enter a number assigned to do a task. You can further simplify the use of rDBMS by creating different help menus.

**Available operations:** With rDBMS you can perform addition, subtraction, multiplication, division and other arithmetic operations on entries, Julian calendar dates and dollar amounts. Quickly and easily select records by specifying up to 32 logical conditions including the AND, OR and NOT Boolean operations. This data base management software package also has extensive error checking capabilities to help prevent clerical errors.

**Manuals and tutorials:** One of the exceptional features of Condor rDBMS is its plainly readable and highly instructive user's manual. It is well designed with

\*Condor and rDBMS are trademarks of Condor Computer Corp.

step-by-step instructions for the new user. A cross index and a command summary are available for the experienced user. The manual begins with an introduction to rDBMS, explains the data base concept and presents procedures for starting the system up. In the manual, several chapters are devoted to tutorial lessons in the use of data base management. This series of lessons, with explanatory illustrations, is designed to help you understand and learn how to use this system as quickly as possible.

**Hardware and software requirements:** To effectively run Condor rDBMS, an H/Z-89 or Z-90 Computer requires a full 64 KB of RAM memory and two high-capacity soft-sectored 5.25" disk drives. The CP/M\* operating system is also needed. An optional line or character printer, preferably with form feed and form length control, is needed for hard copy printouts of reports.

HCD-8937-1, on soft-sectored 5.25" disk, Shpg. wt, 4 lbs. .... 650.00

### Remote IBM Terminal Emulator software permits your H/Z-89 or Z-90 to emulate various IBM data communications terminals

**Remote Batch Terminal Emulator:** Allows your H/Z-89 or Z-90 Computer to add batch terminal emulation of IBM 3780, 2780, 3742, and 2770 terminals to its microprocessing functions. A few applications of this type of system are: remote job entry, down-line loading and distributed processing. To run this program, your H/Z-89 or Z-90 requires 48 KB RAM, one 5.25" disk drive, a Z-89-11 I/O board, and CP/M.

HWI-8917-1, on hard sectored 5.25" disk, Shpg. wt. 4 lbs. .... 895.00

HWI-8917-2, save \$50, HWI-8917-1 and Z-89-11 I/O, 12 lbs. ... 995.00

**3270 Emulator:** This program allows your H/Z-89 or Z-90 Computer to work as a microcomputer or to emulate the popular IBM 3270 display station. Both computers require 64 KB RAM, one 5.25" disk drive, a Z-89-11 I/O board, and the CP/M operating system.

HPO-8917-1, on hard sectored 5.25" disk, Shpg. wt. 2 lbs. .... 650.00

HPO-8937-1, on soft sectored 5.25" disk, Shpg. wt. 2 lbs. .... 650.00

HPO-8917-2, save \$51, HPO-8917-1 and Z-89-11 I/O, 3 lbs. ... 749.00

HPO-8937-2, save \$51, HPO-8937-1 and Z-89-11 I/O, 3 lbs. ... 749.00

### Z-89-11 Multi-Mode Interface for H/Z-89 and Z-90

**Input/Output Board:** Use with the above software programs and an H/Z-89 or Z-90 to emulate various IBM data terminals. Interface also has a Centronics-style I/O port for use with parallel printers. Needs CP/M.

Z-89-11, Assembled Interface Board, Shpg. wt. 1 lb. .... 150.00



### ZDS\* Teacher program aids student learning

- Use computer-assisted instruction to improve, increase and enhance your students' learning ability

**Applications program:** Designed for the development and presentation of written material, ZDS Teacher is an excellent software program for educational courses and training programs. A built-in full screen editor aids you in the creation and development of individualized courses including quiz and test pages. Helpful built-in messages make for easy program use.

**Hardware and software requirements:** To properly run ZDS Teacher on an H/Z-89 or Z-90, 48 KB of RAM and one disk drive is needed. This program runs under the CP/M operating system, version 2.2 or higher.

HTA-817-1, on hard-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 295.00

HTA-837-1, on soft-sectored 5.25" disk, Shpg. wt. 2 lbs. .... 295.00



### ZDS Student program runs Teacher programs

- Enables a student to independently view, study and take tests on courses written with ZDS Teacher program

**Learning tool:** Students proceed at their own pace through courses developed by teachers using the ZDS Teacher software. Helpful messages at the bottom of the screen let students concentrate on study material, not computer control.

**Hardware and software requirements:** On an H/Z-89 or Z-90 Computer, 48 KB of RAM and one disk drive is required. ZDS student has no authoring capabilities and must be used with ZDS Teacher. CP/M 2.2. or higher is also needed.

HTA-817-2, on hard-sectored 5.25" disk, Shpg. wt. 1 lb. .... 40.00

HTA-837-2, on soft-sectored 5.25" disk, Shpg. wt. 1 lb. .... 40.00

\*CP/M is a registered trademark of Digital Research, Inc. ZDS is a trademark of Zenith Radio Corporation.





# MS\*-DOS course thoroughly covers the fundamentals and organization of this system

\$99<sup>95</sup>

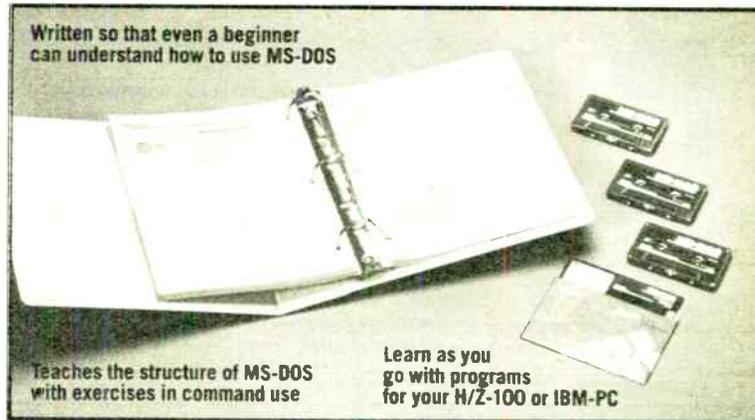


- Teaches MS-DDS in general and Z-DDS\*\* specifically using exercises for the H/Z-100 operating under Z-DDS
- Complete coverage with how to access system routines to do console input/output and work with disk files
- New full section narration guides you through the course in everyday language

**Overview:** In seven units, this comprehensive course teaches how MS-DOS is organized and all about how to use it. Directed toward the novice computer user, this course of study provides instructions in all the built-in commands and in the typical transient utilities. It will also provide an understanding of what assembly language is and how to use the system routines and the program debugger.

**Description:** About MS-DOS in general and Z-DOS specifically, this course begins with a disk operating system background and explains how the disk itself is organized. Then the most often used commands are discussed along with how to enter and edit command lines. Examined next are the frequently used CHKDSK, FILCOM, RDCMP and MAP commands. This is followed by a study of the file editor, EDLIN, including all its features. The program debugger, DEBUG, is then explained. The final unit teaches system interfacing through assembly language. Shown is how to input and output characters and strings, to read and write disk files, and to use directory entries within programs.

**Full section narration:** Accompanying the MS-DOS course are three audio cassette tapes which introduce each section. In addition, the cassette narration guides the user through the course. In everyday language, these cassettes help to provide a fuller understanding of how a computer operates.



Written so that even a beginner can understand how to use MS-DOS

Teaches the structure of MS-DOS with exercises in command use

Learn as you go with programs for your H/Z-100 or IBM-PC

**Gain experience:** Fifteen computer exercises provide experience in using MS-DOS features and commands with the H/Z-100 Desktop or Personal Computer and the IBM Personal Computer. Includes 5.25" floppy disk.

**Credit:** Pass the optional final examination with a 70% or better score and receive a Certificate of Achievement plus 3.0 Continuing Education Units.

EC-1121, MS-DOS Course, Shpg. wt. 6 lbs. . . . . 99.95

\*MS is a registered trademark of Microsoft Corporation  
\*\*Z-DOS is a trademark of Zenith Data Systems Corporation

## Assembly Language course teaches you to write faster, more efficient computer programs

\$49<sup>95</sup>

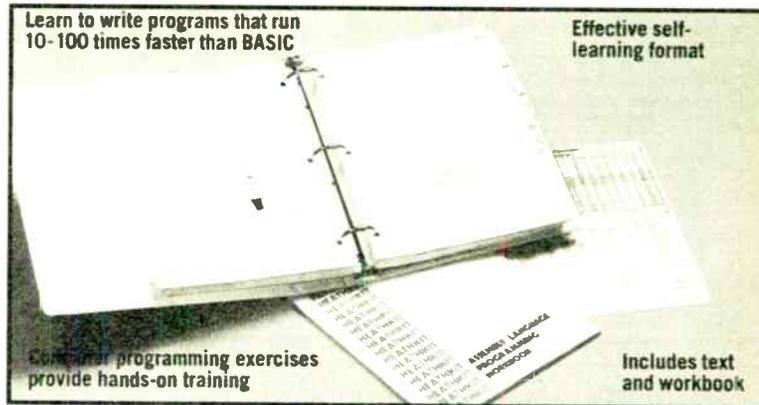


- Learn to use less memory space and to run faster programs without wasting interpretation time
- See how to use a computer's entire memory space
- Use with any 8080/8085 microprocessor-based computer

**Low-level language:** Assembly Language lies between the high-level languages like BASIC and FORTRAN and the 1's and 0's of machine language. It uses labels, operands, comments, and assembler directives. This allows you to create a source code that's easily read and adapted to your computer system. Using a mnemonic for every machine operation, Assembly Language programs require less memory space and run faster because time isn't wasted in interpreting commands.

**Efficiently used memory:** With shorter and more clearly defined codes, Assembly Language allows you to store more data in less memory space. This results in faster executed programs, 10 to 100 times faster than programs written in interpreted BASIC. Symbolic notation and easy to carry out documentation methods make program listings easy to understand.

**Course materials:** This course includes a 400-page text loaded with interesting and explanatory illustrations. A companion workbook provides a valuable hands-on training opportunity with computer programming exercises. To perform these exercises, access to an 8080/8085 microprocessor-based computer such as the H/Z-89 or H/Z-100 Computer is needed.



Learn to write programs that run 10-100 times faster than BASIC

Effective self-learning format

Computer programming exercises provide hands-on training

Includes text and workbook

**Credit:** Take and pass the optional final examination with a 70% or higher score and earn 6.0 Continuing Education Units (CEUs) and receive a Certificate of Achievement suitable for framing.

EC-1108, Assembly Language Course, Shpg. wt. 7 lbs. . . . . 49.95

## NEW Variable Speed Recorder cuts listening time in half and improves your learning ability

\$139<sup>95</sup>

- Pitch-corrected playback for fast, clear speech

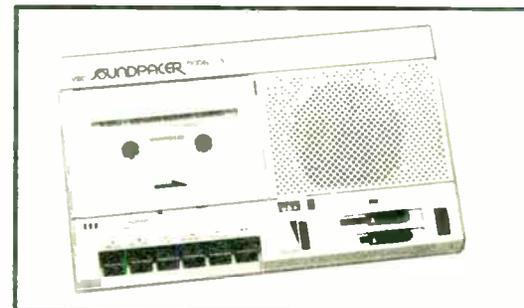
**Speed-listening tape recorder:** Save yourself time and increase your learning ability with the Variable Speed Recorder. With its slide speed control, this flexible recorder allows you to listen to cassette tapes at up to twice their normal speed. While it may seem fast, this is a comfortable speed at which most people read. A selectable range from 90% to 200% of normal speed allows you to choose your own best listening and concentration speed.

**Compressed speech:** Electronically, the sound from the tape is sampled. What you actually hear are mili-

second pieces of words. This produces a clear and normal, but, fast-talking voice which is unlike the mouse sounds produced by other recorders when they are speeded up. Now you can listen to Heath audio tutorial tapes, lectures, etc. in half the time... saving time for your other interests.

**Features:** The variable speed recorder plays standard cassette tapes and uses a built-in condenser microphone for easy tape recording. Jacks are available for an earphone or external speaker; a DC input, remote and microphone. A 3-digit counter helps keep track of taped material. The recorder operates on 6 "AA" batteries or 120 VAC.

ECP-3804, Shpg. wt. 3 lbs. . . . . 139.95



Alaska, Hawaii and Michigan Residents: Call 611-982-3411

## Learn how to use CP/M\* and how to get the most out of this industry-standard operating system



- Use with any Heathkit/Zenith or 8080/Z-80/8085 based microcomputer that runs the CP/M operating system
- Starts with the basics of CP/M and builds up knowledge in a step-by-step learning process
- Uses a proven audio-visual tutorial method for greater comprehension and retention
- Earn credit and receive recognition

**Beginner-oriented course:** Now, with this CP/M Course, even first-time computer users can easily learn about the operating system that has become an industry standard. It begins with the very basics, so elementary that a previous background in CP/M or Assembly Language isn't necessary.

**CP/M Course:** Consisting of a 500-page text and five audio tapes, this self-instruction course makes it very easy to learn about CP/M. It begins with an introduction to the operating system and then covers the writing of basic CP/M commands. This includes the operating system's major control functions and diagnosing problems from error messages. In the next unit, built-in commands of the command control processor are discussed followed by a coverage of transient programs. Then, you are taught how to use the STAT and CONFIGUR commands. This is followed by how to transfer files using PIP, CP/M's versatile file transfer program. The next unit introduces the operating system's resident text editor, ED. ED's capabilities are further expanded upon with the course showing how to edit existing files plus explaining about more advanced ED functions. Finishing out the course is a discussion about submitting command files.

**Compatible:** CP/M is designed for use with all Heathkit/Zenith computers having a minimum of 48K RAM and using the CP/M operating system.

**Credit:** Pass the optional final exam with a 70% or higher score and earn 2.5 CEUs. You'll also receive a handsome Certificate of Achievement.

EC-1120, CP/M-80 Course, Shpg. wt. 6 lbs. .... **99.95**

## BASIC Course teaches you to program in one of the most popular microcomputer languages



- Learn to write and make corrections to powerful computer programs with versatile BASIC
- Set your own pace with self-instructional format and earn valuable Continuing Education Units
- Includes hands-on computer programming exercises
- Self-test reviews let you check your own progress

**Popular BASIC programming:** This course teaches you to write BASIC programs that instruct a computer to perform specific tasks. In fourteen programmed instruction segments, you proceed at your own speed and learn the standard words and commands of BASIC. In this course, many BASIC versions, formats, commands, statements and procedures are covered. You'll learn about the tools of the language and learn to define and plan a program. Then you'll format and write a program as well as adapt programs to suit your needs. Related exercises reinforce text material and give you hands-on experience.

**Course Includes:** The BASIC Programming Course includes a self-instructional textbook and a workbook filled with exercises in writing and running BASIC programs. Access to a computer is recommended for maximum benefit of this course. In addition, handy reference cards with Benton Harbor BASIC statements, ASCII number codes, BASIC direct command statements and a reference chart with math and Boolean algebra operations are included.

**Credit:** After completing the course and passing the optional final examination with a 70% or higher score, you'll be awarded 3.0 Continuing Education Units. You'll also receive a Certificate of Achievement from Heathkit/Zenith Educational Systems that's suitable for framing.

EC-1100, BASIC Programming Course, Shpg. wt. 7 lbs. .... **44.95**

**College-Level Examination:** Earn valuable college credit for successful completion of this course. For more information see page 71.

ECC-1100, Shpg. wt. 1 lb. .... **25.00**

## COBOL Programming Course teaches you to write and run programs in the business language



- Learn the primary language used in accounting, inventory, and other business applications
- Introduces the programming language that handles large, structured data files
- Covers the basics of COBOL for beginning programmers and others interested in commercial data processing
- Uses both the ANS-74 and ANS-68 versions of COBOL

**Business language:** COBOL is especially useful in applications involving manipulation of large, highly structured data files like those found in accounting functions, inventory control and other business applications. In these areas, it's more efficient than BASIC and gives you far greater productivity than Assembly Language. It's also more self-documenting, letting you see each step of an operation.

**Comprehensive Course:** This self-instructional course covers the basics of encoding, input characteristics, program hierarchy, identification, environment, data and procedure divisions. The text is filled with diagrams, tables, illustrative programs and unit tests. Nine audio cassette tapes allow you to hear and see each concept as it's presented. In this business language programming course, both ANS-74 and ANS-68 versions of COBOL are presented.

**Programming exercises:** Located at the end of the workbook are six COBOL practice programs. To get the most from these exercises, we recommend that you do them on a computer system. A system like the H/Z-89 or Z-90 Computer equipped with 48K bytes of RAM, two disk drives, the CP/M operating system (p. 54) and the COBOL-80 programming language (p. 56). For use with the H/Z-100 (using MS\*-DOS/Z-DOS\* on page 49) family of computers, see page 48.

**Credit:** To earn 3.0 Continuing Education Units, a nationally recognized method of honoring non-credit adult education courses, you must pass the optional final examination with a 70% or higher score. After passing the final, you'll also receive a Certificate of Achievement from Heathkit/Zenith Educational Systems.

EC-1105, COBOL Programming Course, Shpg. wt. 7 lbs. .... **149.95**

## Microcomputing Course teaches you the basics of computers plus what they can do for you



- Learn about microcomputer fundamentals and the elements of BASIC language programming
- See how a computer can be used to solve your problems and then choose the right computer system for you
- Learn how to choose the kind of software you need
- Written in simple and easy-to-understand terms

**A basic introduction to computers:** For those who want to know what a computer can do for them, this Microcomputing Course is an ideal place to start. In easy and simple terms, you are shown what a computer can do for you. The self-instruction text fully explains the different parts of a computer and shows you how to apply its capabilities to your specific needs. With the text and two accompanying audio cassette tapes, you'll learn about computer hardware and how it works to better evaluate what extras you'll need along with your computer. You'll learn about software and how to choose the best programs for your use. In this course, you'll even write short programs using the popular BASIC programming language.

**Objective:** The purpose of this course is to make personal computing understandable to you. It puts the various types of computer systems into perspective so that you can make informed decisions about a computer purchase.

**Credit:** After passing the optional final exam, you'll be awarded 1.0 Continuing Education Unit (CEU) and receive a handsome Certificate of Achievement.

EC-1000, Microcomputing Course, Shpg. wt. 5 lbs. .... **44.95**

\*CP/M is a registered trademark of Digital Research, Inc. MS and Microsoft are trademarks of Microsoft, Inc. Z-DOS is a trademark of Zenith Data Systems Corp.

**MONEY-BACK GUARANTEE:** If you're not satisfied with any Heathkit/Zenith Educational System Course, return the course materials and your proof of purchase for a refund of the purchase price.



Credit Card Orders Call TOLL-FREE: 800-253-0570

# Learn how to write powerful and effective programs with this Microsoft\* BASIC Course



- Learn to write and modify computer programs using the popular Microsoft version of BASIC
- Programming experiments provide users with actual experience in writing BASIC programs

**Microsoft BASIC:** Microsoft BASIC, a very extensive application of the BASIC language, is one of the most versatile programming languages for microprocessors. In this course, you'll learn how to get the most from this language including the enhancements that make it so popular. If you're using an H/Z-89, TRS-80, APPLE, or any other computer that uses Microsoft BASIC, this course will help you to improve your programming skills.

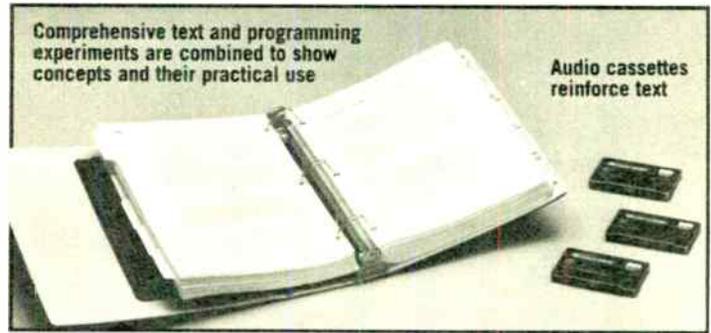
TRS-80, APPLE, or any other computer that uses Microsoft BASIC, this course will help you to improve your programming skills.

**Comprehensive:** In 12 units, this course covers every aspect of Microsoft BASIC programming. Using a programmed learning method of instruction, you are presented with basic information as a foundation to build further concepts on as you progress through the course. Upon completion, you'll be able to write BASIC programs that instruct a computer to perform certain tasks, such as sorting and organizing.

**Units 1-4:** Unit 1 introduces computers and programming by covering computers, programs, data, the computer system and programming languages. Unit 2 discusses computer arithmetic in BASIC including numeric variables, intrinsic functions and strings. Unit 3 is a start into program structures and covers sequences, branching and loops. Unit 4 is more about program structures with further discussion of decisions and loops. This unit includes coverage of relational operators, counter-driven loops and nested loops.

**Units 5-7:** Unit 5 covers data structures with discussions on N-dimensional loops and string records. Unit 6, on subprograms, covers user-defined functions and subroutines. Unit 7 discusses complex program structures such as logical operators, multiple branching and structured programming.

**Units 8-12:** These last units cover operations and extensions available on disk versions of BASIC. Unit 8 teaches about major language extensions such as program editing and data type extensions like extended functions, operators and statements. Unit 9 shows sequential disk operations with program storage, pro-



gram retrieval and sequential data files. Unit 10 covers random access disk operation with subjects on random access buffers and fields as well as storage and retrieval of numeric data. Unit 11 details error trapping and memory conservation. Unit 12 ends the course with a coverage of optimization and machine interfacing. Also included in this course is a discussion of the features of the Microsoft BASIC Interpreter (except for the TRON/TROFF) debugging utility.

**Hands-on learning experience:** Interspersed throughout the course are programming experiments that illustrate the commands and features presented in your studies. These experiments reinforce your learning by making you use what you have learned in actual programming situations.

**Hardware and software requirements:** To obtain the full benefit from this course, you'll need access to a computer that uses the Microsoft BASIC language.

**Credit:** Pass the final examination with a 70% or better score and earn 5 CEUs. Plus, you'll receive a handsome Certificate of Achievement.

EC-1110, Shpg. wt. 7 lbs. .... 99.95

## Programming in Pascal Course for all users



- Pascal is the ideal language for both beginning and experienced program writers
- Pascal is sophisticated, structured, efficient, and powerful yet it is easy to learn

**Introduction:** Whether you're an experienced user or just a beginner, this programming course can teach you to write programs in the high-level language of Pascal. And, our audio-tutorial format shows you how to program in this powerful, modular language with quick results.

**Contents:** In 11 units, this self-instruction text completely covers Pascal. Starting off, the text shows how to identify and write simple Pascal programs. Then, Unit 2 covers how to identify and write self-contained procedures. Unit 3 teaches the decision making part of programming. Covered are how and when to incorporate IF, THEN, ELSE and CASE statements into Pascal programs. Also included in this unit is how to use Boolean variables. Unit 4 continues on with REPEAT, UNTIL, WHILE, DO and FOR loops.

**More Coverage:** Unit 5 discusses Pascal data types and teaches you how to declare your own data types. Unit 6 details the use of arrays and character strings. This unit shows how to use arrays in solving problems. Unit 7 teaches you more about procedures and describes how to write complete Pascal procedures for performing desired tasks. Unit 8 identifies the need for records and sets and how to correctly declare them. Unit 9, on pointers, covers the difference between pointers, linked lists, stacks, queues, binary trees and statements. The last unit, 9 describes sequential files and standard Pascal files. In this unit, you are shown how Pascal data files are stored on disks.

**Audio-tutorial:** A clearly written 500-page text and five supporting audio cassettes combine to form an integrated and effective learning program. Plus, a better understanding of material is obtained through Heathkit's step-by-step learning process. When you complete this course, you'll be able to write modular Pascal programs that instruct a computer to perform complex tasks.

**Credit:** Pass the final examination with a 70% or better score and earn 4 Continuing Education Units (CEUs) and receive a Certificate of Achievement.

EC-1111, Shpg. wt. 7 lbs. .... 99.95

## FORTRAN Programming Course for science/math



- Learn all about FORTRAN, the programming language preferred by scientists, mathematicians and engineers.
- Audio-tutorial presentation plus hands-on programming experiments provides triple learning capability

**FORTRAN:** A powerful program, FORTRAN simplifies complicated scientific and mathematical problem solving. Learn its fundamentals and how to use its power with the economical and effective Programming in FORTRAN Course.

**Comprehensive course:** This 11-unit course begins with a special introduction to computers. Then FORTRAN programming is introduced and covers subjects like how to analyze this kind of program, statement types, elements and the character set. Covered next are arithmetic operations, elementary input and output control, library functions and other control statements. Arrays are introduced and programming practices are taught. This programming course teaches the use of variables, advanced input and output, subprograms and special input/output. Review tests at the end of units help to determine if you are progressing satisfactorily or need to review certain material. After completing this course, you'll be able to write FORTRAN programs that instruct a computer to perform specific tasks.

**Audio cassette reinforcement:** This course uses an effective audio-tutorial method of learning. A 500-page text and six audio cassettes work together to provide you with a complete understanding of FORTRAN programming.

**Hands-on experiments:** Provided with this course are experiments in actual FORTRAN programming (coding forms included). The text also offers extensive practice in writing FORTRAN programs and using the character set.

**Added reinforcement:** To get the most from this programming course, we recommend that you perform the experiments on a computer such as an H/Z-89 or H/Z-100 Computer. With these computers, you'll need the appropriate CP/M\* operating system and the Microsoft FORTRAN programming language.

**Credit:** Take and pass the final examination with a 70% or better score and earn yourself 5 Continuing Education Units (CEUs). Plus, you'll also receive a Certificate of Achievement from Heathkit/Zenith Educational Systems.

EC-1101, Shpg. wt. 7 lbs. .... 99.95

\*Microsoft is a registered trademark of Microsoft Corp. CP/M is a registered trademark of Digital Research, Inc.

Alaska, Hawaii and Michigan Residents: Call 616-982-3411



## Exhaust Gas Analyzer checks auto emissions

**\$119<sup>95</sup>**

- Get the most performance from your gasoline dollar by verifying carburetor settings with automotive exhaust gas checks using the CI-1080 Analyzer

One of the best ways to guarantee that your engine is running at its maximum potential and emitting as few pollutants as possible is by testing it with the Heathkit Exhaust Gas Analyzer. A CI-1080 car monitor for minimum pollution, check the emission control system and indicate relative thermal conductivity.

By measuring the thermal conductivity of your engine's exhaust gases, the Analyzer shows the air-to-fuel ratio and the overall combustion efficiency of the engine plus the percentage of carbon monoxide present. From these readings, you can determine if an auto's fuel mixture is unnecessarily rich or lean for the best fuel economy compared to performance. Knowing the minimum gas emission level is essential when tuning up engines to meet a specific rating for clean air standards in many states. The CI-1080 is not intended for use with Chrysler "lean burn" engines.

For easier use, the easy-to-read 4½" color-coded meter is designed to hang on a partly open window or stand upright without marring car body finishes. The removable sensor/probe assembly packs away with the meter in a sturdy poly-duralene case. Powered by 6- or 12-volt car battery. All accessories included.

Kit CI-1080, Shpg. wt. 6 lbs. .... 119.95



### 1 Electronic Ignition Tester

**\$19<sup>95</sup>**

- Quickly check out ignition systems with this easy-to-use tester
- Small enough to fit in a glove box

This economical tester checks each of the major ignition blocks. Use it to check the battery, reluctor and pickup coil, and the ignition module. Also use this diagnostic aid to locate faulty components in the ignition primary circuit.

Kit CI-2055, Shpg. wt. 2 lbs. .... 19.95

### 2 Charging System Tester

**\$19<sup>95</sup>**

- Diagnose faulty components in a vehicle's charging system
- Portable and reliable

Two-wire connection and three quick tests determine if: the battery has a sufficient charge to start the engine, the battery is being charged by the alternator, the voltage regulator is at fault, or the alternator windings and diodes are OK.

Kit CI-2065, Shpg. wt. 2 lbs. .... 19.95



## Electronic Siren/PA for mobile service vehicles

**\$99<sup>95</sup>**

- For positive or negative ground systems
- Includes a hi-lo siren circuit and provisions for use with an emergency lighting control

Make your community's volunteer emergency unit or rescue squad dollars stretch even further with the GD-1810 Electronic Siren/PA.

This compact, 55-watt siren has automatic or manual wail, hi-lo emergency tone and yelp to accommodate different traffic situations. A 20-watt public address circuit amplifies your voice for outside announcements and monitors incoming radio calls while you're away from the vehicle.

The back-lit front panel makes night reading easy for sure operation as you drive. Siren pitch and radio level adjustments control output. Use with an emergency lighting system requires a properly rated 12-volt relay (see below).

Includes a microphone with a 4-foot coiled cord, 12 feet of 2-conductor hookup wire and a 12 VDC power socket. Select your choice of high-output speakers below. Concealed speaker requires 4½" x 4½" x 13" space behind grille.

Kit GD-1810, Shpg. wt. 6 lbs. .... 99.95

GDA-18-1, Weatherproof Exterior Horn Speaker, Assembled, 10 lbs. .... 99.95

Kit GDA-18-2, Concealed Grille Speaker, Shpg. wt. 10 lbs. .... 99.95

Kit GDA-1558-1, Emergency Lighting Relay, Shpg. wt. 1 lb. .... 4.95

## Versatile Engine Analyzer pinpoints automotive problems

- Precision and versatility mark this automotive instrument designed for testing and adjusting internal-combustion engines

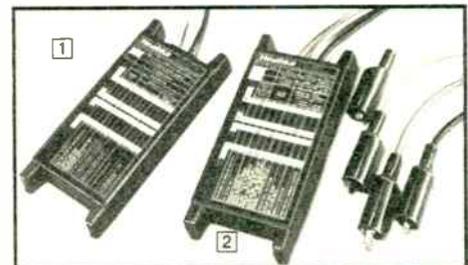
Save money by being able to troubleshoot and locate problems in the alternator, generator, voltage regulator, distributor, condenser, starter, plugs, points, battery and electrical accessories. Use the solid-state CM-1050 Engine Analyzer to track down problems in these areas or just use it to keep your car running smoothly.

This professional-grade instrument tests conventional, magneto, transistorized and most capacitive discharge systems with positive or negative ground.

It tests 3, 4, 6 or 8 cylinder engines of all kinds. The large, color-coded meter can display 0-32 volts on DC and 1 ohm to 100 kilohms. Other displays include: 0-6000 RPM, 0-60° dwell angle, -5 to 90 amps DC, and qualitative readings for point resistance, alternator and spark output. Separate input jacks permit current checks in conjunction with other functions and a switch-substituted condenser test for faulty ignition condensers.

All test leads, clips and special accessories (including a 32-page Operation Handbook) are supplied with this easy-to-build kit. The CM-1050 requires three "C" cells (not included) to operate.

Kit CM-1050, Shpg. wt. 8 lbs. **NO LONGER AVAILABLE**



## Professional tune-ups in your own garage with the 12-inch Deluxe Ignition Analyzer

**\$599<sup>95</sup>**

- Accurately displays primary and secondary waveforms
- Measures RPM, dwell angle and ignition voltage
- Tests ignition advance with optional timing light
- Includes illustrated, 75-page Operation Handbook

Designed for the auto hobbyist yet perfect for a professional garage operation, Heathkit's top-of-the-line Ignition Analyzer enables you to perform precision auto tune-ups every time. Rock-steady CRT parade and superimposed patterns are made possible by the latest design in inductive pickup circuitry. Select 4, 6 or 8 cylinder operation from front panel pushbuttons. Dwell, RPM and voltage measurements are easily read on a large 8-inch meter.

Cylinder select buttons short out cylinders for performing power balance checks and for electrical displays of one or more cylinders. Front panel switches allow both parade and superimposed displays of primary and secondary waveforms with 10:1 and 2:1 trace expansion. Four simple connections enable all tests. Analyzer includes adapter for GM HEI systems as well as all necessary cables, clamps and inductive pickup for full operation.

Kit CO-2600, Shpg. wt. 83 lbs. .... **599.95**

COA-2600-2, Alternator Test Adapter, Shpg. wt. 1 lb. .... **14.95**

Timing Light with Advance Meter plugs directly into the CO-2600 Analyzer and provides a bright timing flash that registers clearly at up to two feet, even in daylight. Built-in RPM/Advance scales measure RPM from 1500 to 4500 and distributor advance from 0 to 60 degrees. Includes 10' cable with connector.

Kit COA-2600-4, Timing Light, Shpg. wt. 3 lbs. .... **62.95**

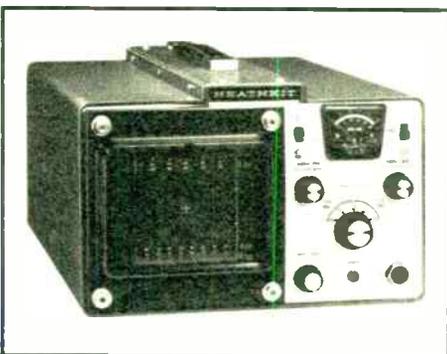
Analyzer Scope Cart stands at the right height for viewing the CO-2600 while working under the hood. This easy-to-build cart rolls smoothly on durable casters.

Kit COA-2600-3, Shpg. wt. 25 lbs. .... **49.95**



Includes a complete introduction to ignition analysis

**CO-2600 SPECIFICATIONS:** For Use With: Standard, transistorized or C-D ignition systems on 4, 6 or 8 cylinder (4-cycle) or 2-rotor Wankel engines. Front Panel Controls: Scope: Intensity, Vertical Position, Vertical Gain, Horizontal Position. Trace Length: 25 kV and 50 kV Secondary Volts, 50 V and 500 V Primary Volts, Parade, Superimpose and eight Power Balance/Single Cylinder pushbuttons plus Cancel, Tachometer 1000 RPM, 3000 RPM, 6000 RPM Voltmeter 2 VDC, 20 VDC Signal Pickup: Direct for primary, inductive for parade trigger and capacitive for secondary. Tachometer and Voltmeter Accuracy:  $\pm 3\%$  of full scale on any range. Meter Size: 8 inches. Scope Vertical Expand: Minimum 2 to 1. CRT Size: 12 inch diagonal. Operating Temperature Range: 32 F to 104 F (0 C to 50 C). Power Requirements: 110/130 or 220/260 VAC, 50/60 Hz. Net Weight: 53 lbs. (24 kg) Dimensions: 12 7/8" high x 25 1/4" wide x 14 1/4" deep (32.7 x 64.1 x 35.9 cm).



### Portable Ignition Analyzer

- Displays primary and secondary waveforms
- Uses clamp-on, inductive pulse pickup method
- Built-in dual range tachometer
- Operates with 3, 4, 6, or 8-cylinder engines

Diagnose and resolve most ignition problems fast with this handy Ignition Analyzer. Quickly detect difficult to pinpoint ignition problems.

Select one of four different patterns, primary or secondary in parade or superimposed displays. For a detailed analysis of a waveform's components, horizontal traces can be expanded 10 to 1 and the vertical sweep can be expanded 2 to 1.

Use it with any standard, transistorized or C-D ignition on 3, 4, 6, or 8-cylinder engines with distributors. Includes adapter for GM HEI systems. Optional 12-volt inverter mounts to the rear of the unit for portable operation. Accompanying handbook illustrates dozens of detailed cause-and-effect waveforms. Operates on 120/240 VAC.

Kit CO-1015, Shpg. wt. 22 lbs. .... **279.95**

Kit COA-1015-1, 12 VDC lighter-socket Power Inverter, Shpg. wt. 3 lbs. .... **39.95**



### Portable digital Engine Analyzer

- Measures dwell angle, engine speed, DC voltage, resistance and current
- 3 1/2 digit LCD display is easily readable even in bright sunlight

Versatility at an affordable price, that's the CM-1551. With this self-powered portable digital analyzer, you can make critical tune-up measurements to help determine if your vehicle is operating at peak performance. Check dwell on 4, 5, 6 and 8-cylinder engines from 0 to 90° within  $\pm 0.2\%$ . Check idle speed in two tachometer ranges up to 10,000 RPM with an accuracy of  $\pm 0.1\%$ . Measure DC voltage in two ranges up to 200 volts at  $\pm 1.5\%$ , current to 20 amps with  $\pm 3\%$  accuracy and resistance to 2 megohms at  $\pm 1.5\%$ .

Using the optional Shunt Accessory (below), the CM-1551 can measure starting current and battery charge/discharge currents. Power is supplied by a 9-volt battery (not included). Analyzer displays circuit polarity, low battery and overranges.

Kit CM-1551, Shpg. wt. 5 lbs. .... **129.95**

Kit CMA-1550-1, 400-Ampere Shunt, 1 lb. .... **15.95**

Award winning series consists of four modules, accessories



### Electrical Systems Course shows home car maintenance and repair

- Avoid costly repairs and save both time and money
- Learn to spot and fix most electrical problems yourself
- Learn with hands-on experiments

The Automotive Electrical Systems Course consists of four modules, each covering a separate section of an automobile's electrical system. Included are audio cassettes, clip leads, parts for experiments and a professional hydrometer. Learn automotive care, maintenance and repair at your own pace.

Earn 4.0 CEUs by passing the optional final examination with a 70% or better score and also receive a Certificate of Achievement.

Complete 4-Module Course and Accessories: EAC-1, Shpg. wt. 23 lbs. .... **39.95**

Module One, Electrical Principles: EA-11, Shpg. wt. 5 lbs. .... **14.95**

Module Two, The Starting System: EA-12, Shpg. wt. 5 lbs. .... **14.95**

Module Three, The Charging System: EA-13, Shpg. wt. 5 lbs. .... **14.95**

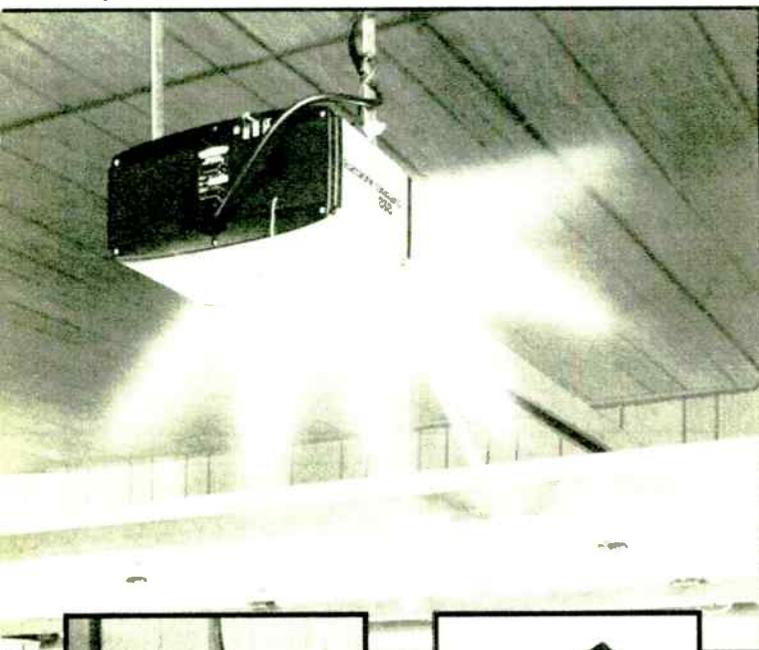
Module Four, Body and Accessory Circuits: EA-14, Shpg. wt. 5 lbs. .... **14.95**



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

World Radio History

# Dependable Moore-O-Matic Deluxe Garage Door Opener ends strain and struggle



**\$189<sup>95</sup>**

- The easiest-to-install screw drive system available
- Door-re-opens instantly if obstructed while closing
- Exclusive triple-thread drive system beats chain or belt-driven openers in long-life durability tests
- Security light comes on when garage door is opened

Convenience and security are often primary concerns for home-owners. Moore-O-Matic Garage Door Openers address both of these concerns — at an inexpensive price. Eliminate the need to fumble with a key-locked garage door and keep dry on your way to work and home — a security light sees you safely into the home.

The Electronic Command Garage Door Opener pays for itself in convenience and security. Touch the button on the remote transmitter and the door opens — 80 watts illuminate your garage. Touch the button again, the door closes and positively locks to prevent anyone from opening it from outside by hand (on the GD-3509, the light blinks when the door is closing). The security-timed light will remain on for about five minutes to let you get safely inside the house.

Designed for garage doors up to 18 feet wide and 7 feet high, the powerful 1/2 horsepower motor opens garage doors effortlessly. A shock absorber cushions vibrations and allows for up to two inches of ice buildup or other impediments. Up-limit, down-limit and obstruction pressures are adjustable. In case of difficulty, the quick-release trolley disengages with a simple string tug. A second tug resets the trolley.

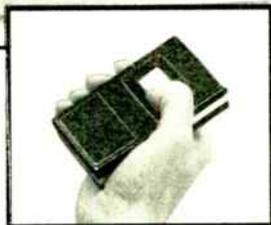
Solid-state transmitters and receivers use digitally encoded signals. You have 256 possible code combinations which you can set and change at anytime to eliminate interference from neighboring units. The electrical control circuits are contained on one removable circuit board, run by an on-board microprocessor.

Electronic Command Opener Systems can usually be installed in a single day, with do-it-yourself ease and no special tools. Requires 120 VAC, 60 Hz. Unit comes partially assembled with a Heath-approved manufacturer's manual for trouble-free installation.

- Transmitter, Receiver, Dual Switch and Screw-Drive Door Opener Mechanism.**  
 GD-3509, Shpg. wt. 41 lbs. Motor Freight ..... **189.95**
- Economical Chain-Drive Door Opener model includes Transmitter, Receiver and Single-button Wall Switch; has light, but without security-timing delay.**  
 GD-3409, Shpg. wt. 47 lbs. (UPS shippable) ..... **149.95**
- GDP-3309-A, Transmitter only, Shpg. wt. 1 lb. ....** **29.95**
- GDP-3319-A, One Transmitter, one Receiver for 3-wire system, 1 lb. ....** **59.95**
- GDP-3329-A, Two Transmitters, one Receiver for 3-wire system, 1 lb. ....** **89.95**
- Power Transformer for adapting 2-wire Opener to 3-wire system.**  
 GDA-3309-3, Shpg. wt. 1 lb. .... **9.95**



Two-button safety wall switch prevents accidental door movement



Single-button portable transmitter can be carried in purse or car

## Programmable Musical Auto Horn lets you express yourself musically



### Wiper Delay makes driving safer

- \$19<sup>95</sup>**
- Normal and delay modes
  - Variable wiper sweeps, from 30 to .5 seconds

The inexpensive CH-1068 is an easy, one evening project that keeps your view clear on the highway. Kit includes test lamp with special instructions to locate and identify hookup leads in your auto system. Designed to fit most single and 2-speed systems. Incompatible with motor-reversing hidden wipers; contact your auto dealer for specifics. Unit mounts quickly and easily using gimbal bracket or double-sided tape strip from kit

Kit CH-1068, Shpg. wt. 2 lbs. .... **19.95**



**\$49<sup>95</sup>**

- Choose from 16 pre-programmed tunes
- Efficient 5-inch diameter horn speaker mounts neatly

Inside the CH-1276 is a micro-processor with 16 permanent tunes. A full keyboard within the main chassis uses a 13-note octave, plus reset and hold keys for programming any tune you want into two open memory cells. External controls let you adjust the tempo to produce the quickness of a march tune, or slow down to the relaxed timing of 'Swanee River.' The three-button remote keypad



Knobs control volume and tempo on songs selected

Use 3-button keypad to select any tune stored in memory

4-ohm weather-proof speaker

mounts at any convenient location and lets you select and play any of the tunes stored in memory.

Kit CH-1276, Shpg. wt. 3 lbs. .... **49.95**

- William Tell Overture
- Yankee Oodles
- Oixie
- Stars and Stripes Forever
- Colonel Bogie March
- Reveille
- Taps
- Wedding March (Mendelssohn)



- Somewhere My Love
- Wedding March (Wagner)
- Never On Sunday
- O Sole Mio
- Greensleeves
- Charge!
- The Great Gate of Kiev
- Post Time



Credit Card Orders Call TOLL-FREE: 800-253-0570

# New high-efficiency collector panel is now A.R.I.-approved for California and Arizona!

## Solar energy is economical for do-it-yourselfers

As the cost of fossil fuel continues to rise, and ecological debates increase the national awareness of our environmental responsibility, all forms of alternate energy will become even more promising. But as the demand for highly efficient energy solutions goes up, so should the price. Considering active and passive solar heating, solar photovoltaic or wind-generated electricity, the Heathkit Solar Water Heater is the most energy-conscious product you can buy. It adds significantly more value to your home — quickly — by offering a faster payback. Now is the very best time to go solar.

We offer the highest quality solar components on the market. They're designed to meet our exacting standards as a reliable system. You probably cannot hire a contractor to install a system this good. Plus, you can save up to 40% over a comparable dealer-installed system.

Designed as a complement to your existing water heating system, the NS-1100 system is properly sized for your own climate, home size, family and hot water requirements by a sophisticated computer program run at your nearby Heathkit Electronic Center (also available by calling Heath's Marketing Services Dept. at 616-982-3411). *Plug into the sun!*

## Solar gives you the most for your money

- New solar panel absorbs even more sunlight
- Federal Tax Credits will pay for 40% of the total system invoice purchase price
- 38 states offer additional tax incentives
- Most systems recover cost in three years
- The Heathkit NS-1100-3 Manual Set answers all your questions about the system.

**Invest against soaring energy costs:** Hot water makes up a significant portion of the average home energy bill. And now, you can cut those energy costs — with the Heathkit NS-1100 Home Solar Water Heater. It's a high quality closed-loop system for maximum water heating efficiency, designed to save from 50% to 80% of the hot water bill for a typical home.

**The NS-1100 system preheats water** going to your conventional water heater — so instead of cold water, it receives solar-heated water. *This free preheating dramatically lowers the energy requirement of your water heater, allowing it to become a holding tank to keep water at the desired temperature.*

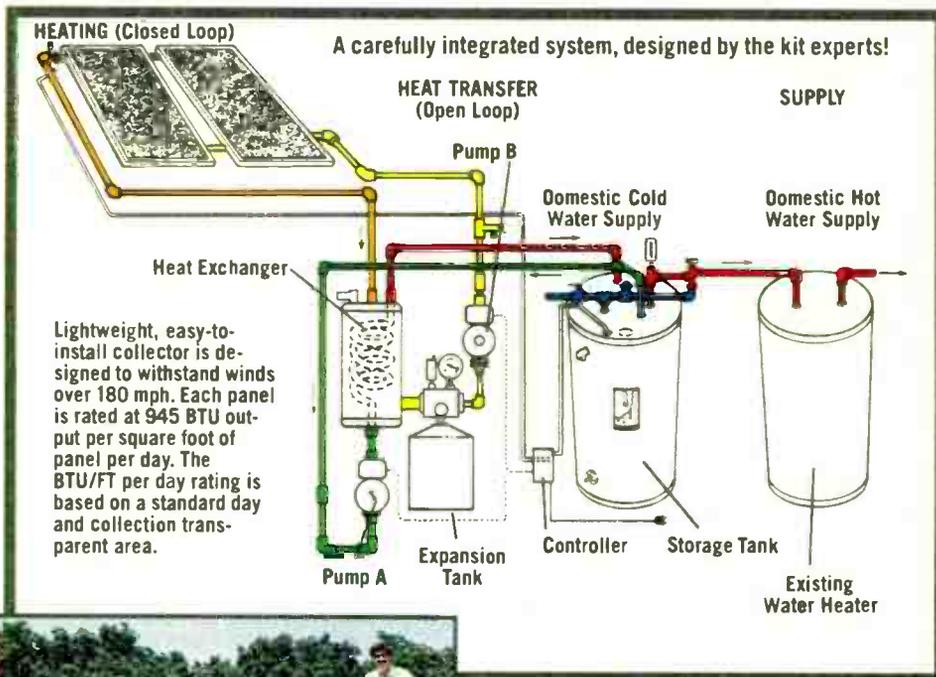
**The NS-1100 meets or exceeds applicable regulations of these organizations:**

1. International Association of Plumbing and Mechanical Officials
2. California Energy Commission
3. Southern building codes
4. Dade and Broward Counties, FL 180-mph Live Wind Load Requirement
5. The Florida Solar Energy Center

**Build it in as little as three weekends:** Only common carpentry and plumbing tools are required to assemble and install the NS-1100 Solar Water Heater in your home. The profusely illustrated, step-by-step Heathkit manual allows you to plan the complete kitbuilding and installation operation ahead of time. The NS-1100 Water Heater System includes all the components you need for kitbuilding and installation except ¾" copper pipe, insulation and solar fluid.

**Technical Consultants are available to answer questions:** Our unique personal consultation service (available at your Heathkit Electronic Center, by telephone or by mail), plus the thoroughly detailed kitbuilding and installation manual assure you of the Heathkit pledge — "We won't let you fail!"

**Declare your energy independence:** Your first step is to order the NS-1100-3 Manual Set and contact a Heathkit Electronic Center (or Heath Company at 616-982-3411) for the price of a system sized just for you. The manual clearly shows how easy it is to install the NS-1100 Solar Water Heater System, and our



Lightweight, easy-to-install collector is designed to withstand winds over 180 mph. Each panel is rated at 945 BTU output per square foot of panel per day. The BTU/FT per day rating is based on a standard day and collection transparent area.



No other Heathkit pays for itself like the NS-1100 Solar Water Heater System... and then starts paying you more!

unique computer program will show you the tax incentives that are available — and the payback timetable you can expect — from the system.

**SAVE 40% on the NS-1100-3 Manual Set** for the NS-1100 system! Written for people with little or no previous experience, it has the answers to all your questions — everything you need to know to install a customized Heathkit Solar Water Heater System successfully, including complete site evaluation, installation and operation information. A solar shade finder helps you find a site where no trees or buildings will block your solar panel from full sunlight. And the price of this Manual Set is deductible from the cost when you purchase a system.

**Think about the savings.** Think about playing a major role in the energy conservation effort. Be recognized as the Solar Authority in your neighborhood, and take pride in the fact that your solar investment will *always* continue to grow in value!

## SAVE twice with a 10% Spring discount AND tax credits.

All items for the NS-1100 Home Solar Heater System have been discounted 10% so you can start saving this summer on your water heating bills. And, this system keeps on saving you money throughout the year. A Federal income tax credit of 40%, plus state tax credits (if available), will also help you pay for your NS-1100 Kit. This credit is not a deduction. It means you receive back 40% of the system cost.

- SAVER! NS-1100-3, Manual Set, 3 lbs. . . . . Was \$25.00, NOW ONLY 15.00**
- Kit NS-1100-1, Plumbing Hardware Pack for NS-1100 systems, 65 lbs., Motor Freight Collect . . . . . Was \$589.95 NOW ONLY 386.95**
- NS-1100-12, 3' x 8' Solar Collector Panel and Mounting Hardware, 136 lbs., Motor Freight Collect . . . . . Was \$575 NOW ONLY 517.50**
- NS-1100-4, 80-Gallon Capacity Solar Tank, 350 lbs., Shipped Motor Freight Prepaid . . . . . Was \$429.95 NOW ONLY 386.95**
- NS-1100-5, 120-Gallon Capacity Solar Tank, 447 lbs., Shipped Motor Freight Prepaid . . . . . Was \$599.95 NOW ONLY 539.95**
- NS-1100-6, 5 Sq. Ft. Heat Exchanger, 18 lbs. . . . . Was \$169.95 NOW ONLY 152.95**
- NS-1100-7, 8 Sq. Ft. Heat Exchanger, 20 lbs. . . . . Was \$189.95 NOW ONLY 170.95**
- NS-1100-8, 8 Sq. Ft. Double-Walled Heat Exchanger (required in Oregon, Los Angeles and Memphis areas), 24 lbs. . . . . Was \$239.95 NOW ONLY 215.95**



Alaska, Hawaii and Michigan Residents: Call 616-982-3411



# Heath's GD-1298 Office Air Cleaner purifies the air in your work environment



## \$199<sup>95</sup>

- Gets rid of cigarette, pipe and cigar smoke, quickly
- Removes pollutants and pollen, dust and odors
- Portable and efficient, with quiet operation
- A one-evening project for the novice kitbuilder

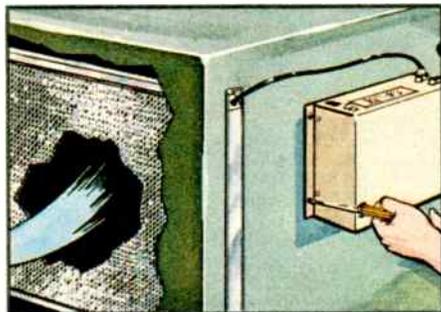
Enjoy the experience of "clean air living." On high speed, this table-top Air Cleaner quickly removes smoke and airborne particles from the air you breathe. At an adjustable low speed, it quietly keeps the air clean overnight. Compact size and light weight make the Office Air Cleaner portable — use it where you need it: in a meeting room, living room, kitchen, den. Keep the air clean in an area of approximately 15' x 20' x 8'.

## More home products to improve the quality of your living environment



Standard filter sizes

Compact power supply



### Clear the air of dust, dirt and unhealthy contaminants

## \$149<sup>95</sup>

- No metalwork or wiring — complete instructions at every step
- Removes 70% of airborne contaminants with each cycle
- Automatic — works with your furnace or air conditioner

Today's well-insulated homes need the Heathkit Electronic Air Cleaner. With each cycle, it removes 70% of airborne contaminants — dust, dirt, cigar and cigarette smoke, even allergens — trapped inside the home. The Electronic Air Cleaner works with your central heating or air conditioning system to automatically bring you cleaned and refreshed air you'll enjoy.

Easy to install in place of your old filter. The GD-2196 is ideal for allergy or hay fever sufferers. Breathe deeply and taste pure air again, while removing soot and grime particles before they can show up on your furniture and personal belongings! 120 VAC, 60 Hz Power Supply measures 8" H x 12" W x 4" D. One power supply and at least one filter needed for operation — two filters can be used with a single power supply. The filter unit replaces your present filter. Kits differ; check your furnace's filter size and capacity before ordering.

#### Electronic Air Cleaner Power Supply:

Kit GD-2196 (needs Filter Accessory below), Shpg. wt. 5 lbs. . . . . 149.95

Filter Accessory GDA-2196-1, 20" x 25" x 1," 1000 cfm, Shpg. wt. 3 lbs. . . 99.95

Filter Accessory GDA-2196-3, 16" x 25" x 1," 800 cfm, Shpg. wt. 3 lbs. . . 99.95

Remove irritating pollen, dust, mold spores and smoke particles, some as small as .01 microns (less than one-half millionth of an inch) in diameter. Three filters improve your working or living environment: a washable, foam prefilter removes large particles; the permanent electrostatic filter removes small particles; and a replaceable, activated charcoal filter absorbs odors. With the GD-1298, you won't have to go outdoors for a breath of fresh air.

Compare Heath's Office Air Cleaner with other portable air cleaners. Most of the small units consist of a foam filter, charcoal filter and fan, and are only designed to remove large particles and to reduce odors. Some of these small units have ion generators to make the air feel fresher. An electrostatic filter is required to effectively remove small particles from the air, and Heath charges its electrostatic filter with 6400 volts for maximum efficiency (a safety interconnect removes the charge for cleaning). Also, the Office Air Cleaner moves much more air past its filters than these other units.

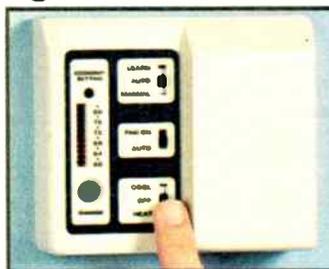
Just place the GD-1298 on a table or desktop, and plug it in. A front panel air intake and top clean-air vent make this Air Cleaner easy to place, and it's so quiet, no one will know it's there. A dependable centrifugal blower pulls in stale air at a continuously variable rate that you choose, from 100 CFM down. An easily adjusted internal control lets you set the minimum speed.

Discover the pleasure of kitbuilding, and save money. Even if you've never built a kit before, you can build the GD-1298 — in one evening. No soldering is required; plugs are used for all connections; and Heathkit's detailed manual takes you through assembly, step by step.

Kit GD-1298, Shpg. wt. 20 lbs. . . . . 199.95

GDA-1298-1, Replaceable charcoal filter, Shpg. wt. 2 lbs. . . . . 7.95

**GD-1298 SPECIFICATIONS:** Air Flow: Selectable, 0 to 100 CFM. Efficiency: High Speed: 70% of general airborne particles; 90% of all airborne particles; Low Speed: 85% of general airborne particles; 95% of all airborne particles. Ozone: Less than 0.2 ppm (.015 typical). Filter Units: Foam prefilter, ionizer and activated charcoal. Ionizer Power Supply: 6400 VDC at 0.2 mA. Power Requirements: 120 VAC, 60 Hz, 75 watts, max. Cabinet Finish: Southern pecan vinyl. Size: 5 1/2" H x 21 1/4" W x 10 5/8" D.



### Reduce Your Gas Bills With Intelligent Thermostats

- Set the temperature you want for the time of day you want
- Program up to six daily settings, for a full week
- Saves significantly more energy than any thermostat we know of

It makes sense! Program your furnace and air conditioner for a weekly cycle of temperatures between 60-82F.

Keep your home within 2° of the temperature you want, day-in/day-out. Use manual and "Slow-Cycle" functions to override programmed settings. Extra value — NE-1211 includes isolation relay (may be required with some systems).

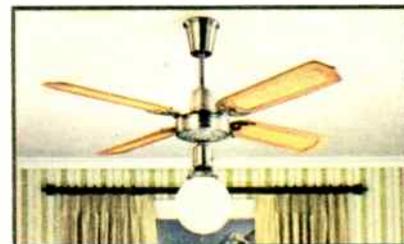
Kit NE-1211, Shpg. wt. 1 lb. . . . . 59.95

NEP-1210, Assembled, Shpg. wt. 1 lb. . . . . 79.95

### Stay comfortable all the time, in all seasons

## \$149<sup>95</sup>

- 52" tip-to-tip blades keep room air moving to conserve energy
- Stylish design complements any interior
- Decorative light kit at no extra cost



Assembles in less than an hour! Blade rotation reverses to move warm air from the ceiling or pull cool air from the floor. Attractive brass tone housing and reversible cane-wicker/solid surface blades blend with any decor. Operates on 120 VAC, 60 Hz and has a manufacturer's 3-year limited warranty.

Kit GD-1338, Shpg. wt. 25 lbs. . . . . 149.95



## Quickly remove dust, dirt, allergens, smoke and other contaminants from any room in your home



- Filtering eliminates 99% of pollen and 94% of harmful particles in the air
- Three filters purify the air and remove unpleasant odors
- Efficient, three-speed fan makes air-cleaning jobs easy
- Easy-to-clean prefilter and electrostatic filter

**\$289<sup>95</sup>**

The **Heathkit Portable Electronic Air Cleaner** takes on your toughest air-cleaning problems. Efficiently remove dust, dirt, smoke and other pollutants from 6,000 cubic feet—that's a 25' by 30' room with an 8' ceiling. Set this Air Cleaner for the task—three speeds tackle a variety of jobs: a full-speed 250 CFM quickly removes smoke from a room, and the low-speed 150 CFM quietly keeps the air fresh while you sleep.

**Use it year-round** for pennies a day. It's great for large gatherings of people when unpleasant smoke from cigarettes, pipes and cigars fills the air. In the winter, it helps keep the air fresh in modern, well-insulated, tightly-sealed homes. And in the summer, the removal of dust and pollen makes it easier for pollen-allergy sufferers to breathe indoors. Three filters work together to keep your air clean and fresh. A foam prefilter removes large particles from the air, and can be removed for washing or replacement. The electrostatic filter removes small particles from the air, and it's easy to clean. An easy-to-replace activated charcoal filter helps remove pesky cooking odors.

**It goes where you need it:** Four GDA-1297-1 Deluxe Casters (a \$13.95 value) are included at no extra cost. Just roll the Air Cleaner to where it's needed, and plug it in. The handsome Southern Pecan vinyl finish will blend with almost any decor. And this kit is simple to build—the power supply, variable speed fan control and filter are preassembled. Uses 120 VAC, 60 Hz. 26½" H x 17¼" W x 13½" D.

Kit GD-1297, Shpg. wt. 59 lbs. .... **289.95**

GDA-1297-2, Replacement Charcoal Filter for GD-1247/1297, Shpg. wt. 2 lbs. .... **9.95**

## A touch of the finger turns on the lights

**\$19<sup>95</sup>**

- Can also be used conveniently for small appliances, TVs, fans, etc.



FAST, EASY  
1-EVENING KIT



**Tap the sensor plate** and the remarkable Touch Control Switch turns small appliances or lights on instantly. No need to go to the expense and bother of installing new outlets or rewiring—the silvery touch plate mounts almost anywhere and connects to the plug-in controller unit with easily-concealed fine white wire (20 feet included). Two touch plates are included with each kit, or use any ungrounded metal, such as railing or doorknob as a sensor.

**Instant on/off control at your fingertips**, without the wiring problems of other switches! Maximum 300 watt load per unit; 150 watts per lamp. Use with TVs to 225 watts, fans to 180 watts and stereo, heaters, etc. to 300 watts maximum. Not for AM radios.

Kit GD-1287, Shpg. wt. 2 lbs. .... **19.95**

## Track down home energy thieves with a Heathkit Heat Sniffer

- Find air-leaks that cost heating and air-conditioning dollars

**\$24<sup>95</sup>**



FAST, EASY  
1-EVENING KIT



The answer to every home-owner's need for a quick and accurate way to track down energy-robbing drafts. Gaps in door frames and window sills can cost you a bundle in heating or cooling expenses by letting in cold or hot air from the outside. With the aid of the NE-2112 Heat Sniffer, you can locate those leaks in minutes.

**The Heat Sniffer is easy to use:** Locate drafts with pinpoint, electronic accuracy. Turn the unit on and adjust knob to silence unit. Then move the Heat Sniffer's sensor along places where heat or cooling losses might occur. Any change in temperature sets off a beeping alarm and a flashing LED.

**One-evening assembly:** Heathkit's comprehensive instruction manual leads you every step of the way. For use in ambient temperatures from 59-95°F (15-35°C). Requires a 9-volt battery (not included).

Kit NE-2112, Shpg. wt. 2 lbs. .... **24.95**

## Sound-Activated Switch turns on lights for you

- Instantly turns lights on when it hears you, turns them off when it doesn't
- LED helps you set audio sensitivity level
- Improves home security



Provide extra safety in halls and on stairways. The Sound-Activated Switch turns on lights for you when you enter the area, and saves lots of money by turning them off after you've gone. Solves the problem of children-leaving lights on. Operates up to 300 watts of 120 VAC lights. Only two controls—sensitivity adjustment sets the sound-triggering level, and a timing adjustment sets turn-off delay.

GDP-1270, Assembled, Shpg. wt. 1 lb. .... **29.95**

## Watt Wizard saves your money three ways

- Save up to 60% running motor-operated devices
- Protect motors against burn-out

**Triple savings:** As an energy-monitoring device, the Watt Wizard qualifies for a 15% tax credit of the purchasing price—save up to 60% of the cost of running some motorized electrical devices and prolong the life expectancy of appliances. Just plug it in, and start saving. The Watt Wizard Power Factor Controller is proven efficient!

NEP-1662, Assembled, 1 lb. .... **39.95**



# Move into the world of robotics

**SAVE...newly reduced prices on HERO 1 kits, accessories and completely assembled robots can save you up to \$300. Check the prices below.**

**See HERO 1 at IPRC '84**  
Come to the first International Personal Robot Congress and Exposition in Albuquerque, New Mexico and see HERO 1 star with other personal robots. Join in the excitement from April 13-15.

## HERO contains all the basic systems of today's industrial robots



On-board computer provides Intelligence

Includes rechargeable batteries and charger

Programmed from keyboard, teaching pendant, or cassette port

Senses light, sound, motion and distance

Speaks with optional phoneme synthesized voice

Three-wheeled base drives and steers HERO

**Programmable robot:** Completely self-contained, HERO 1 is capable of interacting with its environment. It detects light, sound, motion and objects in its path. It can travel over a set course and repeat specific functions on a predetermined schedule. With an optional arm and voice, HERO 1 can grasp items and speak.

**A computer on wheels:** HERO 1 is controlled by an on-board 8-bit 6808 microprocessor. Following programmed instructions, the microprocessor can guide HERO 1 through complex maneuvers, activate and monitor its sensors, and modify the robot's actions as a result of sensor or real-time clock inputs. To store user-programmed instructions, Hero comes equipped with 4K of RAM memory. An 8K ROM stores a number of built-in commands and speeches.

**Three programming methods:** HERO 1 can be programmed by entering instructions through the hexadecimal keypad mounted on top of its head. By using a hand-held remote control teaching pendant, manually-controlled motor and arm movements can be programmed into memory. This pendant can be used to select individual motors and their directions of rotation. Another method of programming HERO 1 is through a rear-panel serial cassette port. By connecting an ordinary audio cassette recorder here, programs can be saved on a cassette tape and then reloaded into the robot.

**Four sensor circuits:** Within HERO 1's head are four sensors which act as its eyes and ears. A sound detector hears sound from 300 to 5000 Hz while a light detector sees light over the visible spectrum. A motion detector senses movement up to 15 feet away and a sonar system determines range.

**Learn by doing:** HERO 1 provides a hands-on knowledge of industrial electronics, mechanics, computer theory and programming as applied to robots by putting them into action. An experimental breadboard is also included for experiments and interfacing user-designed circuits to the on-board microprocessor. The top-mounted breadboard has direct access to a user I/O port, a user defined interrupt, CPU control lines, and +12 VDC and +5 VDC. For a more extensive background in robotics and its associated technology, a companion Robotics Education Course (see opposite page) is available.

Hero's hand can grip small objects, pivot, rotate and open up 3 1/2"

Optional arm provides five axes of motion and lifts one pound when fully retracted

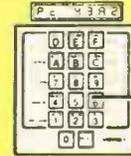
I/O board guides data between the CPU and HERO's motor and sense circuits

Real time clock and calendar accurately tracks the time of day and the date

Teaching pendant provides a quick and easy way to program complex arm and body movements

Side panels snap off for easy access to circuit boards

Stepper motors rotate the arm, wrist, and extend and retract the gripper up to 5"



Hexadecimal keypad is used to enter, check, and modify programs and select modes

Top-mounted senses include motion, sound, and light detectors and a voice

HERO's sonar system determines range and direction of objects between 4" and 8'

Plug-in circuit boards are easily removed for experimentation or maintenance

Two independent +12 VDC supplies provide power to the logic circuits and the motor drive circuits

Front wheel drives and steers HERO around objects and provides exceptional maneuverability with its 12-inch turning radius

Rechargeable gel-type batteries are protected by an automatic voltage sensor - external charger is included

Clear and easy-to-follow instructions guide you through each kitbuilding step

**Rechargeable batteries with charger:** When HERO 1 tells you that its voltage is low, use the external battery charger even while it is operating.

**Grasps small objects:** With the optional ET-18-1 Arm and Gripper Mechanism, HERO 1 can be programmed to pick up small items. Using five stepper motors, the robot is capable of five axis of motion. On command, the gripper can open up to 3 1/2" and close, the wrist rotates 350 degrees and pivots 180 degrees, the arm pivots 150 degrees, and the arm extends up to 5 inches.

**Speech Synthesizer:** The ET-18-2 Speech Synthesizer gives HERO 1 a voice. It uses a phoneme-based synthesizer system that generates 64 phonemes (speech sounds). The phonemes are then linked together by your computer program to simulate human speech or various sound effects.

**Kit ET-18, Basic HERO 1 Robot (less arm, voice), 69 lbs. .... 999.95- 799.95**

**ET-18-1, HERO 1's Arm (Arm and Gripper Mechanism), 6 lbs. .... 399.95- 349.95**

**ET-18-2, HERO 1's Voice (Phoneme Speech Synthesizer) 1 lb. .... 149.95- 99.95**

**ET-18-4, Demo ROM, plug in ROM containing several routines demonstrating all HERO 1's motor and sense circuits, including voice, Shpg. wt. 1 lb. .... 49.95**

**ET-18-5, Monitor ROM Listing, Shpg. wt. 1 lb. .... 39.95**

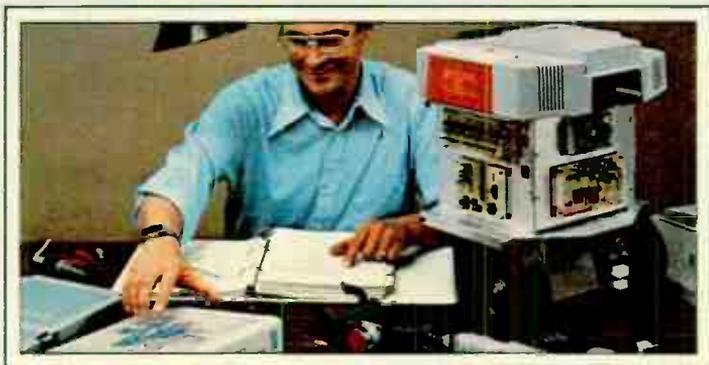
**NEW! ET-18-7, Automatic Mode ROM, enables the robot to operate automatically by utilizing inputs from its various sensors. Shpg. wt. 1 lb. .... 29.95**

**ETW-18, Assembled Robot (with arm, voice), 70 lbs. .... 2499.95- 2199.95**

**SAVE \$50.00! Kit ETS-18, complete HERO 1 Robot (with arm and voice). Shpg. wt. 91 lbs. .... \$1549.95 separately, NOW ONLY 1499.95- 1199.85**



## Learn all the fundamentals of robotics with this comprehensive course in robot technology



**\$99<sup>95</sup>**

- Step-by-step self-study approach covers the entire field of robotics
- Two volumes filled with illustrations, charts and diagrams to enhance your learning
- Hands-on experience is provided by optional experiments performed on the teaching robot — HERO 1
- Receive credit by passing final exam

**Comprehensive course:** The Robotics and Industrial Electronics course is an A to Z look at how robots work. It reviews elementary electronic principles used in robotics and introduces new concepts associated with robots.

**Course objectives:** In this self-study course, you master each concept before proceeding to the next. You start with the terminology used with low, medium, and high-technology robots. Progressing at your own speed, you become acquainted with the operation of various AC and DC motors and generators, industrial hydraulic and pneumatic systems, and DC stepper motors. Microprocessors are introduced and how to write robot control programs. Then sensing systems are covered along with voice synthesis, which allows a robot to talk, and the skills required to make a robot perform tasks.

**These subjects are covered in the Heathkit/Zenith Robotics Course:**

- |                                |   |
|--------------------------------|---|
| 1. Robot Fundamentals          | 6. Heathkit/Zenith Robot Microprocessor |
| 2. AC and Fluidic Power        | 7. Data Acquisition (Sensors)           |
| 3. DC Power and Positioning    | 8. Data Handling and Conversion         |
| 4. Microprocessor Fundamentals | 9. Voice Synthesis                      |
| 5. Robot Programming           | 10. Interfacing                         |
|                                | 11. Industrial Robots at Work           |

**Programmed reviews:** During your studies, you'll find many self-test reviews. Each review is designed to reinforce the material presented. You use these short quizzes to test your understanding of the material. Also, these quizzes can be used as a guide to determine what areas may require further study.

**Hands-on experiments:** Accompanying this course are optional experiments which are performed on the unique robotics and industrial electronics trainer, HERO 1 (opposite page). Together, the Robot and course provides you with a tremendous learning opportunity. A chance to learn, practice, and apply the basic principles of industrial electronics, computers, automated equipment, sensors, servos, stepper motors, controllers, and other basic elements of industrial robots. While working with HERO 1, you gain practical and hands-on experience with the basic elements of robotics: programming, electronically-controlled movement and positioning, interfacing and data acquisition.

**Recognition and credit:** Pass the optional final examination with a 70 percent or better score and receive a handsome Certificate of Achievement that's suitable for framing from Heathkit/Zenith Educational Systems. Also, you'll earn 8 Continuing Education Units (CEUs) which is a nationally-used method of recognizing achievement in non-credit adult education.

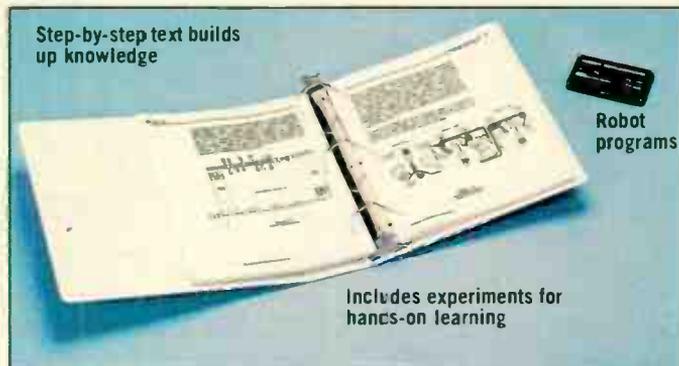
**Prerequisites:** To better understand the material covered in the Robotics and Industrial Electronics Course, you should complete the following subjects or have a basic knowledge about them: EE-3101A DC Electronics (p. 70), EE-3102A AC Electronics (p. 71), EE-3201A Digital Techniques (p. 73), and EE-3401 Basic Microprocessors (p. 74).

EE-1800, Robotics Course, Shpg. wt. 12 lbs. .... **99.95**



## Continue your education in robot technology with a course in Robot Applications

Step-by-step text builds up knowledge



Includes experiments for hands-on learning



**\$99<sup>95</sup>**

- Course briefly reviews basics of robotics and introduces new concepts
- Provides a knowledge base to keep you abreast of changing robotics field
- Uses HERO 1 to perform experiments including the construction and use of an EPROM burner
- Gain recognition and earn credit

**Course objectives:** In the Robot Applications Course, you'll learn the concepts and technologies that make advanced industrial robots a reality. You'll learn many of the factors that govern the selection of an industrial robot based on management and workplace environment conditions. Signal conditioning, the process of getting the signal from the sensor to the microprocessor controller, is covered in depth. A detailed study of sensor systems is reinforced by a number of experiments designed to give you hands-on experience with sensor systems. You'll construct vision, tactile, and environmental feedback types of sensors. With the programs provided with this course, you'll be able to produce a variety of sensor systems. When you have finished this course, you'll be able to understand both the capabilities as well as the limitations of today's robots.

**These subjects are covered in the Robot Applications Course:**

- |                              |                                       |
|------------------------------|---------------------------------------|
| 1. Management Considerations | 4. Tactile Sensing                    |
| 2. Environmental Feedback    | 5. Computer Aided Manufacturing (CAM) |
| 3. Vision Systems            | 6. Robot Applications                 |

**Programmed reviews:** As with other Heathkit/Zenith courses, you'll find many self-test reviews during your studies. They are there to reinforce the material in the lessons. Use these short quizzes to test your understanding of the material you've covered and as a guide to determine what areas, if any, in which you may need further study.

**Hands-on experiments:** Along with the Robot Applications Course are ten experiments that are conducted on the versatile robotics and industrial electronics trainer, HERO 1 (opposite page). An audio tape supplied with the course contains several programs for HERO 1 which are used in doing the experiments. These experiments are a hands-on opportunity to become acquainted with the concepts and technologies you have studied in the text. Experiments covered in the course include: a smoke detection/vocal warning system, a heat sensor, color discrimination, object identification, vision-aided positioning, array tactile sensor, a controller memories/EPROM burner, stationary home security robot, mobile intrusion alarm, and a mobile home security robot. All components needed to successfully complete the experiments (including a programmable ROM) are included with the course.

**Recognition and credit:** Upon completion of the optional final examination and with a passing grade of 70% or better, you receive from Heathkit/Zenith Educational Systems a Certificate of Achievement that's suitable for framing. You'll also earn 4 Continuing Education Units (CEUs). This is a nationally recognized method of awarding achievement in non-credit adult education.

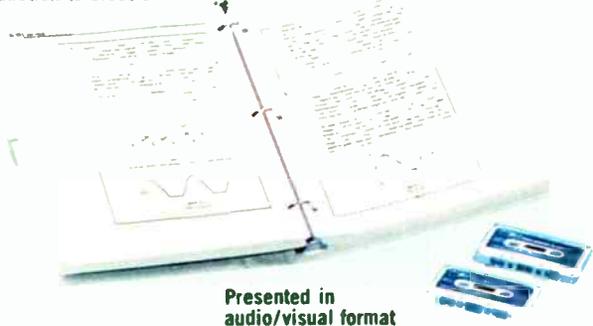
**Prerequisites:** For a fuller understanding of the material in this course, the completion of the EE-1800 at the left is highly recommended.

EE-1812, Robot Applications Course, Shpg. wt. 6 lbs. .... **99.95**



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

**Fundamentals of electricity and an introduction to electronics**



Presented in audio/visual format

**Concepts of Electricity Course for the beginner**

**\$29<sup>95</sup>**

- Provides a working knowledge in the fundamentals and concepts of electricity
- Incorporates a unique audio/visual learning method
- Expands into the areas of circuit theory and associated electromechanical systems

**From the very beginning:** For those without previous knowledge or experience in the field of electronics, the Concepts of Electricity Course is designed to examine the subject at a beginner's level. At the same time, this Course acts as an introduction to other electronics courses on the following pages. You begin by learning with an audio/visual presentation of the fundamental concepts of direct current. Accompanying sound is included on audio tapes clipped to the Course's binder. This DC background is then expanded into the areas of circuit theory and associated electromechanical systems such as motors, generators and meters.

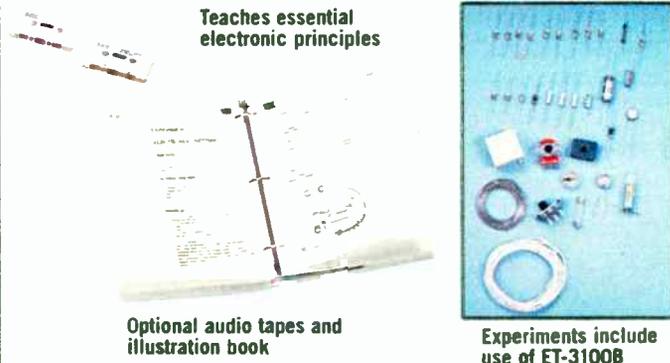
**Reviews:** Each audio/visual section is followed by a programmed instruction section designed to reinforce what you have just covered. And, a unit review at the end of each unit tests your understanding of the material.

**Course Goals:** When you complete this Course, you'll be able to explain the difference between DC and AC, and be able to explain the operation of DC and AC generators and motors. After completing the Course in your own step-at-a-time pace, you'll know the difference between resistors, capacitors, diodes and other electronic components. Beside being able to solve basic problems involving current, voltage, and resistance, you'll know how to measure them.

**Final Examination:** After completing the Course, you can take a Final Examination. Besides being an excellent learning activity, it provides a comprehensive review of the material you've covered. With a passing grade on the Exam, you are awarded an attractive certificate and 1.0 Continuing Education Unit.

EE-3100, Concepts of Electricity Course, Shpg. wt. 5 lbs. .... 29.95

**Teaches essential electronic principles**



Optional audio tapes and illustration book

Experiments include use of ET-3100B

**Electronics Course stresses DC principles**

**\$49<sup>95</sup>**

- Contains a comprehensive and complete background coverage of basic DC electronics
- Uses an optional audio-visual accessory package to enhance the learning process
- Provides positive reinforcement with experiments

**DC electronics coverage:** An ideal point at which to begin your electronics training, the EE-3101A Course teaches the necessary principles needed for an understanding of DC electronics. The subjects covered include: current, voltage, resistance, Ohm's Law, magnetism, electrical measurements, DC circuits, inductance and capacitance. This course also contains instructions on the use of a multimeter to check current, voltage, and resistance. For your convenience, a list of objectives previews each unit.

**Self-instructional learning:** Heathkit/Zenith's programmed learning allows you to work at your own pace. Review tests are provided so that you can check your progress while reinforcing what you learned. An optional audio/visual package contains two audio tapes and a 123-page illustration booklet with over 230 illustrations to enhance your learning experience. Also included are experiments to help you see concepts as they are put into use. These experiments use the ET-3100B Experimenter/Trainer (below) and a multimeter, like the IM-2260 (p. 25). By taking the final exam and passing with a score of 70% or better, you can earn 2.0 Continuing Education Units and be awarded a handsome certificate from Heathkit/Zenith Educational Systems.

EE-3101A, DC Electronics Course, Shpg. wt. 6 lbs. .... 49.95

EEA-3101A, Optional Audio-Visual Accessory, Shpg.wt. 2 lbs. .... 19.95

**SAVER!** Save \$20 with the purchase of both the DC Electronics Course and the ET-3100B Kit Experimenter/Trainer. Separately they cost \$149.90.

EES-3101B, Includes EE-3101A and ET-3100B, Shpg. wt. 17 lbs. **ONLY 129.90**

**Increase your learning success with hands-on experience**

Experimenter and designing tool in one unit

Compact, rugged, reliable, and versatile tool

Variable power supplies and 200 to 200 kHz generator



Solderless breadboard sockets for circuits

**\$99<sup>95</sup>**

- Used to complete experiments in all electronic courses
- A versatile design tool for experimental circuits
- Handy built-in test features

**ET-3100B Electronic Design Experimenter:** Provides a greater understanding of electronics by allowing circuits to be quickly constructed, modified, and tested. Designed for hands-on use with experiments in the DC, AC, Semiconductor, Electronic Circuits, Electronic Communications, Electronics for Hobbyists and Test Equipment Courses. Also, doubles as an excellent prototyping tool for the design and testing of circuits.

ET-3100B, Trainer, 6 lbs. .... 99.95

ETW-3100B, Assembled, 6 lbs. 169.95

**Tutorial Electronics Dictionary**



**Tutorial Dictionary:** More than clearly defined meanings are found in this 832-page source of technical terms. Besides fully illustrated pages, this Dictionary contains a summary of 16 electronic-related topics.

These outlines allow this informative Dictionary to become a low-cost self-instructional course in electronics. Each topic outline lists related terms, making your Dictionary an effective learning tool. Approximately 20,000 terms are covered in a clear and concise manner.

EB-1010, Shpg. wt. 3 lbs. .... 14.95

**AC Electronics Course takes over from DC Course**

**Self-study format**

**485-page text enhances understanding of AC**

**Optional Audio-Visual Package**

**All parts included for completing experiments**

**Covers the solid-state technology of semiconductors**

**450 page text**

**Updated with the latest information**

**Audio-Visual Accessory Package available as an option**

**All parts are included for the Course's 11 experiments**

## AC Electronics Course teaches principles of AC

**\$54<sup>95</sup>**

- Designed to give a firm foundation in the principles of AC electronics through text and experiments
- Shows how various components react in AC circuits
- Demonstrates the application and use of different components in many AC circuits

**Complete coverage:** The self-instruction AC Electronics Course advances your knowledge of electronics with a comprehensive coverage of all the principles of alternating current. Proven programmed-instruction format presents AC theory, measurement, and circuit behavior. Your studies are reinforced with programmed reviews and hands-on experiments. To perform these experiments, you'll need the ET-3100B Electronic Design Experimenter on page 70. A multimeter (like the IM-2260 Digital Multimeter on page 25) and an oscilloscope (IO-4105 Oscilloscope on page 29), or their equivalents, are also recommended for the experiments. After completing and passing the optional final exam with a 70% or better score, you earn 1.5 Continuing Education Units and receive a Certificate of Achievement. Completion of the EE-3101A DC Course, or an equivalent knowledge, is recommended before starting this Course. In addition, an optional audio-visual presentation is available with added lesson reinforcement and a different slant of the material in the text.

- EE-3102A**, AC Electronics Course, Shpg. wt. 7 lbs. .... **54.95**  
**EEA-3102A**, Optional Audio-Visual Accessory Package, Shpg. wt. 2 lbs. ... **19.95**  
**SAVER!** Purchase the AC Course and the ET-3100B Trainer together and save \$20 from the cost of separate purchases.  
**EES-3102B**, EE-3102A and ET-3100B Kit Trainer, Shpg. wt. 19 lbs. **ONLY 134.90**  
**Spanish Language AC Electronics Course:** Spanish translation of this course, less EB-6102-30 Parts for the experiments (see page 85).  
**EE-3102S**, AC Electronics Course in Spanish, Shpg. wt. 7 lbs. .... **59.95**

## Solid-state Semiconductor Devices Course

**\$54<sup>95</sup>**

- Examines semiconductor materials and their electrical properties to form a basic foundation of study
- Completely covers diodes, transistors, and integrated circuits and how they are used
- Increases understanding of concepts with experiments

**Self-instructed semiconductor education:** Step-by-step you learn about the micro-sized world of diodes, transistors, and integrated circuits. At your own speed, you build concept on concept until you've developed a complete understanding of semiconductor theory. Then you examine zeners, bipolar transistors, FETs, thyristors, UJTs, and others to see how they are made, how they operate, and how they are used. Programmed reviews check your progress and optional experiments reinforce your understanding of important concepts. To perform the experiments, you'll need the ET-3100B Experimenter on page 70. A multimeter, (like the IM-2260 Digital Multimeter (p. 25) or an equivalent is recommended for these experiments. After scoring 70% or better on the optional final exam, you receive a certificate for framing and earn 3.0 CEUs. Before starting this Course, you should have completed the EE-3101A DC Course and EE-3102A AC Course or have an equivalent knowledge. An optional audio-visual package is available to help make your learning even easier.

- EE-3103A**, Semiconductor Devices Course, Shpg. wt. 6 lbs. .... **54.95**  
**EEA-3103A**, Optional Audio-Visual Accessory Package, Shpg. wt. 2 lbs. ... **19.95**  
**SAVER!** Save \$20 when you purchase both the EE-3103A Semiconductor Course and ET-3100B Trainer at the same time.  
**EES-3103B**, EE-3103A and ET-3100B Kit Trainer, Shpg. wt. 18 lbs. **ONLY 134.90**  
**Spanish Language Semiconductor Devices Course:** Spanish translation of this course, less EB-6103-30 Parts Package for experiments (see page 85).  
**EE-3103S**, Semiconductor Devices Course in Spanish, Shpg. wt. 6 lbs. ... **59.95**

### MONEY-BACK GUARANTEE

If you are dissatisfied with any self-instruction course for any reason, return all course materials (except trainer) and your receipt for a full refund of purchase price.

### Save \$60 on entire Fundamental Electronic Series

Purchase the DC and AC Electronics, Semiconductor Devices, Electronic Circuits and Test Equipment Courses along with the ET-3100B Kit Trainer.  
**SAVER!** **EE-3115B**, Above Courses and Trainer, 66 lbs. .... **329.70**



Accredited by the NHSC



Licensed school - State of Michigan

### Approved by nationally recognized organizations

Heathkit/Zenith Continuing Education is accredited by the National Home Study Council and licensed as a school by the State of Michigan. These acknowledgements are your assurance that all Heathkit Self-Instruction Programs are quality self-study programs.



### Earn College credit for many Heathkit/Zenith courses

The American Council on Education recommends that member colleges grant credit for several of our courses. Consult "The National Guide" for course recommendations. If you have taken and passed the examinations on pages 70 to 74 (EE-3101, -3102, -3103, -3104, -3105, -3201, -3401) or EC-1100 on page 60, you may be eligible for college credit. If your college

participates in this program, and you have taken the course and passed the final exam, order the Heathkit/Zenith College Credit Program Exam. To order, simply take the course number (for example EE-3101) and change the prefix to ECC. In our example, you would specify ECC-3101 to order the exam.

**ECC-3101, ECC-3102, ECC-3103, ECC-3104, ECC-3105, ECC-3201, ECC-3401, ECC-1100**, Shpg. wt. 1 lb. each ..... **each 25.00**



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## Electronic Circuits – from theory to practice

\$64<sup>95</sup>

- Updated to include the latest in available information
- Put the knowledge you've learned in previous Heathkit/Zenith courses to work for you, building more skills
- "Hands-on" experiments add to enjoyment, and explain technical concepts presented in the course
- Optional audio-visual accessory package available

With the Heathkit/Zenith Electronic Circuits Course you go directly from theory into practice. Like all Heathkit/Zenith courses, your text carefully and completely explains all concepts presented. You build fact upon fact, leading to complete mastery of a subject. Clear illustrations explain difficult points and add to your understanding of the information presented within the easy-to-understand text.

The Heathkit/Zenith Electronic Circuits Course exposes you to the circuits you'll find in everyday electronics – and explains them fully.

The proven self-instruction format lets you learn at your own pace: Professionally-prepared text, backed up by easy-to-understand visuals, let you learn more now – and retain more knowledge for years to come.

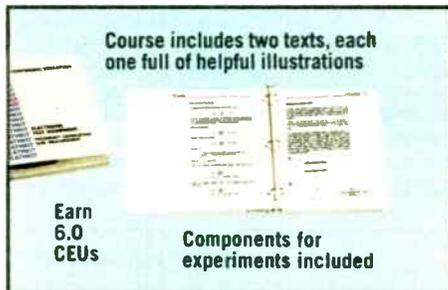
The Electronic Circuits Course will teach you how to identify power supply rectifiers, filters and regulation circuits – and explain how they work. You'll develop an understanding of amplitude and frequency modulation along with the heterodyne principle and modulation and detection circuits. You will be able to construct transistor and integrated circuit amplifiers, oscillators, active filters and pulse-shaping circuits; power supplies and power supply regulation circuits – even a basic amplitude modulation and demodulation system.

Like all Heathkit/Zenith Courses, the Electronic Circuits Course leads you step by step through this challenging subject. Contained within the clear and easy to understand text are sections on basic amplifiers; including the importance of amplifiers, amplifier configurations, biasing and coupling. The next section brings you a discussion of typical amplifiers. Details are provided on audio amplifiers and push-pull, power, video, RF and IF amplifiers. Then on to operational amplifiers, power supplies, oscillators, pulse circuits and finally the various types of modulation.

## Test Equipment Course covers applications

- Learn to use a wide variety of test equipment, oscilloscopes and meters
- Practical experience is stressed by experimentation

\$64<sup>95</sup>



This course gives you the knowledge you need to make measurements with digital and analog meters; explain the operation of, and use, the oscilloscope in electronic testing and servicing. You'll also learn to use frequency generators and frequency counters. A section on special measuring instruments covers bridge circuits, transistor testers, curve tracers, spectrum analyzers and logic probes. The optional Audio-Visual Accessory Package enhances the effective teaching process.

The Fundamental Electronics Courses, (EE-3101A-3104A) and the Heathkit/Zenith Course on Digital Techniques, EE-3201A or equivalent knowledge, are suggested as background information. In addition to the textbook and electronic components, we suggest access to the following materials to complete the experiments: A digital meter, analog meter, oscilloscope, frequency generator and frequency counter and the ET-3100B Trainer.

Pass the optional final exam with a score of 70% or more and earn 6.0 CEUs.

EE-3105A, Shpg. wt. 9 lbs. . . . . 64.95

**SAVER! EES-3105B**, EE-3105A and ET-3100B Kit Trainer, 21 lbs. **ONLY 144.90**

EEA-3105A, Audio-Visual Accessory Package, Shpg. wt. 2 lbs. . . . . 19.95

Optional audio-visual presentation available

Clear and precise text

For full value from this accredited course, pass the optional final exam and earn 4.0 CEUs plus certificate

All necessary components are included

Included with your Electronic Circuits Course is a well-illustrated and concise text, complete with an attractive and durable vinyl binder. You are also supplied with over 100 electronic components for use in the 18 experiments outlined in the text. The optional Audio-Visual Accessory Package aids your understanding. You should complete DC and AC Electronics and Semiconductor Devices Courses (EE-3101A-3103A) or have equivalent knowledge. We suggest an oscilloscope like the Heathkit 10-4105 (p. 29), a VOM and the ET-3100B Trainer to complete the experiments.

Earn 4 Continuing Education Units (CEUs) and a Certificate of Achievement from Heathkit/Zenith Educational Systems: Pass the optional final exam with a 70% or better score.

EE-3104A, Shpg. wt. 7 lbs. . . . . 64.95

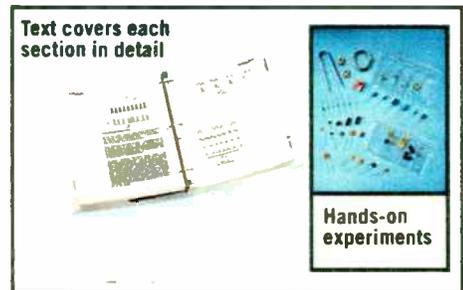
**SAVER! EES-3104B**, EE-3104A and ET-3100B Kit Trainer, 19 lbs. **ONLY 144.90**

EEA-3104A, Audio-Visual Accessory Package, Shpg. wt. 2 lbs. . . . . 19.95

## Detailed Electronic Communications Course

- Develop expertise in electronic communications techniques
- Components for seven experiments included; ET-3100B Trainer required

\$59<sup>95</sup>



The Electronics Communications Course from Heathkit/Zenith allows you to develop an understanding of broadcast and data communications fundamentals.

It covers a wide variety of information including communication fundamentals – amplitude and angle modulation and the communications system. You'll learn about amplitude modulation circuits, suppressed carrier AM and single-sideband. A section on AM receivers includes AM detectors and superheterodyne receivers. Sections on angle modulation, pulse modulation, antennas and communications systems are also included.

Seven hands-on experiments will add to your understanding. Build an AM transmitter, a balanced modulator, FM transmitter, receiver, pulse modulator, time division multiplex transmitter and a communications modem.

Course suggested as a follow-up to EE-3101A-3104A. Successful passage of final exam worth 2.0 CEUs, and a personalized Certificate of Achievement.

EE-3106A, Shpg. wt. 7 lbs. . . . . 59.95

EEA-3106A, Audio-Visual Accessory Package, Shpg. wt. 2 lbs. . . . . 19.95

Kit ET-3100B, Trainer, Shpg. wt. 6 lbs. . . . . 99.95



## Prepare for microprocessors with the Heathkit/Zenith Digital Techniques Course

**\$89<sup>95</sup>**

- Learn to design and apply modern digital circuitry
- Costs less than college or tech school courses
- Loaded with 24 practical, hands-on experiments to reinforce the learning experience

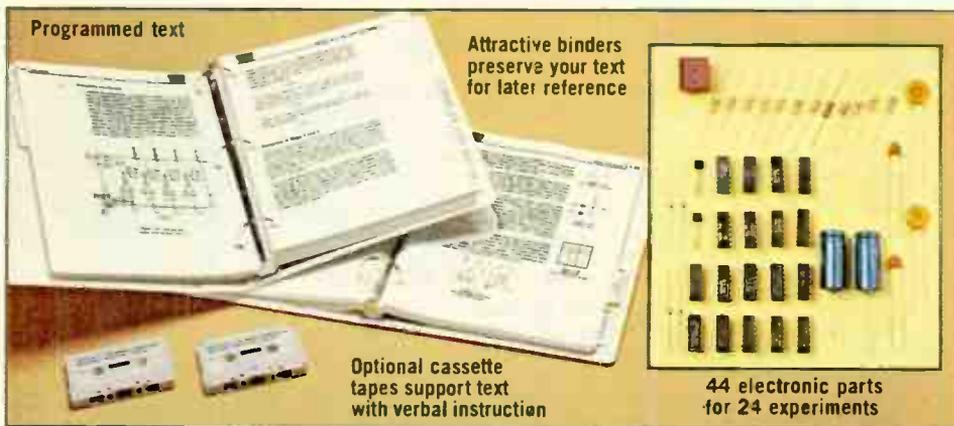
**Study what you want, when you want:** The course begins with fundamentals and theory of digital techniques, and familiarizes you with digital logic circuits, Boolean algebra, flip-flops and

registers, sequential logic circuits, combinational logic circuitry and digital design — a wealth of knowledge at a low price. After completing the course, you'll know how to design digital circuitry for virtually any modern electronic application.

**A money-back guarantee ensures your satisfaction** with this and all the Heathkit/Zenith Self-Instruction Courses. Because we're that sure that we've put together the information you need in the clear, comprehensive format you expect. If the course doesn't meet your expectations, simply return all course materials (excluding Trainer) and your receipt for a full refund of the purchase price.

**Profuse illustrations, audio aids and experiments speed comprehension** of concepts and practical applications presented in the text. You learn three ways — by reading, listening and doing — a method that helps you understand complex subject matter easily and naturally. Programmed reviews, included with each unit of the Digital Techniques Course, aid retention of important points and help you check yourself before moving on to the next concept. Unit exams further summarize material and test your understanding of the course material.

**The Course includes text** in two heavy-duty vinyl binders, a pair of optional audio



Programmed text

Attractive binders preserve your text for later reference

Optional cassette tapes support text with verbal instruction

44 electronic parts for 24 experiments

cassettes, and 44 electronic components for performing 24 useful experiments. A prior knowledge of electronics is assumed (Heathkit Zenith DC, AC, Semiconductors and Electronic Circuits Course on pages 70-72 of this catalog, or equivalent). The ET-3200B Trainer is required for experiments; recommended instruments are a multimeter like the IM-2260 (page 25) and a single-trace oscilloscope like the IO-4105 (page 29).

**Earn 4.0 Continuing Education Units** with a grade of 70 percent or above on the final examination, and receive a Certificate of Achievement from Heathkit/Zenith Educational Systems.

**EE-3201A**, Shpg. wt. 7 lbs. .... **89.95**

**SAVE \$15.00 — buy the Digital Techniques Course and the ET-3200B Trainer Kit together.** \$189.90 if purchased separately.

**SAVER! EES-3201B**, Shpg. wt. 19 lbs. .... **ONLY 174.90**

**EEA-3201A**, Optional Learning Cassettes, Shpg. wt. 2 lbs. .... **19.95**

## Trainer ensures easy mastery of digital techniques

**\$99<sup>95</sup>**  
Kit

- Perform a wide range of digital experiments
- Increase your understanding of digital techniques
- Test your own digital circuits

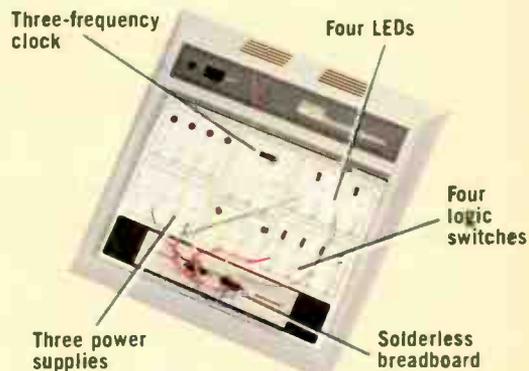
**Put your digital knowledge to work** with the high-quality ET-3200B Electronic Trainer. Designed for the experiments in both the Digital Techniques and CMOS Digital Techniques programs, the ET-3200B Trainer is a useful tool which speeds comprehension and practical application of course material. This versatile trainer also allows you to build and test prototypes, confirm circuit operation, and test digital ICs. Solderless breadboard sockets make experimenting and de-

sign easier and faster, with a flexible capacity for eight 14-pin or 16-pin dual in-line ICs, and 24-28-, or 40-pin DIPs. Has four binary data switches, two no-bounce switches to pulse logic circuits, a three-frequency pulse clock generator and four LEDs for logic-state indication.

**Built-in regulated power supplies** furnish +12 VDC at 500 mA, -12 VDC at 100 mA and +5 VDC at 500 mA. The Trainer is compatible with RTL, TTL, CMOS, ECL, NMOS, PMOS and Linear. 120/240 VAC. Build it yourself and save \$80 over our assembled price.

**Kit ET-3200B**, Shpg. wt. 6 lbs. .... **99.95**

**Factory Assembled and Tested Trainer.**  
**ETW-3200B**, Shpg. wt. 6 lbs. .... **179.95**



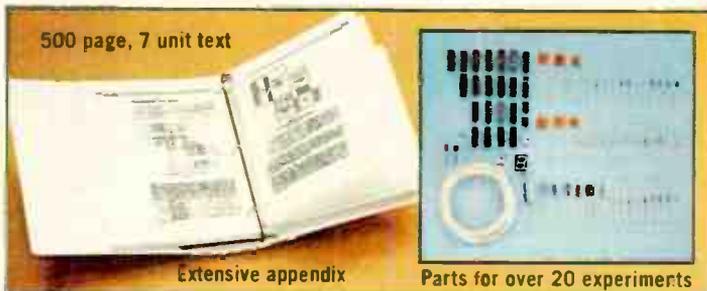
## CMOS Techniques Course brings you up-to-date

**\$89<sup>95</sup>**

- Stresses practical applications and in-circuit advantages
- Learn to interface between CMOS and other logic families
- Learn more by doing, with our proven teaching methods

**Practicality makes CMOS** (complementary metal-oxide-semiconductor) devices desirable; our practical course uses a learn-by-doing approach, with experiments that illustrate course topics — components included.

**Basic CMOS concepts through advanced applications** are covered, including interfacing, logic blocks, multivibrators, counters and registers, and analog applications. EE-3201A or equivalent knowledge is a prerequisite. The ET-3200B Trainer (described above) is required to perform the experiments; we also suggest using an oscilloscope like the IO-4105 (page 29), and a multimeter like the IM-2260 (page 25). Earn 3 CEUs.



500 page, 7 unit text

extensive appendix

Parts for over 20 experiments

**EE-3202A**, Shpg. wt. 6 lbs. .... **89.95**



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# Learn about microprocessors, microcomputers and programming at your own pace with this award-winning Heathkit/Zenith Course



- **COMPLETE:** Covers all the basics of microprocessors, microcomputers and programming – even includes hands-on hardware/memory interfacing and programming experiments
- **EFFICIENT:** Programmed-learning design and audio visual aids, combined with 19 hands-on experiments, mean you learn about microprocessors faster and more effectively
- **PROVEN:** The Heathkit/Zenith Microprocessor Self-Instruction Course has introduced thousands of people like you to microprocessors, microcomputers, interfacing and programming
- **ECONOMICAL:** Learn effectively for less – with our complete guarantee of satisfaction

As soon as you begin the **Microprocessor Self-Instruction Course** from Heathkit/Zenith Educational Systems, you will start learning about microprocessors, microcomputers and computer programming in a complete, efficient and well-organized way. You'll understand microprocessor basics, computer arithmetic, programming and interfacing – everything you need to know to get a headstart in the exciting world of computers.

**No previous background?** The Heathkit/Zenith Microprocessor Course has adopted the finest models of successful self-instruction technique. Concise, steady-paced textbooks,

colorful audio-visual presentations and hardware experiments make important microprocessor theory, application and design easier for you to understand.

You start by learning or reviewing the basics of computer number systems and codes. Next, you apply that knowledge as our prize-winning Microprocessor Course takes you step-by-step through



computer arithmetic, programming, examination of popular microprocessors, interfacing and input/output operations you can put to use immediately.

The **Heathkit/Zenith Microprocessor Course** is organized into ten learning units: **Unit 1, Number Systems/Codes**, covers decimal, binary, octal and hexadecimal numbering systems; conversions, binary codes and positional notation. **Microcomputer Basics, Unit 2**, teaches you terms and conventions, introduces you to several instructions and shows how programs are written and executed. **Unit 3, Computer Arithmetic**, covers binary addition, subtraction, multiplication and division, two's complement arithmetic and Boolean logical operations like NOT, AND, OR, Exclusive-OR and INVERT.

The fourth unit of the Course is an **Introduction to Programming**, including branching, conditional branching, algorithms and programming instructions. **The 6800 Microprocessor is covered in Units 5 and 6**, and includes a study of architecture, instruction set, addressing modes, stack operations, subroutines, input/output operations and interrupts. **Units 7 and 8 teach the important concept of Interfacing.** You'll learn the fundamentals of interfacing, interfacing

**SAVER!** Order EE-3401 Course and ET-3400A Trainer together. If purchased separately, \$339.90. **ETS-3400A**, Shpg. wt. 25 lbs. **ONLY 314.90**

## Our Microprocessor Trainer helps you learn about computers, interfacing and programming procedures the hands-on way

Functioning as a miniature digital computer, the ET-3400A Trainer is used with the experiments in the EE-3401 and EE-3402 courses. It features a built-in 1K ROM monitor program for controlling unit operation. It also has a six-digit hexadecimal 7-segment LED display for address and data read-outs, and monitoring internal logic states.

The **17-key hexadecimal keyboard** permits you to access memory location to examine contents, then step forward or backward to examine other memory locations, change the contents of memory locations, examine and/or alter any of the MC6808 microprocessor's internal registers, set break points for program debugging, or reset the MPU. The flexible instruction set of the MC6808 permits five addressing modes, and uses two accumulators, an index register and stack pointer.

The **ET-3400A has 512 bytes** of Random Access Memory (RAM) built-in. It also features 8 buffered binary Light-Emitting Diodes (LEDs) for display of breadboard logic states, 8 SPST DIP switches for binary input to breadboarding circuits, and a breadboarding socket for prototyping, memory and

interfacing circuits.

All microprocessor address, control and data busses are terminated on the front panel for ease of connection to prototyped circuits. There's also provision for a 40-pin external connector to expand memory and I/O capacity. Built-in +5, +12 and -12 VDC power supplies provide internal power needs. The ET-3400A requires 120 VAC, 60 Hz power. Draws 30 watts. Dimensions of the Heathkit ET-3400A Microprocessor Trainer are 3½" H x 12½" W x 11¾" D (8.89 x 30.99 x 29.85 cm), without the ETA-3400 Trainer Accessory.

The programming and interfacing experiments supplied with the EE-3401 and EE-3402 courses are implemented on the ET-3400A. The Trainer is a flexible general-purpose training unit and microprocessor breadboard. Use it in other applications that require a low-cost, microprocessor-based software development system, or as a design aid for developing special interfaces. Team it up with the ETA-3400 Microprocessor Trainer Accessory (opposite page) for increased personal micro-computing power and versatility.



For serious students, the ET-3400A Microprocessor Trainer and ETA-3400 Microprocessor Trainer Accessory are a superior pair of educational tools.

Kit ET-3400A, Shpg. wt. 7 lbs. .... 239.95  
 ETW-3400A, Assembled, 6 lbs. .... 339.95  
 Kit ET-3400-AE, Trainer for 240 VAC, 50 Hz power, Shpg. wt. 6 lbs. .... 249.95



Programmed-instruction Course, with audio-visual aids and hands-on experiments, teaches effectively

Worth 8.0 CEUs

Includes 62 components for experiments

Random Access Memory (RAM), interfacing with displays, interfacing with switches, the Peripheral Interface Adapter (PIA) and using the PIA.

**Programming experiments are the subject of Unit 9.** You will write and experiment with a wide variety of increasingly complex programs. In an early experiment you will actually turn the ET-3400A Trainer (described below) into a teaching machine that will give you drills and practice in computer numbering systems. In later experiments in the Course, you will use all instructions and addressing modes. You experiment with subroutines, stack operations, and more.

**In the final unit of the Heathkit/Zenith Microprocessor Course, Interfacing Experiments,** you put into practice everything you have learned about programming and interfacing. Using the electronic components supplied with the Course, you convert the ET-3400A into a digital clock, a musical instrument and a digital voltmeter. You experiment with address decoding, PIAs, input and output of data, parallel-to-serial conversion techniques, digital-to-analog and analog-to-digital conversion techniques, and interrupts.

**Units 1-6 and Unit 9** assume no prior knowledge of electronics. Units 7, 8 and 10 assume knowledge equivalent to the Heathkit Zenith EE-3201A Digital Techniques Course (described on page 73).

**This course comes with 62 electronic components**—everything you need to complete the course experiments. These components include RAMs, a Peripheral Interface Adapter (PIA) chip, a digital-to-analog converter, op-amps and a variety of other microprocessor-oriented devices. The ET-3400A Microprocessor Trainer (below, left) is required to perform the experiments.

**Passing the optional final exam,** with a 70% or better score, will earn you a full 8.0 CEUs. A classroom version of this course is available on page 85.

**With the computer age upon us,** now is the time to begin your education in microprocessors, microcomputers, and programming by ordering the tried and proven Heathkit/Zenith EE-3401 Microprocessor Course today.

**To continue your microprocessor education after completing this course,** take the **EE-3402 Microprocessor Interfacing Course on page 77.** It picks up where this course left off—and uses the same ET-3400A Trainer.

EE-3401, Shpg. wt. 12 lbs. . . . . 99.95

Optional Film Slides duplicate the audio-visual flip charts.  
EE-3401-1, Shpg. wt. 2 lbs. . . . . 60.00

Optional 35mm F8mmstrip duplicates audio-visual flip charts in filmstrip form.

EE-3401-2, Shpg. wt. 1 lb. . . . . 20.00

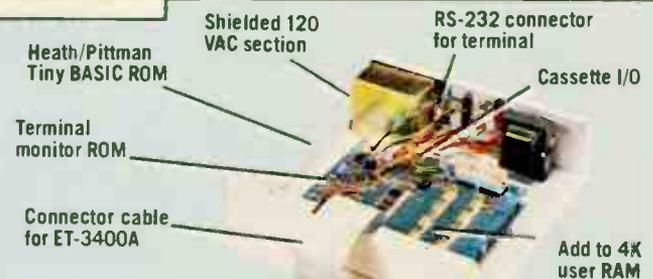
**SAVER!** Order EE-3401, ET-3400A, ETA-3400 and ETA-3400-1 together. Save \$70; \$564.85 separately.  
ETS-3401A, Shpg. wt. 46 lbs. . . . . ONLY 494.85

## ETA-3400 Accessory turns Microprocessor Trainer into a complete microcomputer system

**When you add this Accessory,** you turn your ET-3400A Trainer into a computer system. It provides you with more computing power—so you can run longer, more sophisticated programs through your ET-3400A Trainer. The Accessory's memory can even be expanded to 4K bytes of RAM by adding the optional ET-3400-1 3K Chip Set (order from the listing below).

**A serial interface with EIA and 20 mA loop formats in the Accessory** allows you to hook up a smart video terminal, such as the Heathkit H Z-29 on page 30, or a 20 mA ASCII teletypewriter machine. It also provides a cassette interface, enabling you to store programs on convenient cassettes. The ROM monitor/debugging program lets you implement the standard trainer monitor functions through the external terminal. Memory locations can be examined or changed, break points can be initiated, and program debugging can be accomplished with a single-instruction step feature. A tiny BASIC Interpreter in ROM lets you program in easy-to-learn BASIC language. User function lets you run machine code routines from BASIC—the same machine code routines you learn in the EE-3401 Microprocessor Course.

**The ETA-3400 connects to the ET-3400A Trainer** by means of a 40-pin ribbon cable (supplied). Parts required to modify the trainer are included. Since this modification changes the clock frequency of the Trainer, experiments in the EE-3401 and EE-3402 courses which use timing loops will be changed. It is recommended that all EE-3401 and EE-3402 experiments be completed before adding the Accessory. H Z-29 or Z-49 Video Terminal is required to use BASIC and monitor software features of the ETA-3400.



The ETA-3400 Microprocessor Trainer Accessory converts the ET-3400A into a full personal microcomputer system.

For 120/240 VAC, 50/60 Hz. The ETA-3400 measures 3" H x 11" W x 12" D.

Kit ETA-3400, Shpg. wt. 8 lbs. . . . . 175.00

EWA-3400, Assembled and tested, Shpg. wt. 8 lbs. . . . . 275.00

ETA-3400-1, Optional 3K Chip Set, Shpg. wt. 1 lb. . . . . 49.95



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## The 6809 Microprocessor Course: Learn to program and interface this popular family

**\$99.95**

- Includes an assembled module which converts your ET-3400 or ET-3400A into an advanced 6809 microprocessor trainer
- This advanced microprocessor has a flexible instruction set with over 1400 different commands available
- Text has 10 programming experiments which give you hands-on experience with the 6809 family

**Advanced – and effective – learning:** Progress to programming and interfacing this extremely fast logic

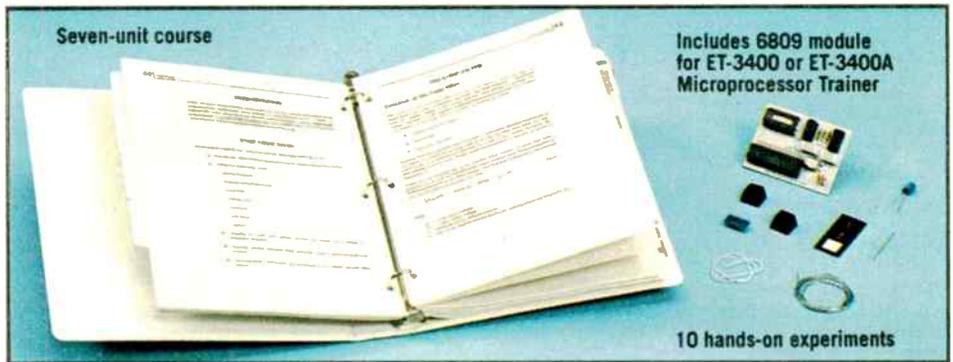
processor with the Heathkit/Zenith EE-3404 6809 Microprocessor Course.

The seven-unit text covers 6809 programming and interfacing completely: In Unit 1, you learn Fundamental 6809 Concepts and Chip Structure—including the 6809 design philosophy, evolution and improvements. 6809 Addressing Modes are discussed in Unit 2. Unit 3 covers 6809 Registers and Data Movement Instructions, while Arithmetic, Logic and Test Instructions for the 6809 are taught in the fourth unit.

Branch and Miscellaneous Instructions are covered in Unit 5. The sixth unit covers 6809/6809E Input and Output Signals—while 6809/6809E Interfacing and Applications are the subjects of the final unit.

**Adapter module included:** The course includes a special adapter module which converts the ET-3400 or ET-3400A Microprocessor Trainer into a 6809-based microprocessor trainer. This assembled module includes a handy debugging routine, contained in the 2 KB ROM monitor program. NOTE: This module is compatible only with the ET-3400.

**Four appendices are included with the text:** They include listings for the 6809/6809E Instruction Set and the 6820/6821 Peripheral Interface Adapter (PIA), specification sheets for the MC6809/MC68A09/MC68B09,



MC6809E/MC68A09E/MC68B09E, MC6829, MC6839 and MC6842, microprocessors and peripheral devices, and a summary of the MC6809 instruction set.

**Hands-on programming experiments enhance your understanding of the subject:** Ten optional programming exercises, which use the ET-3400 or ET-3400A Microprocessor Trainer (not included), reinforce the concepts presented in the text for maximum retention and educational benefit.

**Prerequisite:** The prerequisite for taking the EE-3404 6809 Microprocessor Course is successful completion of the EE-3401 Microprocessor Course or equivalent knowledge.

**Earn 3 Continuing Education Units and a Certificate of Achievement:** Pass the optional final examination, with a score of 70 percent or better, to receive these items of recognition from Heathkit/Zenith Educational Systems.

**Fully guaranteed:** If you're not completely satisfied, return all course materials (less trainer) for a refund of the purchase price.

**EE-3404**, Shpg. wt. 6 lbs. . . . . **99.95**

## Complete Voice Synthesis Course explains the latest fundamentals and techniques

- Covers voice synthesis hardware and software
- Includes complete chip sets for digitized and phoneme voice synthesis applications
- Experiments in the text give hands-on experience

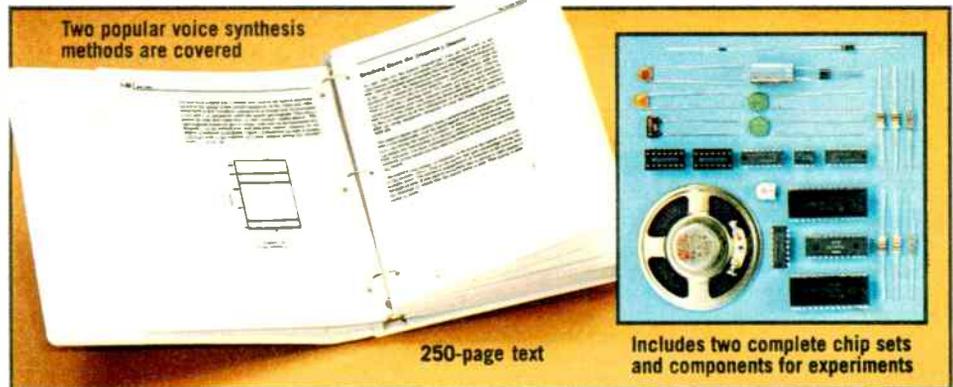
**Get on speaking terms with your computer:** The Heathkit/Zenith EE-3403 Voice Synthesis Course teaches you this state-of-the-art technique in an easy-to-follow format with hands-on experiments that will have your ET-3400 or ET-3400A Microprocessor Trainer talking to you in no time. This five-unit course consists of a 250-page text filled with experiments in voice synthesis, along with the chip sets and other electronic components necessary to complete the experiments.

**Covers two voice synthesis methods:** The course teaches both digitized voice synthesis (fixed vocabulary with human voice qualities) and phoneme voice synthesis (which allows you to reproduce any English word and almost all pronounceable sounds).

**Practical course features a great deal of experimentation:** EE-3403 cuts through the technical fog and gets right down to how to program and interface the two most popular voice synthesis methods. The course is also valuable in helping you understand the alternatives available in speech synthesis. It can be a real money-saver to a design engineer, for example, who wants to explore the wide range of capabilities and problems of various synthesizers.

**Complete chip sets for digitized and phoneme voice synthesis are included:**

1. The digitized chip set contains both a ROM chip and a synthesizer chip—featuring a vocabulary totaling more than 200 words.
  2. The phoneme synthesizer is self-contained on a single chip.
- If purchased separately, the chip sets alone would cost over \$150.



**Course covers subject completely:** The five-unit text covers voice synthesis in a clear, concise manner. You'll also learn the basic hardware and software necessary for breadboarding computer-synthesized speech—and the programming and interfacing you'll need for both digitized and phoneme voice synthesis. And it prepares you to write machine code programs tailored for the ET-3400 and ET-3400A Microprocessor Trainers.

**When you complete this course,** you'll be able to make your Heathkit/Zenith ET-3400 or ET-3400A Microprocessor Trainer (necessary for the course—see page 74) talk. To better prepare yourself for the material in the Voice Synthesis course, the EE-3401 Microprocessors Course (page 74) or equivalent knowledge is needed.

**Earn 3 Continuing Education Units and a Certificate of Achievement:** Pass the optional final examination with a 70% or better score.

**EE-3403**, Shpg. wt. 4 lbs. . . . . **129.95**



## Low-cost Heathkit/Zenith Educational Course demonstrates Microprocessor Interfacing



**\$99<sup>95</sup>**

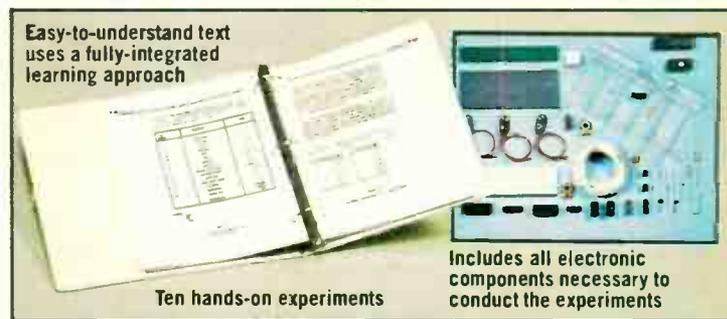
- Add to your microprocessor knowledge with this course, which details interfacing techniques and concepts
- Begins where the EE-3401 Microprocessor Course ends – and offers a logical continuation to your studies
- Provides in-depth coverage of the 6800 microprocessor family and introduces the powerful 6809 and 68000
- Money-back guarantee – if you are not satisfied, return your course materials for a refund of the purchase price

You can afford to continue your study of microprocessors with this low-cost course from Heathkit/Zenith. It's a natural follow-up to the EE-3401 Microprocessor Course.

**Complete and detailed texts:** As with all Heathkit/Zenith courses, the EE-3402 Microprocessor Interfacing Course is written in a unique programmed self-instructional format. Carefully and expertly prepared, 750 pages of text lead you step-by-step until you've mastered each concept. Unit examinations check your progress and can show where you need further study.

**A total of eleven in-depth learning units** and ten optional hands-on experiments teach the necessary fundamentals and practical skills for proper interfacing of microprocessor-controlled components. Individual topics you explore include the Advanced Peripheral Interfacing Adapter (PIA), analog conversion, serial data communications, peripheral and memory devices, programmable timers, an in-depth discussion of the 6809 Advanced Microprocessor, and three sections on the 68000 Advanced Microprocessor. Four detailed appendices contain useful listings, data sheets and a summary of the 6800 family for quick reference.

**Ten experiments:** With these focused experiments to expand your experience, you



Easy-to-understand text uses a fully-integrated learning approach

Ten hands-on experiments

Includes all electronic components necessary to conduct the experiments

can reinforce the knowledge gained through the texts. All components required for the experiments are included with the course. To perform the experiments, you'll also need the ET-3400 or ET-3400A Microprocessor Trainer. **Pass the optional enclosed final exam** with a score of 70% or better and earn 7.0 Continuing Education Units and another Certificate of Achievement.

**Prerequisite:** You should complete the EE-3401 Microprocessors Course, or have equivalent working knowledge, before attempting this follow-up course.

**Money-back guarantee:** If you're not satisfied, return the course materials (not applicable to Trainer) to Heathkit/Zenith for a full refund.

**EE-3402, Shpg. wt. 11 lbs. .... 99.95**

### SAVE \$30<sup>00</sup> on your microprocessor education!

Purchase the complete microprocessor set (shown at right) and save \$30 to apply elsewhere. Everything you want to know about microprocessors and how to successfully interface them is included.

**You get both courses and a powerful trainer:** The award-winning EE-3401 Microprocessors Course and popular Microprocessor Interfacing follow-up course are yours, plus the ET-3400A Trainer kit, which is required to perform the 29 course-related experiments. If purchased separately, you would spend \$429.85.

**SAVER! EES-3402, Shpg. wt. 49 lbs. .... 399.85**



Includes both the Microprocessors Course and Microprocessor Interfacing Course along with the ET-3400A Trainer for experimentation

## Microprocessor Applications Course teaches practical ways to adapt and utilize $\mu$ P power



**\$99<sup>95</sup>**

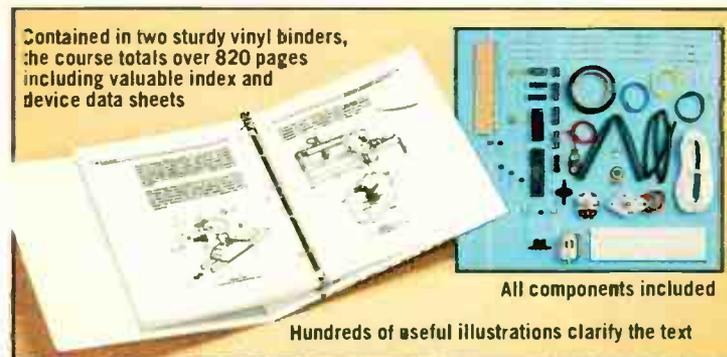
- Puts previous knowledge of microprocessors to work quickly, as you apply them in "real world" situations
- 55 components, including IO, ICs are supplied for use with Trainer to complete 13 high-level experiments
- Written in the educator-preferred, Heathkit/Zenith style with unit reviews and a final exam worth 8.0 CEUs

The possible applications of microprocessors are almost endless and only limited by the imagination. Dedicated computer intelligence in such everyday items as automobiles, appliances and toys is becoming commonplace – yet it is only a beginning. Because of the microprocessor, just about any electromechanical device is a candidate for computer control. The next few

years will see increasingly widespread application of this technology.

**EE-3405 was written to help students bridge the gap** between their daily analog world and the digital world of the microprocessor. The fundamental methods of microprocessor programming and interfacing (presented in EE-3401 and -3402) to perform simple I/O tasks, are prerequisite to having a microprocessor actually sense, control and quantify "real world" events, as outlined in this course. When you master these various techniques, you will be well on the way to joining and taking an active part in the microprocessor applications revolution.

**The Course begins** with a two-unit discussion of Digital-to-Analog and Analog-to-Digital Conversion. Units 3 and 4 cover Sensors, Transducers and Detectors. Unit 5 teaches the interfacing of electronic/electrical Control Devices and Stepper Motors, such as those used in robotics. The application principles and microprocessor control of Phase-Locked Loops are presented in Unit 6.



Contained in two sturdy vinyl binders, the course totals over 820 pages including valuable index and device data sheets

Hundreds of useful illustrations clarify the text

All components included

The last text unit is titled **Microprocessor Applications – Present and Future**, and was written to stimulate your imagination by examining several actual and possible microprocessor applications. Following that, 13 interesting experiments will demonstrate and reinforce the most important text concepts in a clear, effective way. You'll build and apply microprocessor control to a thermometer, photometer, programmable digital frequency synthesizer, position and velocity sensors, optical counters, stepper motor, voltage/frequency converters and more.

**To perform the experiments**, you'll need the ET-3400 or ET-3400A Microprocessor Trainer featured on page 74, plus a VOM and an oscilloscope.

**EE-3405, Shpg. wt. 10 lbs. .... 99.95**



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

EDUCATION/77



# Master the fundamentals of high-performance 16-bit microprocessors with the Advanced

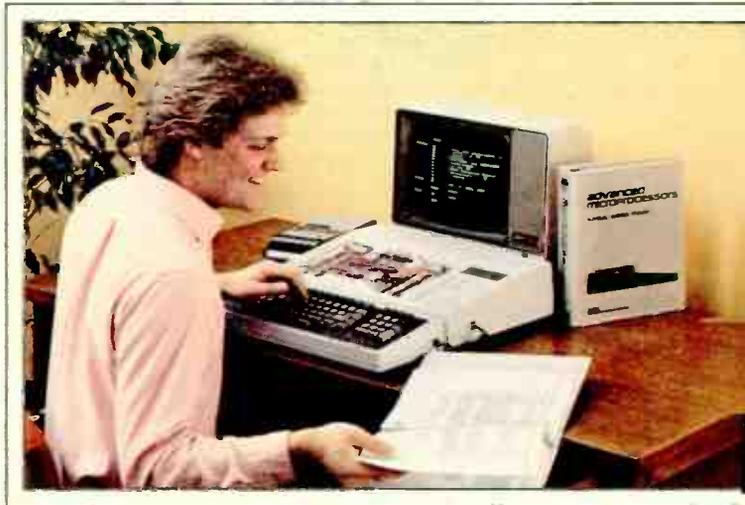
\$99<sup>95</sup>



- Learn to program and interface powerful and incredibly fast 16-bit microprocessors
- Gain an in-depth understanding of the 8088 microprocessor used in the H/Z-100, IBM-PC, DEC Rainbow 100 and many others
- Reinforce your studies with experiments from the course that are designed to illustrate concepts learned in each unit
- Perform all experiments on the unique ET-100 Trainer that is actually a versatile low-cost, cassette-based, 16-bit computer
- Upgrade the Trainer into a disk-based 16-bit computer system capable of running all Heathkit/Zenith 16-bit software

**Complete training system:** Heathkit/Zenith introduces a truly remarkable, dual learning package. The first half consists of an Advanced Microprocessors Course...EE-8088. A comprehensive training course, it provides an in-depth study of 16-bit microprocessors and covers terms, architecture, and programming. In addition, thorough coverage is given to interfacing the microprocessor to its support devices and to the outside world. The second half is a one-of-a-kind 16-bit training computer, the ET-100 (see below). Available separately, the ET-100 supports the EE-8088 as a working computer-trainer. When the course is completed, the ET-100 can be used as a valuable learning tool, a low-cost engineering proto-typing fixture, or a very powerful computer.

**Future technology:** Already being used to control some personal and small-business computers, 16-bit microprocessors are expected to dominate the marketplace in the very-near future. To help you keep up with this trend, the Advanced Microprocessors Course eases you into the world of 16-bit computing. It begins by acquainting you with microprocessor terms and then introduces assembly language. Progressing at your own speed, you then proceed through program writing, addressing modes, memory, logic and control lines, and dynamic and static RAM. After completing the EE-8088 Course, you'll have acquired a solid background in 16-bit microprocessors.



**Hands-on learning:** To bring your study material to life, the EE-8088 provides more than three hundred pages of experiments. These include experiments in software programming and hardware interfacing. Because it is both a trainer and a computer, both types of experiments can be carried out on the ET-100 Trainer. Together, the EE-8088 Advanced Microprocessor Course and ET-100 Trainer provides you with the knowledge and experience to master 16-bit microprocessors and computers.

**Course materials:** An easy-to-read self-instruction program, the EE-8088 consists of 1200 pages of text divided into ten units. Units one through eight cover the subject material and units nine and ten contain experiments to be done following each completed unit. Included with the course are all the parts necessary for performing every end-of-unit experiment.

## Our most advanced computer trainer, the world's lowest priced 16-bit computer, is now priced even lower

- Has buffered access to all the 8088's address, data, and control lines
- Permits solderless computer circuit building on its large breadboard
- Teaches basics of 16-bit microprocessing with EE-8088 course experiments
- Features the H/Z-100's super-fast 16-bit 8088 microprocessor
- Comes with 16 kilobytes of RAM and can be expanded to 64 kilobytes
- Has a powerful software package in 32K of ROM which includes a CP/M assembler, screen editor, and a debugger



**Advanced Trainer:** For engineers, the ET-100 is ideal for breadboarding computer circuits that interface to the 8088 microprocessor. All control, data, and address lines are readily available around the three solderless breadboards. Even the programmable parallel interface (PPI) is accessible. All access lines are buffered to protect the microprocessor from damage. The ET-100 allows experimenters and technicians to easily and conveniently modify circuits, build interfaces, or simply experiment with the 8088. Four power supply voltages, independently regulated from the logic board supply for protection, are also available on the breadboard to power your projects. For moving your circuit to another location for testing or safekeeping, the top breadboard is removable so you can move the entire circuit without disassembling it. And to those students using the EE-8088 Course, the ET-100 teaches 16-bit microprocessor fundamentals through course experiments.

**16-bit computer:** The ET-100 Learning Computer uses the same sophisticated 8088 microprocessor that's found in our H/Z-100 Desktop Computer. A powerful editor, assembler and debugger are permanently stored in ROM for your program writing and editing convenience. The ET-100 has its own cassette port for loading and storing programs and data. And, its RS-232 Input Output port can be used with a printer or other peripherals. A detached 95-key keyboard includes 16 function keys and a numeric keypad. It generates a full ASCII character set plus 33 graphic characters. The ET-100's video output can be displayed in twenty-four 80-character lines on a monitor, like the ZVM-122A or ZVM-123A (p. 35). Or, display twenty 40-character lines on either channel 3 or 4 of a TV using a TV modulator (p. 79).

Kit ET-100, Basic Learning Computer, Shpg. wt. 33 lbs. .... 799.95  
 ETW-100, Assembled and tested, Shpg. wt. 33 lbs. .... 1095.00



# Microprocessor training system and our most powerful and versatile 16-bit computer

Teaches fundamentals of 16-bit microprocessors and interfacing

Text is easy to read and is well illustrated to speed writing



As an experiment, build and use a light pen

Course includes thorough self-testing and a final exam

Experiments using these components clearly show concepts learned in each Unit

**Course Contents:** *Unit 1* examines microprocessors and introduces the 8088 microprocessor with instruction addressing modes. *Unit 2* introduces machine and assembly language programming. *Unit 3* shows conditional/unconditional loops and loop addressing plus subroutines. *Unit 4* details the instruction set of the 8088 along with a summary of its addressing modes. *Unit 5* discusses memory segmentation. *Unit 6* explains input/output operations, internal/external interrupts, and string operations. *Unit 7* describes the various MPU bus and control lines, typical address and data bus networks, and data handling techniques. *Unit 8* examines the memory system in detail and goes into the various forms of input/output interfacing. *Units 9 and 10* contain programming and interfacing experiments. An *Appendix* ends the Course with additional educational information including reviews and data sheets.

**Exams:** A thorough examination ends each unit and tests your understanding of the material. After completing the course, you can take the optional "Final Examination." Besides testing your knowledge, the final exam provides an excellent review of the material you've covered. After successfully passing the exam, you'll receive a handsome Certificate of Achievement and 8 Continuing Educational Units (CEUs).

**Prerequisites:** A better understanding of the material in the EE-8088 Course is achieved with a prior knowledge of digital electronics. This can be obtained through the Heath/Zenith Educational Systems "Digital Techniques" course (EE-3201A, p. 73) or a similar program. You should also be familiar with binary and hexadecimal numbering systems, and computer math.

**EE-8088, Advanced Microprocessor Course, Shpg. wt. 10 lbs. . . . . 99.95**

## ETA-100 Learning Computer Accessory turns the ET-100 into a disk-based 16-bit computer system

- Increases user RAM to 128K bytes that's expandable to 192K bytes
- Adds a separate programmable timer for timing internal events
- Provides two RS-232C serial ports and a Centronics printer port
- Contains a floppy disk controller for 48 or 96 TPI 5¼" drives

- Provides bit-mapped video capabilities that upgrades to color
- Includes a 48 TPI disk drive with 320 kilobyte storage
- Includes MS-DOS/Z-DOS and Z-BASIC software
- Allows use of all H/Z-100 16-bit software packages

**Powerful upgrade package:** Turns your ET-100 Trainer into a powerful 16-bit disk-based computer that helps you with a variety of applications, such as data processing, telecommunications, and financial analysis. The ETA-100 package consists of two circuit boards, a boot ROM, and an external disk drive unit. A dust cover is also included so that a monitor such as the ZVM-122A or ZVM-123A (p. 35) can be placed on top of the Computer.

**H/Z-100 features:** After installing the ETA-100 package, your Computer will gain many features found in our most powerful desktop computer, the H/Z-100. Features like, 128K bytes of RAM that can be expanded to 192K bytes with the addition of accessory Z-205-1 (p. 33). A programmable timer is included that's independent of the system clock. Two full RS-232C serial ports permit communication with printers, modems, and voice synthesizers.

**Further features:** With the addition of the floppy disk controller and 48 TPI disk drive, the ETA-100 can store up to 320K bytes of data. And by adding a second 48 TPI drive with accessory Z-207-3, storage can be doubled to 640K bytes. The ETA-100 uses bit-mapped graphics where individual pixel dots are controlled for a 640 x 225 pixel high-resolution graphics display. For an eight-color display, add two Z-219-1 video RAM chips sets (p. 33).

Kit ETA-100, Expansion Accessory, Shpg. wt. 70 lbs. . . . . 1299.95

ETS-100, Kit ET-100 and ETA-100, Shpg. wt. 102 lbs. . . . . 1999.90

EWA-100-A, Assembled Expansion Accessory, plus software, 70 lbs. . . 1650.00

EWS-100-A, Assembled ET-100 and ETA-100, plus software, 96 lbs. . . 2750.00

**NEW!** ETA-100-1, Extra Removable Breadboard, Shpg. wt. 1 lb. . . . . 29.95

ETA-100-2, Channel 4 Modulator, use with TVs, Shpg. wt. 1 lb. . . . . 39.95

ETA-100-3, Channel 3 Modulator, use with TVs, Shpg. wt. 1 lb. . . . . 39.95



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## Passive Circuit Design Course – introductory knowledge for our Engineering Design Series

**\$49<sup>95</sup>**



- This new course, first in a series, teaches the fundamentals of successful passive-component circuit design
- Step-by-step programmed learning maximizes retention, with unit exams to summarize material and verify progress
- Earn 4.0 Continuing Education Units by passing the enclosed optional final exam with a score of 70% or better

A passive component is one that does not provide a power gain. Typical examples include resistors, capacitors, inductors, voltage and current sources, transformers and diodes. Now, with the Heathkit/Zenith EE-1001 Passive Circuit Design Course you can become actively involved in learning how to design practical circuits utilizing passive components. Also, it establishes a foundation for more advanced design

courses such as the EE-1002 Transistor Circuit Design Course, below.

**Before you can design circuits, you must be able to analyze them.** For this reason the first three units provide a thorough review of the techniques and associated mathematical concepts. Unit 1 is devoted to DC Circuit Analysis, Unit 2 teaches you Mathematics for Circuit Design and Unit 3 follows with AC Circuit Analysis. But a circuit that "works" on paper may not do what you want it to once built. Consequently, Unit 4, Real Circuit Components, is devoted exclusively to the nonideal properties of real components and various guides to help you select an appropriate-type component for a given application.

The remaining units concentrate on using these techniques to design circuits. Unit 5, Unregulated Power Supplies, discusses the design of numerous rectifier circuits and smoothing filters. Unit 6, Additional Passive Circuits, examines how clippers, clampers, peak detectors, multipliers, RC and other



waveshaping circuits are designed. Unit 7, Selected Applications, illustrates seven general and nine measurement applications for passive circuits. In addition, Unit 8 contains ten hands-on experiments which reinforce the text material by giving you direct experience in prototype design. To perform these experiments, you will need the ET-1000 Circuit Design Trainer.

Two appendices with a resistor color code chart plus circuits, equations and parameters related to passive circuit design conclude the material.

**Prerequisites** for the Passive Circuit Design Course are a basic knowledge of DC and AC electronics, algebra and trigonometry and a *desire to learn*.

EE-1001, Shpg. wt. 9 lbs. .... 49.95

## Transistor Circuit Design Course teaches how to design a multitude of useful circuits

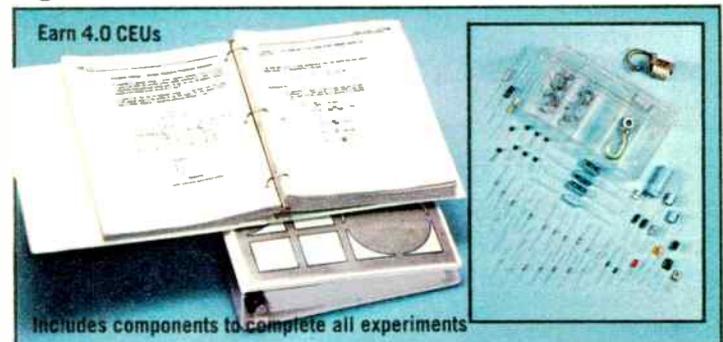
**\$59<sup>95</sup>**



- Concentrates on teaching the fundamental techniques of successful transistor circuit design using the proven, Heathkit/Zenith programmed-learning approach
- Thirteen experiments integrate theory and practicality; analysis is followed by step-by-step design examples

Learning is, and should be, fun. Our second course in the Engineering Design Series honors that maxim and picks up where the EE-1001 Passive Circuit Design program leaves off, by centering on the challenge of Transistor Circuit Design. In the same informative, friendly and hardware-intensive manner as its predecessor, EE-1002 takes the drudgery out of design theory, adds proven operants and introduces new methods that maximize understanding of each skill.

**Complete, state-of-the-art education:** Perhaps the most unique feature is the abundance of summary and design guides provided in units 1 through 8. Chapters probe Bipolar Transistors, Biasing Schemes, Common-Emitter Voltage Amplifiers, Common-Base and Common-Collector Voltage Amplifiers, Power Amps, Multiple-Transistor Circuits, Field Effect Transistors, and Common-Emitter Frequency Effects. Unit 9 contains thirteen in-depth, hands-on experiments which develop the important know-how and confidence for constructing various types of transistor-based application circuits. The easiest way to perform these experiments is with the ET-1000 Engineering Design Trainer (below), which contains all of the necessary functions to complete all of the experiments. All prerequisite material is covered in the EE-1001, above.



Lastly, a 35-page Appendix provides a compendium of the circuit configurations, parameters and design guides found throughout the text, including device data sheets, formula and conversion tables, operating modes, graphical info, and notation summaries. As in EE-1001 above, a comprehensive reference index to the text rounds out the course presentation. For the serious student of electronic design theory and implementation, EE-1002 is a concise, low-cost method of gaining valuable experience and knowledge toward the achievement of important career and educational goals.

EE-1002, Shpg. wt. 9 lbs. .... 59.95

## Analog/Digital Circuit Design Trainer is a versatile, multi-purpose learning tool

**\$199<sup>95</sup>**

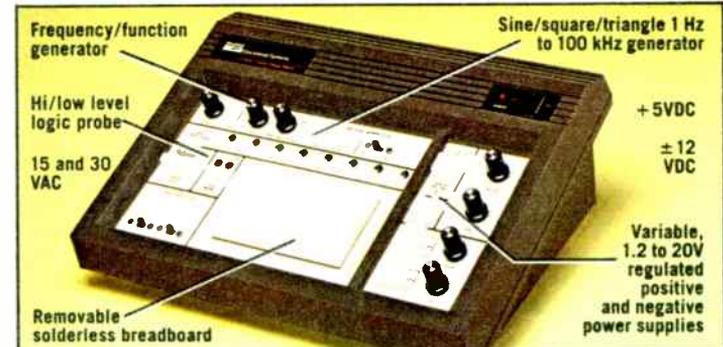
- Quickly build and test circuits for experimentation
- All power supplies protected against short circuit

**A complete mini-lab for dedicated circuit design:** For students taking electronic courses or engineers requiring a flexible, all-in-one prototyping unit, the ET-1000 Circuit Design Trainer provides a self-contained source of breadboarding capability. Has binary logic and data switches, eight buffered LED logic indicators, a five-range pulse-width selector, 1 kΩ and 100 kΩ linear potentiometers and more. 120/240 VAC. 15¾" H x 10¾" W x 4¾" H.

Kit ET-1000, Shpg. wt. 14 lbs. .... 199.95

ET-1000-1, Extra Removable Breadboard Accessory, 1 lb. .... 29.95

ETW-1000, Assembled and tested Circuit Trainer, Shpg. wt. 13 lbs. .... 349.95



# Printed Circuits Course helps you learn how to design and build your own PC boards

**\$64<sup>95</sup>**

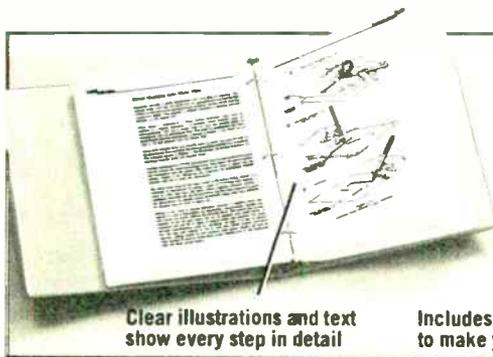


- Learn both the direct pattern and photographic etching techniques
- Copy PC board layouts from books and magazines or fabricate your own, from almost any schematic

**Fascinating course** teaches you how to make printed circuit boards from scratch using both the direct pattern and photographic transfer techniques.

**You'll learn the properties** of different types of PC board materials, plus the processes used in manufacturing them. In the experiments you'll learn how to design a circuit, prepare the artwork, and transfer clean art images to the board. You'll also learn how printed circuit boards are assembled using automated insertion machines and wave soldering techniques.

**The experiments guide you** to design, layout and etch circuit boards for the GD-600 Photoelectric Lamp Switch and GD-1287 Touch Switch kits, which you will build as you study the course. All necessary materials, components and hardware to complete the kits and experiments are included. An etch-resist pen,



**Clear illustrations and text show every step in detail**



**Includes everything you need to make your own PC boards**

**You'll actually build two useful kits**

rub-on transfers, art tape, etchant, solvent, a positive pattern, clear acetate, photographic developer and sensitized PC boards are provided.

**Pass the optional final exam with a 70% or better score to earn 2.0 CEUs and a Certificate of Achievement.** Course NOT available outside the continental U.S.

**ET-3134, Shpg. wt. 7 lbs. .... 64.95**



**Programming experiments impart valuable experience**

**ET-6800 Trainer has 256 bytes of NMOS RAM**

**Earn 4.0 CEUs**



## Enjoy an easy Introduction to Microprocessors

- No previous knowledge is required
- I/O keyboard Trainer starts you programming

**Instruct yourself in this increasingly important technology** — our low-cost course explains how microprocessors operate, number systems, codes, computer math and the 6808 microprocessor. Programming experiments use optional ET-6800 Trainer above.

**EC-6800, Shpg. wt. 9 lbs. .... No longer available**

**SAVER! Buy EC-6800 Course and ET-6800 Trainer together.**

**ETS-6800, Shpg. wt. 29 lbs. .... No longer available**

**17-key hexadecimal Trainer** for EC-6800 programming experiments lets you enter programs, single-step, alter and access memory. Built-in 1K ROM monitor program controls operation. Address and data readout on six-digit LED display.

**ET-6800, Shpg. wt. 17 lbs. .... No longer available**

## Cassette Recorder/Player

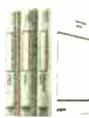
**Highly recommended GE model** is ideal with courses containing audio tapes. Push-button eject, play, rewind, fast forward, record & stop functions. 3-digit counter with reset button helps you find pertinent information quickly.



**ECP-3B01A, Assembled and tested, Shpg. wt. 4 lbs. .... 60.00**

**Premium quality 30-minute cassette tapes.**  
**ECP-3802, Three cassettes, 1 lb. .... 6.00**

## Audio-tutorial math courses are a low-cost way to learn with confidence



**Comprehensive tutorial texts combined with problem-solving audio cassettes, printed visuals and practice exercises present math concepts clearly and maximize your retention of the material.**

**Think Metric, U.S.A. Course:** Learn the international standard system of weights and measures in a fun and easy way. A self-instructional text and audio cassette acquaints you with all the aspects of measurement and the simple rules for conversion. Earn 1.0 CEU and a Certificate of Achievement.  
**EM-2, Shpg. wt. 4 lbs. .... 5.00**

**Intermediate Algebra Course:** Nine learning units and nine audio cassettes covers advanced concepts in algebra including two variable expressions, special functions and binomial expansion. This comprehensive course shows how to solve problems by graphing equations. In addition, the use of logarithms is given special attention. Included in the course are: functions, relations and inverses; linear relations; quadratic equations; systems of equations and inequalities; determinants; sequences and series; and probability. Earn 3.5 CEUs and a Certificate of Achievement.  
**EM-5, Shpg. wt. 7 lbs. .... 24.95**



**Illustrations aid your comprehension**

**Course in is two binders**

**Over 1,000 pages**



**All parts included**

## Hobbyists — learn basic knowledge in many fields

**\$64<sup>95</sup>** • Build and experiment with 26 different circuits  
• Gain an overview of electronics for many hobbies



**You'll understand more** of those do-it-yourself projects in popular magazines when you finish the Electronics for Hobbyists course. Seven units of easy-to-understand text and 26 experiments develop your understanding and experience.

**Learn the practical principles** of direct and alternating current, active devices, integrated circuits, digital logic, number systems, microprocessors, programming, computers, software and more. The last unit is a survey of electronic hobbies — experimentation, R C modeling, computers, audio, shortwave and amateur (ham) radio. Experiments require the ET-3100B Trainer (p. 70), a multimeter and oscilloscope. Earn 4.0 CEUs.

**EE-3140, Shpg. wt. 11 lbs. .... 64.95**



Alaska, Hawaii and Michigan Residents: Call 616-982-3411



## Advanced Electronics Series conveys specialized information

Whether you're an electronics professional, part-time student or curious hobbyist, the Heathkit/Zenith Advanced Technology Series is a rewarding way to gain the latest, state-of-the-art information on these important subjects. It's the fast, easy, low cost way to gain new knowledge and maintain a competitive edge through self-study. They're economical and flexible, too, in that all five courses use the same Trainer. Classroom versions of these courses are found on page 85. All courses worth 3.0 CEUs.

Every course is comprehensive in its coverage, yet totally self-contained. The text presents material in easy-to-understand terms, using a programmed instruction format to quickly reinforce new concepts as they are learned. You proceed at your own pace. Hands-on experiments, designed to strengthen the practical skills stressed in each course, improve your comprehension and retention. All components required to complete the experiments are included – see below and page 83 for the ET-3300B Trainer.

### Optoelectronics covers the latest light-reactive devices



**Course concentrates** on light sources and optoelectronic displays available – including how to drive and multiplex them. Also acquaints you with the theory, design and applications of light-sensitive components such as photodiodes, photo-transistors, solar cells, optocouplers, lasers and fiber optics. Recommended: a VOM like the IM-5217 (p. 18) and a scope like

the IO-4105 (p. 29). Prerequisites: EE-3101A and -3201A.  
**EE-105**, Shpg. wt. 5 lbs. .... **59.95**  
**Kit ET-3300B**, Laboratory Circuit Breadboard, Shpg. wt. 6 lbs. .... **99.95**  
**ETW-3300B**, Assembled and tested Circuit Breadboard, Shpg. wt. 6 lbs. .... **179.95**  
**SAVER!** Buy EE-105 and ET-3300B together. **EES-105B**, 11 lbs. ... **ONLY 149.90**

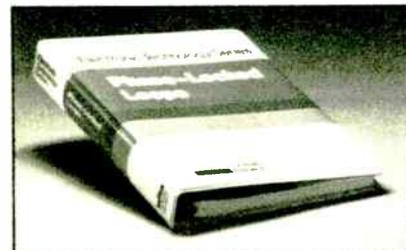
### Gain proficient know-how of Active Filters at low cost



**Teaches proficiency** in designing active filters with op amps, plotting and predicting frequency responses, breadboarding first-order low- and high-pass, second- and higher-order, plus bandpass and state variable filters. Recommended: a scope like IO-4105 (p. 29) and a function generator like IG-1271 (p. 19). **NOTE:** An ET-3100B Experimenter Trainer may also be

used for this, but no other course in the Advanced Series.  
**EE-102**, Shpg. wt. 5 lbs. .... **39.95**  
**Kit ET-3300B**, Laboratory Circuit Breadboard, Shpg. wt. 6 lbs. .... **99.95**  
**ETW-3300B**, Assembled and tested Circuit Breadboard, Shpg. wt. 6 lbs. .... **179.95**  
**SAVER!** Buy EE-102 and ET-3300B together. **EES-102B**, 11 lbs. ... **ONLY 124.90**

### Learn about Phase-Locked Loops – and build them, too



**PLLs and their ingredients** – the phase detector, loop filter and voltage-controlled oscillator – are presented in the thorough, easy-to-follow Heathkit Zenith way. The 268-page text involves you deeply in this new aspect of radio and TV communications. Recommended: a DC voltmeter like the IM-5217 (p. 18), dual-trace oscilloscope like IO-4205 (p. 29) and audio signal generator like IG-5218 (p. 19). Pre-

requisites: EE-3101A through -3104A and -3201A.  
**EE-104**, Shpg. wt. 5 lbs. .... **49.95**  
**Kit ET-3300B**, Laboratory Circuit Breadboard, Shpg. wt. 6 lbs. .... **99.95**  
**ETW-3300B**, Assembled and tested Circuit Breadboard, Shpg. wt. 6 lbs. .... **179.95**  
**SAVER!** Buy EE-104 and ET-3300B together. **EES-104B**, 14 lbs. ... **ONLY 139.90**

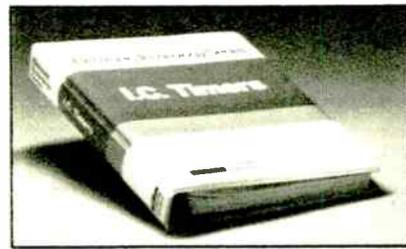
### Integrated Op-Amps: the universal, idealized amplifier



**A comprehensive 358-page text** details the measurement of common op-amp parameters, basic op-amp linear circuits, integrator and differential circuits and performance of op-amp constant current sources. Also discusses current voltage and voltage current converters, Norton and Bi-FET op amps. Recommended: a scope like the IO-4105 (p. 29), multimeter like IM-2260 (p. 25)

and function generator like IG-1271. Prerequisites: EE-3101A-3104A.  
**EE-101**, Shpg. wt. 5 lbs. .... **44.95**  
**Kit ET-3300B**, Laboratory Circuit Breadboard, Shpg. wt. 6 lbs. .... **99.95**  
**ETW-3300B**, Assembled and tested Circuit Breadboard, Shpg. wt. 6 lbs. .... **179.95**  
**SAVER!** Buy EE-101 and ET-3300B together. **EES-101B**, 11 lbs. ... **ONLY 129.90**

### Discover the many, useful ways to implement IC Timers



**Understand applications** of common IC timers for logic functions, in output drive and time delay relay circuits, as wide-range pulse generators, voltage frequency converters, freewheeling power-fail and sin sq wave oscillators, universal timers, speed alarms and precise clock sources in this 348-page text. Recommended: a scope like the IO-4105 (p. 29), IM-2260 multimeter (p. 25) or

similar. Prerequisite: EE-3201A Digital Techniques Course (p. 73).  
**EE-103**, Shpg. wt. 5 lbs. .... **44.95**  
**Kit ET-3300B**, Laboratory Circuit Breadboard, Shpg. wt. 6 lbs. .... **99.95**  
**ETW-3300B**, Assembled and tested Circuit Breadboard, Shpg. wt. 6 lbs. .... **179.95**  
**SAVER!** Buy EE-103 and ET-3300B together. **EES-103B**, 11 lbs. ... **ONLY 129.90**

### SAVE \$60 on multi-skill package for a fully advanced education

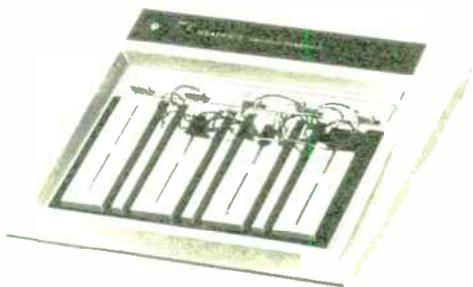


**Take valuable advantage** of this cost-cutting discount offer and move ahead faster – order all five courses in the Advanced Electronics Series and the ET-3300B Breadboard Trainer together! Includes the EE-101 Op Amps Course, EE-102 Active Filters Course, EE-103 IC Timers Course, EE-104 Phase-Locked Loops Course, EE-105 Optoelectronics Course and the ET-3300B Laboratory Circuit Breadboard. Purchased separately the six-part package totals \$339.70. Order the entire group now. (get Optoelectronics free) and start expanding your specialized electronics skills!

**SAVER!** EES-1015A, Shpg. wt. 34 lbs. .... **279.70**



## ET-3300B Course Trainer



## Versatile Lab Circuit Breadboard makes doing experiments easier

**\$99<sup>95</sup>**  
Kit

- Redesigned to match our fully updated electronics courses
- Three-output power supply
- Fused and current limited for best short circuit protection
- Build the kit and save \$80

**Master more advanced electronics skills:** We believe that students learn best by doing. That's why our entire line of professionally-recognized courses include hands-on experiments that firmly reinforce the most important concepts and practical applications presented in each text. Students actually observe, measure and *experience* the empirical and theoretical dynamics of circuit operation.

**Suggested to complete experiments:** If you're planning to educate yourself with one of the hardware-intensive courses in the Heathkit/Zenith Advanced Electronics Series, the multi-purpose ET-3300B Laboratory Circuit Breadboard is specifically designed for use with the specialized experiments you'll be performing in each course on page 82, and the EH-701 and -702 "file" courses at right.

**Made from rugged quality materials,** the Breadboard is a great convenience tool and will make learning easier. It features seven solderless socket areas plus five power/ground sockets for quick and easy circuit construction. The sockets will accept any size dual inline integrated circuit package, and almost all other standard electronic components.

**Reliable safety:** The ET-3300B's built-in power supplies are designed to be completely immune to shock and hazard, with fixed current-limiting of each supply to protect against short circuit. Convenient, self-contained power sources also save setup time and eliminate the mess of running long, tangling hookup wires. The power supplies provide +5 VDC ( $\pm 4\%$  at 1.5A), +12 VDC at 100mA, -12 VDC ( $\pm 2\%$  at 100mA) and two ground connections.

**Build the versatile ET-3300B yourself** from a money-saving kit and save \$80. Overall assembly time is about two evenings. Or purchase the completely assembled and factory-tested ETW-3300B Circuit Breadboard and save time for your studies. Requires 120 VAC, 60 Hz power. UL listed. Beige cabinet measures 3½" H x 12" W x 12" D.

Kit ET-3300B, Shpg. wt. 6 lbs. .... **99.95**

ETW-3300B, Assembled, Shpg. wt. 6 lbs. **179.95**

**SAVER!** Buy all five courses in the Advanced Electronics Series (see box, pg. 82) and ET-3300B Laboratory Circuit Breadboard kit together.

EES-1015A, Shpg. wt. 34 lbs. .... **279.70**

AK, HI, MI: Call 616-982-3411.

## Linear Circuits Course brings solid-state electronics to life

**\$49<sup>95</sup>**

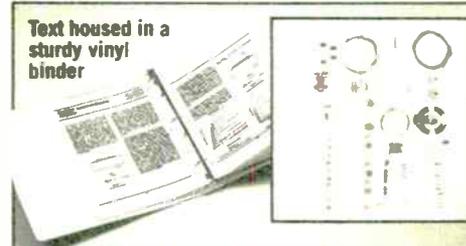
- Build each circuit as you learn
- Covers dozens of basic circuits and their many modifications
- Includes 86 components (worth over \$45) for building more than 30 linear circuits



The Linear Circuits Course is an easy-to-understand integration of text, diagrams and experiments that move smoothly into the hands-on experience you require to make learning more meaningful and expand your skills faster.

**EH-701 is a hardware-oriented program** consisting of a series of circuit "files" arranged in progressive order. Each file gives a concise description of the basic circuit and its operation, presents a complete schematic and details several modifications to alter the useful parameters. The course emphasizes the value of "doing" rather than reading.

**Circuits covered include** bipolar transistors, field effect transistors, the 555 timer and 741 op amp linear circuits. You construct various amplifiers, astable and monostable multivibrators, pulse position and width modulators, active filters and more



using the complete parts inventory supplied.

**For maximum convenience,** we recommend using the ET-3300B Laboratory Circuit Breadboard. However, all circuits can be constructed and tested using your own breadboards. To observe circuit operation, you'll need a voltmeter like the IM-5217 on page 18, and an oscilloscope such as the IO-4205 on page 29, DC and AC Electronics, and the Semiconductor Devices Course (EE-3101A to -3103A, pgs. 70-71) or equivalent knowledge is a prerequisite.

**Earn 4.0 Continuing Education Units** by passing with a grade of at least 70% on the optional final exam.

EH-701, Shpg. wt. 2 lbs. .... **49.95**

## TTL and CMOS Circuits Course instructs in advanced digital logic

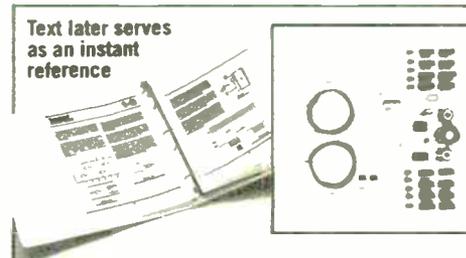
**\$59<sup>95</sup>**

- A new series of circuit "files" arranged in logical sequence
- Examines TTL and CMOS in depth as you learn-by-doing
- Includes 65 electronic parts for building over 50 circuits



**Build circuits immediately:** In the EH-702 TTL and CMOS Circuits Course, you develop hands-on skills right away, building new knowledge at your own pace. You learn interactively, turning theory into practical experience.

**The modular "file" format** of this course places major emphasis on practical digital logic design and IC applications. Little reading is required - you put the essential technical theory to work fast by constructing over 50 circuits including the 7447 BCD to seven-segment decoder, D- and J-K-type edge-triggered flip-flops, four-bit adder, CMOS 100 kHz crystal oscillator, the AND, NAND, OR, NOR and XOR logic gates, data selectors, distributors, comparators, a quad-bilateral switch and more. All components needed to conduct the experiments are supplied.



**Construct these state-of-the-art circuits** with the ET-3300B Laboratory Circuit Breadboard featured at left, or use your own breadboard and power supplies. To better observe circuit operation, you'll need a voltmeter like the IM-5217 (p. 18) and a dual-trace scope like IO-4205 (p. 29). AC, DC and Semiconductor Devices Courses are prerequisites. Earn 4.0 CEUs if you score 70% on the optional final exam.

EH-702, Shpg. wt. 3 lbs. .... **59.95**

**SAVER!** Purchase the EH-701 Linear Circuits and EH-702 TTL & CMOS Circuits Courses together.

EHS-712, Shpg. wt. 6 lbs. .... **79.90**

## An outstanding Soldering Course for new or experienced kitbuilders

**\$17<sup>95</sup>**

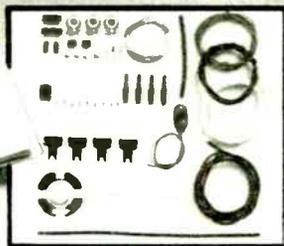
- Six experiments lead you through the construction of a two-transistor light oscillator



**The EI-3133 Soldering Course** is a fun, easy way to perfect your soldering skills for quality success. It teaches professional facts and techniques in a detailed way, using a proven "hands on" approach. Topics covered include the chemistry of solder, proper iron size, tinning and cleaning, the characteristics of good solder connections, solder bridges, visual troubleshooting for repair and the best methods of desoldering. The handy practice kit comes complete with circuit board, components and solder. Ideal for individuals, industry or schools. Requires a soldering iron and small hand tools. See page 87.

EI-3133, Shpg. wt. 3 lbs. .... **17.95**

Effective, 450-page text



All components for experiments included except 9V battery

Appendix includes glossary of terms

## Learn all about revolutionary, state-of-the-art Fiber Optics technology with this exciting new course

\$99<sup>95</sup>



- Covers theory, components and fiber optic systems in detail
- Course includes components and instruction to develop a two-way fiber optic link plus four hands-on experiments
- Learn at your own pace and retain more with Heathkit/Zenith's proven, self-instructional text format and unit reviews

Managers, engineers, students and hobbyists will benefit from this broad, in-depth introduction to the interesting and challenging science of lightwave technology. Fiber Optics are an important, future-shaping breakthrough in rapid signal transmission with cost/performance benefits that promise to revolutionize the world of data communication. Be prepared for the future by educating yourself now.

The five-unit Heathkit/Zenith Fiber Optics Course covers the fundamentals of fiber optics. Unit 1, Optical Energy, deals with the nature of light. Just as electronics students need a basic understanding of atomic structure and the nature of electrons, so does the student of fiber optics need an understanding of optical radiation. Once this is established, you will move on.

Unit 2, Optical Fibers, describes the principles of the transmission medium. You will learn the various fiber types and their construction, how they propagate light, the importance of such characteristics as numerical aperture, source area and radiation pattern in the energy launch, and loss factors.

Units 3 and 4 deal with the active devices used to generate and detect the light used in fiber optic transmission. As you progress through the study of Fiber Optic Light Sources, you will learn much about light-emitting diodes. This unit covers their physical construction, theoretical operation, biasing characteristics and several types of fiber optic LED design considerations. A detailed discussion of laser emission and principles associated with the use of injection laser diodes in fiber optic circuits concludes the unit.

Finally in Unit 5, Fiber Optic Systems, you will tie all of the component parts together into an operational fiber optic link. You will examine the requirements of the various types of links and learn which components best fulfill certain requirements. Four optional hands-on experiments are also included in the course to enhance your understanding of the text. You will construct a modulated source driver circuit, a fiber optic receiver circuit, and fabricate actual fiber optic links. These experiments will allow you to gain valuable design experience, and let you observe the parameters of a fiber optic link directly. To perform them, you will need either a Heathkit/Zenith ET-3400 or ET-3400A Microprocessor Trainer or the ET-3200B Digital Techniques Trainer, an oscilloscope, a multimeter and common hand tools (not included). All other necessary parts such as ICs, transistors, resistors, capacitors, emitters, detectors, fiber, and connectors are furnished with the course.

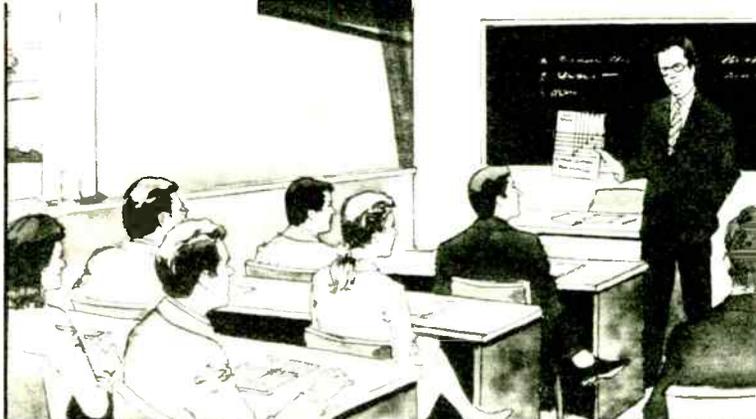
In addition to the text, two supplemental appendices support the learning program. A listing of standard resistor values will come in handy when the student is building actual circuits from mathematically-derived schematics. Typical data sheets for several fiber optic devices will help in evaluating your newly acquired knowledge. A 25-page glossary of terms serves for quick reference.

Earn 3.0 Continuing Education Units and a Certificate of Achievement by passing the enclosed optional final exam with a score of 70% correct or better.

**Prerequisites:** It is recommended that a student pass the Heathkit/Zenith EE-3101 DC Electronics and EE-3102 AC Electronics courses (or have equivalent knowledge) before taking the Fiber Optics Course. EE-3201A Digital Techniques is also recommended, but not required. Our money-back guarantee: if not completely satisfied, return course materials for a refund of the purchase price.

EE-4201, Shpg. wt. 6 lbs. .... 99.95

84/EDUCATION



### Color 35mm slides and filmstrips available

Intended to duplicate the flip charts that are included only in self-instructional version of Microprocessors and Automotive Systems courses. Flip charts not included in classroom versions.

- EE-3401-1, Microprocessors Slides, 2 lbs. .... 60.00
- EE-3401-2, Microprocessors Filmstrip, 1 lb. .... 20.00
- EB-10-70, Auto Electrical Systems Filmstrip, 1 lb. .... 29.95
- EB-20-70, Automotive Tune-Up Filmstrip, 1 lb. .... 14.95



### CEU exams for Classroom Courses

A new opportunity: Students and employees using classroom versions can earn Continuing Education Units. Each package contains ten copies of that course's CEU exam, with full instructions.

#### CEU exam for DC Electronics Classroom Course.

- EB-6101-80, Shpg. wt. 2 lbs. .... 100.00
- EB-6102-80, AC Electronics, 2 lbs. .... 100.00
- EB-6103-80, Semiconductors, 2 lbs. .... 100.00
- EB-6104-80, Electronic Circuits, 2 lbs. .... 100.00
- EB-6201-80, Digital Techniques, 2 lbs. .... 100.00
- EB-6401-80, Microprocessors, 2 lbs. .... 100.00

### Call for free information and price schedules on the full line of Classroom Courses

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Alaska .....	907-349-6180	Montana .....	503-640-1729
Arizona .....	602-945-6605	Nebraska .....	316-342-5236
Arkansas .....	205-822-1326	Nevada .....	702-358-0829
California (No.) .....	415-651-6720	New Hampshire .....	617-285-9028
California (So.) .....	714-493-8040	New Jersey .....	609-767-1399
Colorado .....	303-795-1450	New Mexico .....	602-945-6605
Connecticut .....	617-285-9028	New York .....	516-922-6590
Delaware .....	717-566-6767	North Carolina .....	919-776-8161
Dist. of Columbia .....	804-741-2580	North Dakota .....	612-533-0000
Florida .....	305-647-5373	Ohio .....	419-382-2724
Georgia .....	404-447-5231	Oklahoma .....	918-664-9015
Hawaii .....	808-395-1532	Oregon .....	503-640-1729
Idaho .....	503-640-1729	Pennsylvania .....	717-566-6767
Illinois (No.) .....	312-941-9340	Rhode Island .....	617-285-9028
Illinois (So.) .....	309-343-6136	South Carolina .....	919-776-8161
Indiana .....	219-482-2609	South Dakota .....	612-533-0000
Iowa .....	515-753-6630	Tennessee .....	615-361-8744
Kansas .....	913-722-4713	Texas .....	214-361-8665
Kentucky .....	205-822-1326	Utah .....	702-358-0829
Louisiana .....	601-327-4757	Vermont .....	617-285-9028
Maine .....	207-397-2902	Virginia .....	804-741-2580
Maryland .....	804-741-2580	Washington .....	503-640-1729
Massachusetts .....	617-285-9028	West Virginia .....	804-741-2580
Michigan .....	313-585-2300	Wisconsin .....	414-784-8075
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# Heathkit/Zenith Classroom Courses are carefully designed to fit your custom training needs

Now you can apply famous Heathkit/Zenith learning courses to meet your special training needs. Success-oriented with just the right amount of technical theory and a maximum emphasis on real-world applications, Heathkit/Zenith Classroom Courses incorporate the very latest methods and materials that are available. Specify them with confidence, because our pledge prevails:

*"We won't let you fail!"*

Classroom courses are available in these areas:

- **Exploratory Courses:** Concepts of Electronics, Printed Circuit Boards
- **Fundamental Electronic Series:** DC Electronics AC Electronics, Semiconductor Devices, Test Equipment, Electronic Communications, Electronic Circuits
- **Advanced Electronic Series:** Operational Amplifiers, Active Filters, IC Timers, Phase-Locked Loops, Optoelectronics, Robotics and Industrial Electronics, Robot Applications, Passive and Transistor Circuit Design
- **Microprocessor Technology:** Digital Techniques, Microprocessors, Microprocessor Interfacing, 6809 Microprocessors, Advanced 16-bit Microprocessors
- **Computers:** BASIC Language Programming
- **Automotive Maintenance:** Auto Electrical Systems, Auto Tune-Up

**FIVE NEW HIGH-TECHNOLOGY COURSES:** Add these new learning programs to your classroom curriculums for the future... courses in Passive Circuit Design, Transistor Circuit Design, Advanced 16-bit Microprocessors, Robotics and Industrial Electronics, plus Robot Applications. See box in chart.

Heathkit/Zenith Classroom Courses are the complete answer for all types of industries, government agencies, and forward-thinking schools who want to teach technical subjects with maximum efficiency at minimum cost. Courses start at the entry level of electronics and move into new state-of-the-art technology, branch into the use of instruments or teach computer literacy. All of these multimedia courses employ the latest learning enhancement techniques. Text material is presented in concise, fast-paced units of study, with major topic areas highlighted in modular subsections. "Hands-on" experiments provide positive reinforcement through interactivity. Illustrations are used profusely for fast, thorough mastery by students of all ages and previous technical experience.

**Organized in three separate publications:** Each course is designed for greater student and teacher convenience. The student text is the core of the learning material, supported by a workbook with exams and experiments keyed to the text presentation. All courses are written in a logical learning sequence that first explains concepts and then builds upon them for a thorough understanding of each topic. The instructor's guide lets the teacher add his or her own parameters for challenge and guidance—providing each student with a fully rounded learning experience. At a fraction of the cost of institutional options.

**Separate parts packs for each student or group of students** contain all the electrical and accessory components necessary for implementing the workbook experiments. To complete the full range of experiments integrated within each program, assembled Heathkit/Zenith trainers are required (see chart list).

**If rapid advances in technology are leaving your employees or students behind, they can catch up quickly and comprehensively. Review the extensive list of courses below, and contact us for more information regarding your needs.**

Course	Text	Price	Workbook	Price	Instructor's	Price	Assembled	Price	Parts	Price	Cassettes	Price	
	Shpg. wt. 2 lbs.		Shpg. wt. 2 lbs.		Guide Shpg. wt. 1 lb.		Trainer Wt. 6 lbs.		Shpg. wt. 1 lb.		Shpg. wt. 2 lbs.		
 <b>Five new Classroom Courses in higher technology</b>	Passive Circuit Design	EB 6001 (3 lbs.)	17 95	EB-6001 40	10 95	EB-6001 50	9 95	ETW 1000 (13 lbs.)	349 95	EB 6001 30	10 95	NOT USED	
	Transistor Circuit Design	EB 6002 (3 lbs.)	19 95	EB 6002 40	10 95	EB 6002 50	9 95	ETW 1000 (13 lbs.)	349 95	EB-6002 30	19 95	NOT USED	
	Robotics & Ind Electronics	EB 1801 (4 lbs.)	29 95	EB 1801 40	14 95	EB-1801 50	9 95	ETW 18 (70 lbs.)	2199 95	EB 1801 30 (2 lbs.)	44 95	NOT USED	
	Robot Applications	EB 1812 (4 lbs.)	19 95	EB 1812-40	10 95	EB-1812 50	9 95	ETW-18 (70 lbs.)	2199 95	EB 1812 30 (2 lbs.)	49 95	NOT USED	
	Advanced 16 bit Microprocessors	EB 8088 (5 lbs.)	24 95	EB 8088 40	11 95	EB-8088 50	9 95	ETW 100 (33 lbs.)	1095 00	EB 8088 30	59 95	NOT USED	
<b>Fundamental Electronics Series</b>	Concepts of Electronics	EB 6140 (3 lbs.)	24 95	EB 6140 40 (1 lb.)	10 95	EB-6140 50	9 95	ETW 3100B	169 95	EB 6140 30	24 95	NOT USED	
	Printed Circuit Boards	EB 6134 (1 lb.)	18 95	EB-6134 40 (1 lb.)	9 95			NOT USED		EB-6134-30 (2 lbs.)	19 95	NOT USED	
	DC Electronics	EB 6101	19 95	EB 6101 40	10 95	EB-6101-50	9 95	ETW 3100B	169 95	EB-6101 30	19 95	EEA-3101A	19 95
	AC Electronics	EB 6102	19 95	EB 6102 40	10 95	EB-6102 50	9 95	ETW 3100B	169 95	EB-6102-30	15 95	EEA 3102A	19 95
	Semiconductor Devices	EB 6103	19 95	EB 6103-40	10 95	EB-6103 50	9 95	ETW 3100B	169 95	EB-6103 30	15 95	EEA-3103A	19 95
	Electronic Circuits	EB 6104	19 95	EB 6104 40	10 95	EB-6104 50	9 95	ETW 3100B	169 95	EB 6104 30	29 95	EEA-3104A	19 95
	Test Instruments	EB 6105 (4 lbs.)	19 95	EB-6105 40	10 95	EB-6105 50	9 95	ETW 3100B	169 95	EB 6105 30	24 95	EEA 3105A	19 95
	Electronic Communications	EB 6106	17 95	EB-6106-40 (1 lb.)	10 95	EB-6106 50	9 95	ETW 3100B	169 95	EB 6106 30	29 95	EEA 3106A	19 95
	Operational Amplifiers	EB 601	18 95	EXPERIMENTS IN TEXT		EB-601 50	9 95	ETW 3300B	179 95	EB 601 30	24 95	NOT USED	
	Active Filters	EB 602	18 95	EXPERIMENTS IN TEXT		EB-602 50	9 95	ETW 3300B	179 95	EB 602 30	14 95	NOT USED	
<b>Introduction to micro-processors</b>	IC Timers	EB 603	18 95	EXPERIMENTS IN TEXT		EB 603 50	9 95	ETW 3300B	179 95	EB 603 30	29 95	NOT USED	
	Phase-Locked Loops	EB-604	18 95	EXPERIMENTS IN TEXT		EB-604 50	9 95	ETW 3300B	179 95	EB 604-30	29 95	NOT USED	
	Optoelectronics	EB 605	14 95	EB 605 40 (1 lb.)	9 95	EB-605 50	9 95	ETW 3300B	179 95	EB 605 30	29 95	NOT USED	
	Digital Techniques	EB 6201 (3 lbs.)	24 95	EB 6201 40	11 95	EB-6201 50	9 95	ETW 3200B	179 95	EB-6201 30	29 95	EEA 3201A	19 95
	Microprocessors	EB 6401 (4 lbs.)	24 95	EB 6401 40 (1 lb.)	11 95	EB-6401 50	9 95	ETW 3400A	339 95	EB 6401 30	59 95	EB 6401 60	12 95
	Microprocessor Interfacing	EB 6402 (5 lbs.)	24 95	EB-6402-40 (1 lb.)	10 95	EB-6402 50	9 95	ETW 3400A	339 95	EB-6402-30	59 95	NOT USED	
	6809 Microprocessors	EB 6404 (1 lb.)	24 95	EXPERIMENTS IN TEXT		EB-6404 50 (2 lbs.)	9 95	ETW 3400A	339 95	EB-6404-30	69 95	NOT USED	
	BASIC Programming	EB-6100 (4 lbs.)	19 95	EB 6100-40	10 95	EB-6100 50	9 95	NOT USED		PARTS, CASSETTES NOT USED			
	Auto Tune-Up	EB-20 (4 lbs.)	19 95	EB-20-40	9 95	EB-20-50	9 95	NOT USED		EB 20 30 (2 lbs.)	17 95	EB-20 60	9 95
	Auto Electrical	EB-10 (3 lbs.)	19 95	EB 10 40	9 95	EB-10 50	9 95	NOT USED		EB 10 30 (2 lbs.)	17 95	NOT USED	



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

EDUCATION/85

## Put away your telephone book — a Heathkit Demon Dialer remembers the numbers you dial most

**\$89<sup>95</sup>**

- Store up to 176 numbers
- Redials numbers
- Accurately dials long numbers

The Demon Dialer has a memory that stores 93 7-digit numbers, 68 11-digit numbers or 55 23-digit numbers. The Memory Expansion Accessory almost doubles the memory by storing the equivalent of 176 7-digit numbers. A 3-volt battery provides memory protection should your electrical power fail.

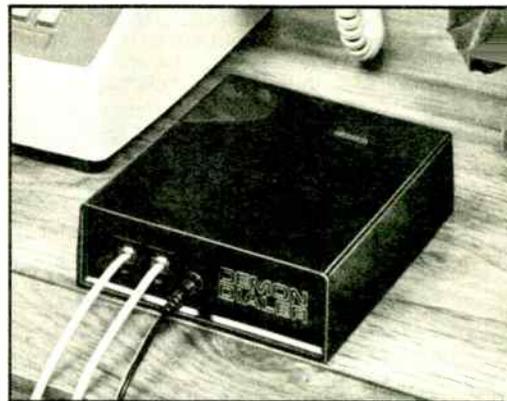
**Computer-controlled by an on-board CPU**, this Dialer will instantly and automatically dial numbers of up to 32 digits stored under easy-to-remember 2- to 6-digit letter/number codes you devise — for example: DOC, FIRE, POLICE, BILL, MARY, etc. Accurate dialing of lengthy long distance and alternate telephone system numbers is ensured, time after time.

**The Demon Dialer has no equal.** Two-key sequences will redial or 'Demon Dial' after the first try. The Demon will silently dial a busy number 5 times in the 1st minute, every 2 minutes for 10 minutes, then every 10 minutes for up to 2 hours. While it 'Demon' dials, incoming calls can still be received, and a 'suc-

cess' signal alerts you when the party being called answers. If they're out, the Demon Dialer can call back every ten minutes for up to ten hours.

**Program numbers into the Dialer memory** using an ordinary touchtone phone. Six simple commands give you complete control of this versatile instrument. For those who depend on telephone contacts to do their job, the Demon Dialer is a convenient way to save precious time and money. Its whole purpose is to make using your telephone easier, and you can master the commands for speedy operation in just a few minutes. This incredible Dialer operates with any telephone branch equipped and billed for touchtone service. Extension phones on the same line also have access to the Demon Dialer.

**Constructed on a single circuit board**, the Demon Dialer is housed in a smoky-gray case you can set on your desk, hide in a drawer or wall-mount with its own self-stick bracket. Not intended for use with some multi-line business phone systems. Kit includes AC power cube, 3-volt battery, two cables with modular plugs, series jack, user's manual and a handy reference Dial Guide/List. 1 $\frac{1}{8}$ " H x 5 $\frac{7}{8}$ " W x 5 $\frac{1}{4}$ " D.



Heathkits brings you quality products at lower cost. Look at what others want for a Demon Dialer!

Kit GT-2217, Shpg. wt. 3 lbs. . . . . **89.95**

GTA-2217-1, Memory Expansion Accessory, Shpg. wt. 1 lb. . . . . **19.95**

## Tune-filled Pleasant Phone Ringer puts the bell out of business

**\$29<sup>95</sup>**

- Gives your phone personality
- Your choice of tunes or tones
- Test button verifies operation

If the ring-ring-ring of your telephone jars your nerves, replace it with this unique ringer. You'll notice what a pleasant difference it can make. The pre-programmed polyphonic musical IC gives you four choices: a beeping signal, an upbeat four-note chime, ten seconds of Beethoven's "Für Elise" or 20 seconds of Rubinstein's "Romance." Easily adjusted to the volume you need.

A pushbutton lets you choose either the conventional telephone bell or one of the four synthesized signals

from the Phone Ringer. Inside, a variable volume control and two speaker terminals are provided so you can spread the melody to other rooms. Keyhole slots in the caseback make wall mounting simple. Two alkaline "C" batteries (not included) power it for a year.

**Simply install the Phone Ringer** between your telephone and its wall outlet. The kit includes modular phone plugs and 6' of cable. 1 $\frac{1}{4}$ " H x 5 $\frac{7}{8}$ " W x 4 $\frac{3}{4}$ " D.

**Compatible with both touchtone and rotary phones.** The GT-1218 makes a harmonious addition to any home or office.

Kit GT-1218, Shpg. wt. 1 lb. . . . . **29.95**



**NEW**

### Electronic Digital Blood Pressure/Pulse Monitor

**\$79<sup>95</sup>**

- Professional medical quality
- Easy to read, easy to use



If you, or a loved one, have reason to regularly monitor blood pressure and pulse rate, the GXP-2120 was designed for you. Eliminate those often troublesome trips to the doctor or a clinic. Now you can take those measurements yourself, at home. No medical expertise is required. The monitor makes measurements easy and displays them numerically.

**Easy to use and easy to read**, this professional monitor is ideally suited for the doctor's office as well as for home use. Just place the cuff in position and inflate. Electronic metering does the rest. Systolic and diastolic pressures and pulse rate are measured and displayed digitally, uses battery power.

GXP-2120, Assembled, Shpg. wt. 2 lbs. . . . . **79.95**

**NEW**

### Take temperatures quickly with digital accuracy

**\$15<sup>95</sup>**

- Accurate digital readings eliminate guess-work



**Eliminate the squinting and guessing** that's required when using a conventional mercury-bulb thermometer. For the price of a quality bulb thermometer, you can own Heath's GXP-2121 Digital Fever Thermometer — and you'll have easy-to-read accuracy from 89.6° to 107°F. within 60 seconds.

**Even your babysitter can accurately measure temperatures.** Just turn the thermometer on and use any of the three conventional ways of taking temperatures. When the F symbol stops blinking, the peak temperature has been recorded and is displayed in easy-to-read numbers. 10 sanitary probe covers (cover order form) and battery are included.

GXP-2121, Assembled, Shpg. wt. 1 lb. . . . . **15.95**

### Cordless Portable Telephone for freedom of mobility

**LAST CALL**



- Powerful 1000-foot talk range
- Excellent immunity from noise

**Portability combined with features:** two-speed pulse or tone dialing, A/B/C buttons store frequently used numbers, private 6-digit security code, one button redial of last number called, low battery light, hi/low volume and memory backup (battery not included).

**The system includes** 120 VAC recharging base unit, dial-out & receive handset, connector cord with modular plugs and user's manual.

GDP-1341, Assembled, Shpg. wt. 5 lbs. . . . . **229.95**

California law requires the following statement: FCC-approved Freedom Phone 4000 will be serviced under provisions outlined in manufacturer's warranty.

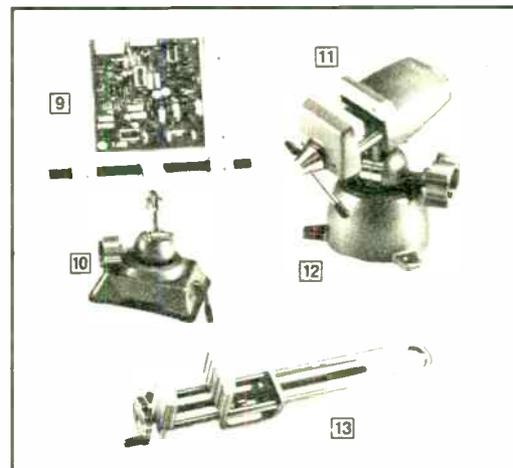
**Credit Card Orders Call TOLL-FREE: 800-253-0570**



# Quality electronic tools and accessories to make your kit building easier and a lot more fun

The right tool makes any job go easier. That can be especially true during kitbuilding, where the proper tool or utility can make a difference in the quality success of your finished product. These items are Heath-recommended for greater convenience and reliability, every time you tackle a new project.

**NEW**



## 1 NEW! Handy Smart Outlet Box

Senses current flow in a control outlet. When a device plugged into this socket is turned on, power is automatically turned on to ten other sockets. Great for work benches, ham stations, computer or audio systems. For further information, see page 92.

Kit GD-1295, Shpg. wt. 4 lbs. . . . . 49.95

## 2 Multiple outlet junction box

Solves your problem of a shortage of electrical outlets. Has twelve 3-prong outlets, eleven are turned on from a switch while the other always has power to it. Fused 3-hole outlets have 10 amp max load.

Kit HD-1274, Shpg. wt. 4 lbs. . . . . 24.95

## 3 Low-cost kitbuilder's tool set

This 11-piece kit is perfect for the beginner or the busy technician. Included in this tool set is a high-quality Weller 25-watt, 800-degree F soldering iron with two interchangeable tips, a soldering-aid tool, a 4 oz. spool of solder, wire strippers, diagonal cutters, 4" long-nose pliers, 1/4" nut driver, and a regular and a phillips screwdriver. Durable 3" H x 10 3/4" W x 10" D carrying case has molded storage tray for all tools and a built-in carrying handle.

GHP-1270, Shpg. wt. 2 lbs. . . . . 39.95

## 4 Weller soldering station

Features an exclusive closed-loop system which automatically controls iron tip temperature at 700 degrees F. Plug-in soldering iron comes complete with heat-shielded holder on a sturdy stand, pilot light and switch, 3-wire cordset, 5 foot power cord, 700-degree tip, tip storage tray and removable sponge.

GDP-1108, Shpg. wt. 5 lbs. . . . . 79.95

Set of five 700 degree F assorted tips for above.

GDP-1109, Shpg. wt. 1 lb. . . . . 17.95

## 5 Weller 25-watt soldering iron

With its 860-degree F 1/8-inch screwdriver tip, this professional pencil iron makes close soldering jobs cleaner and easier. The GDP-207 is lightweight, has a rugged stainless steel barrel and uses long-life soldering tips. An excellent kitbuilding soldering iron.

GDP-207, Shpg. wt. 1 lb. . . . . 14.95

## 6 See better, clearer, easier

Illuminated magnifier provides bright, cool light with an energy-conserving 22-watt circulator fluorescent. Eye strain is relieved by a distortion-free 2 to 1 magnifier with a 5" polished lens.

GDP-200, Assembled, Shpg. wt. 7 lbs. . . . 79.95

## 7 Magnify small detailed circuits

Headband magnifier enlarges 2 1/2 times while it frees both your hands. Finely ground lenses are shatter- and scratch-resistant.

GDP-201, Assembled, Shpg. wt. 1 lb. . . . . 19.95

## 8 Flexible extension lamp

Flexes over 360 degrees with a 32-inch reach. Rugged counter-balanced arm clamps in any position. Incandescent bulb is not included.

GDP-202, 4 lbs. . . Was \$26.95, NOW ONLY 19.95

## 9 PanaVise circuit board holder

Clamps and holds steady circuit boards up to 12" wide. Boards mount in spring-loaded arms that can be tilted 220 degrees and rotated 360 degrees.

GDP-1254, Shpg. wt. 2 lbs. . . . . 19.95

## 10 PanaVise vacuum base

Holds firmly to almost any smooth surface. Base uses a rubber suction pad that doesn't scratch the mounting surface.

GDP-1252, Shpg. wt. 2 lbs. . . . . 19.95

## 11 PanaVise standard vise head

Nylon jaws open to a full 2 1/2". Vise firmly grips larger and heavier objects.

GDP-1253, Shpg. wt. 2 lbs. . . . . 17.95

## 12 PanaVise standard height base

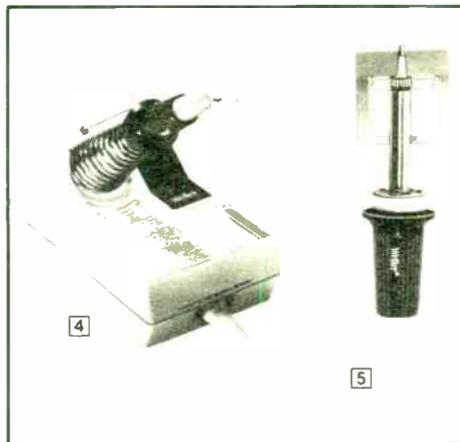
Base can be permanently mounted and used with any 3/8" shaft PanaVise fixture. A special ball-joint base fixture allows versatile positioning.

GDP-1251, Shpg. wt. 2 lbs. . . . . 14.95

## 13 PanaVise wide-opening holder

Vertical-opening vise positions and holds large items up to 9". Holds bulkier items like chassis and has replaceable jaw pads.

GDP-1255, Shpg. wt. 2 lbs. . . . . 15.95



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

# Get your ticket and get on the air – faster and easier – with this Heathkit Novice Course

Here's a self-instruction course that's guaranteed to help you get your Novice ticket and talk to the world. This deluxe learning program prepares you for the Amateur Radio Novice FCC exam, and provides you with helpful guidelines for setting up and operating your own station once you pass the exam. When you have completed the Novice License Course, you will be able to send and receive Morse Code accurately at the rate of five words per minute, and to pass a 20-question, multiple choice written test from the FCC.

## We guarantee you'll pass your FCC Exam



**\$39<sup>95</sup>**

- Communicate with nearly a million other hams all around the world...right from your own home or car...transmitting and receiving CW on a variety of frequencies
- Heath guarantees that you will pass the Novice FCC test – or we will refund the full purchase price of the course

Now – for CBER's, electronic hobbyists, and everyone interested in operating world-wide two-way Amateur Radio equipment – Heath makes it easier than ever

to pass the required FCC exam. Everything you need to learn comes with the course.

Join the expanding world of Amateur Radio. Where else do you have the opportunity to communicate one-on-one with such a diversity of people – this hobby spans all professions, in all countries. You'll probably get to know most of the hams in your area on a personal level, and you'll be able to participate in Novice field-day competitions, take part in Novice traffic nets to relay third-party messages and in case of an emergency you can provide a public service.

Long a leader in Amateur Radio technology, Heath has prepared a self-instruction program that's guaranteed to help you earn a Novice ticket. Everything you need to get your license and become a part of a privileged fraternity is in this comprehensive, well organized study package, including information on how you apply to take the latest FCC Novice exam. Also, it provides helpful guidelines for setting up and operating a good station when your license and personal call sign arrive.

This deluxe learning course now contains 48 new pages of text material to prepare you for the latest FCC Novice license examination.

The course is organized in nine separate learning modules corresponding to the subject areas you'll find covered in the Novice exam. Each subject is presented in a clear, step-by-step manner for upward progress at your personal learning rate.

At the end of each module, multiple-choice questions help you review and check your understanding and retention of the material. After Module 9, three practice exams and a final styled after the new FCC Novice examination impart the experience and test-taking confidence you want to pass the first time with flying colors.

The Course includes two audio cassette tapes full of important knowledge. The first is an introduction to Amateur Radio, an explanation of the RST signal reporting system, a review of electronic circuit components, and a study of practical circuits. The second tape will teach you the International Morse Code in letter groups quickly and effectively, and then help boost your send and copy speeds to 5 words per minute for the CW test.

Upon completion of the entire Course, you'll be able to accurately send and receive code at five words per minute, and pass a 20-question multiple-choice written test from the Federal Communications Commission.

An attractive vinyl binder houses the nine modules and cassette tapes. As a bonus, you receive a set of handsome Operating Aids including a colorful 31" x 22" Frequency Spectrum Chart and a matching U.S. Area Call Map, a glossary of common abbreviations used during communication with other Amateurs, an explanation of the twelve most frequent 'Q' signals, instructions for making your own base station antenna, and much more.

Heath's Novice License Course is guaranteed to help you get your license. If you should fail to pass your FCC Novice exam after completing the course, we will refund your money. Simply return the course materials, along with your receipt and a copy of your rejection notice from the FCC.

So...if you've been putting off getting your novice ticket because of fear of failing the code test or the technical exam...or if you just didn't know where to start, the Heathkit/Zenith Novice License Course is the correct answer! It contains every-

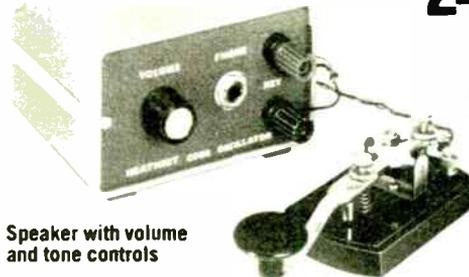


thing you need to get started on the right track toward the day when you put a rig on the air and start talking to the world. Order it now – the exciting universe of Amateur Radio is waiting to hear from you!

ER-3701, Shpg. wt. 7 lbs. .... 39.95  
Kit HD-1416, Code Oscillator (see below). Shpg. wt. 2 lbs. .... 24.95

## Build up your code speed with this handy kit

**\$24<sup>95</sup>**



Speaker with volume and tone controls

Sturdy telegraph key with adjustable rebound

Use this CW Code Oscillator to get your code speed up and pass your FCC exam in a simple and inexpensive way. This handy Practice Oscillator features a telegraph key with adjustable rebound, built-in speaker, volume and tone controls, plus a headphone jack for private listening. And once you get your license, it can serve as a side tone oscillator for any transmitter using negative-grid block keying. The manual includes sections on Operation, Application and Learning the code. The two-tone emerald cabinet is 2 5/8" H x 4 1/4" W x 4 3/8" D. Operates on one long-life 9V battery (not included).

Kit HD-1416, Shpg. wt. 2 lbs. .... 24.95

## We'll help you get started in Amateur Radio

Save 23% by purchasing the ER-3701 Novice Course and HD-1416 CW Oscillator together. Includes 10% certificate good for up to \$10 off Heathkit equipment.

**SAVER!** ERS-3701, Shpg. wt. 9 lbs. .... 49.95

## Advanced Class Amateur Radio License Course is the perfect incentive to upgrade

Prepared with the General Class license holder in mind, ER-3703 is the first completely up-to-date compilation of the technical and examination material required to help you achieve Advanced Class status. It assumes you possess a General license or have the equivalent skills and background knowledge to do so.

**\$49<sup>95</sup>**

- Well-organized to make most efficient use of your time
- Join the growing numbers of Advanced-rank operators
- We guarantee that you'll pass your FCC exam the first time – so sure in fact, that we will refund the cost of the program if you fail to pass after completing the enclosed optional final exam. That's confidence!

In response to the intense interest of General hams to achieve Advanced operating privileges, we've produced a comprehensive self-education Course that's *guaranteed* to aid in obtaining their next license, and earn a new call sign.

Housed in a pair of matching vinyl binders, the Advanced License Course fills over 800 pages. Unlike many, this Course is not simply a repetitious list of questions and answers to be memorized for passing the exam, but a detailed source of technical and appendical material which will improve your overall knowledge and understanding of radio electronics at the Advanced Class level.

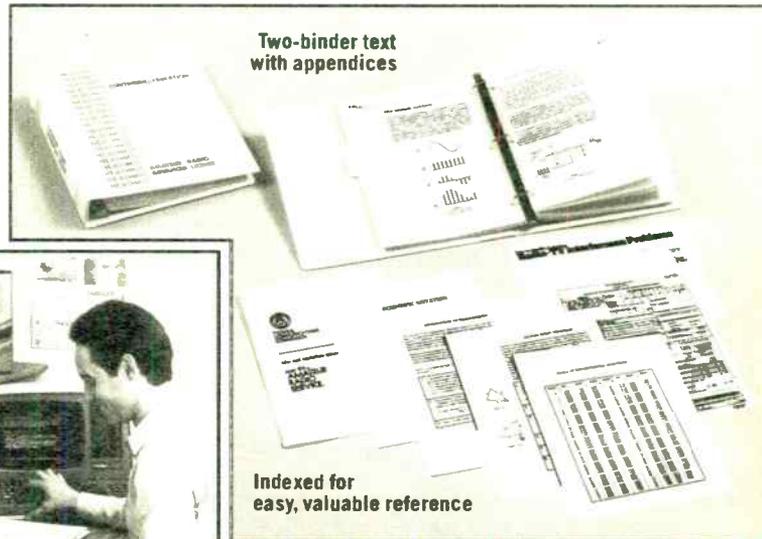
The FCC Element 4(a) written examination deals with the following subjects: Rules and Regulations, Radio Phenomena, Operating Procedures, Emission Characteristics, Electrical Principles, Practical Circuits, Circuit Components, Antennas and Transmission Lines, and Radio Communication Practices. ER-3703 covers them *all* in detail for the exam.

Two multiple-choice, 50-question exams at the end of the Course simulate the actual FCC test, and thereby give you "hands-on" test-taking experience.

The Advanced License Course is arranged in 8 learning units:

- |                                       |                                     |
|---------------------------------------|-------------------------------------|
| ● DC and AC Electronics               | ● Semiconductors                    |
| ● Basic Circuits for Equipment Design | ● Transmitter and Receiver Circuits |
| ● Antennas, Feedlines and Propagation | ● Station Operations                |
| ● Measurements and Test Equipment     | ● Practice Examinations             |

In addition to the text, you receive a copy of Part 97, FCC Rules and Regulations for Amateur Radio Operation, "How to Identify and Resolve Radio-TV Interference Problems" and the FCC's Form 610 license test application.



Two-binder text with appendices

Indexed for easy, valuable reference



The Heathkit Pledge extends beyond the fun of kitbuilding, to license acquisition as well: "We won't let you fail!"

Designed in the modular style proven most effective by educators, the Advanced License Course includes self-test reviews after each chapter to assure greater retention of the material. This format also makes it easy to identify problem areas *before* the FCC test. The self-instructional nature of the Course allows you to progress at your own pace and backtrack to review any subject.

Fully one-fifth of the 80-15 meter HF spectrum in four specific subbands (3800-3890, 7150-7225, 14175-14275 and 21270-21350 kHz) is allocated to the Advanced and Extra Class license holders. Why be left out? These are the choicest kilocycles with more DX hot spots and experienced amateurs. Demonstrate your desire for self-improvement and upgrade your ticket with the Heathkit/Zenith Advanced Class License Course. Send us a copy of your new license or FCC notification of passing to receive 4.0 Continuing Education Units and a personalized Certificate of Achievement. Don't delay – start by ordering your guaranteed Course today!

ER-3703, Shpg. wt. 9 lbs. .... **49.95**

## General License Course promotes Novice to voice communication

**\$59<sup>95</sup>**

- Leave the CB or Novice bands behind and progress to the full range of Amateur Radio experiences. Send your words and images around the world!

Move up to the General Class and get all the added privileges – more frequencies to operate on, plus voice transmission, radio teletype, slow-scan TV, facsimile, satellite activity – an impressive list of incentives that add up to more QSOs, QSLs and thousands of new friends gained via these modes.

This Course now contains additional new material to prepare you for the latest FCC examination.

An informative text takes you through the subjects covered on the new FCC written test. Its in-depth coverage will give you a wealth of concentrated information – more than enough to pass either the Technician or General Class written examinations. Later, keep it handy as a valuable reference.

The Course provides extra code practice to bring your send and copy speeds up to 15 words per minute. Since the FCC requires only 13 wpm to pass the General exam, the extra 'two-word edge'

gives you more confidence to pass the code test comfortably. We won't let you fail!

Four simulated FCC written tests give you test-taking experience, and allow you to review problem areas so you'll be better prepared for the actual exam. Once you pass your General exam, send us a copy of your new license or FCC notice of passing to receive 5.0 CEU's and a Certificate of Achievement.

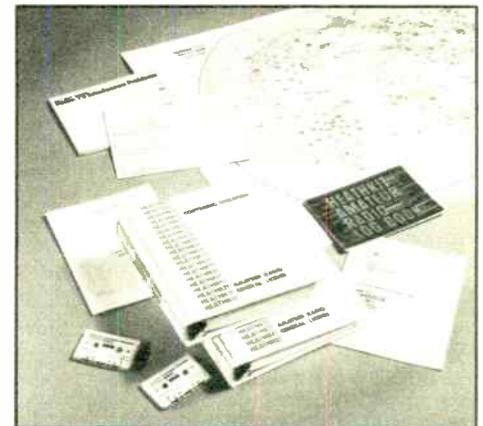
The General Course is arranged in 11 units:

- |                       |                  |
|-----------------------|------------------|
| ● Ham Radio Operation | ● Measurements   |
| ● Direct Current      | ● Transmitters   |
| ● Alternating Current | ● Receivers      |
| ● Active Devices      | ● Antennas       |
| ● Electronic Circuits | ● Practice Exams |
| ● Getting on the Air  |                  |

Your General License Course includes:

- |                          |                             |
|--------------------------|-----------------------------|
| ● Two Vinyl Binders      | ● Complete Test             |
| ● Two 90-min. Code Tapes | ● Code Workbook             |
| ● New FCC Form 610       | ● FCC Exam Schedule         |
| ● 4 Simulated Exams      | ● FCC Rules and Regulations |
| ● Station Log Book       | ● World Call Map            |
| ● T.V.I. Booklet         |                             |

Upgrading has never been easier because our Course has *everything* you need, including guaran-



tee of passing the General Class exam – or we'll refund your money for the program materials when you return them with a copy of your FCC rejection notice. It's a claim exclusive to Heath.

You have nothing to lose – order the best today!  
ER-3702, Shpg. wt. 24 lbs. .... **59.95**



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## See our kits on display at Heathkit Electronic Centers

Units of Veritechnology Electronics Corporation

<b>ARIZONA - Phoenix, 85017</b> 2727 W Indian School Rd 602-279-6247	<b>INDIANA - Indianapolis, 46220</b> 2112 E 62nd St 317-257-4321	<b>OHIO - Cleveland, 44122</b> 28100 Chagrin Blvd 216-292-7553
<b>Tucson, 85710</b> 7109 E Broadway 602-884-6773 At the corner of Broadway and Kolb	<b>KANSAS - Mission, 66202</b> 5960 Lamar Ave 313-362-4486	<b>Columbus, 43229</b> 2500 Morse Rd 614-475-7200
<b>CALIFORNIA - Anaheim, 92805</b> 330 E Ball Rd 714-776-9420	<b>KENTUCKY - Louisville, 40243</b> 12401 Shelbyville Rd 502-245-7811	<b>Toledo, 43615</b> 48 S Byrne Rd 419-537-1887
<b>Campbell, 95008</b> 2350 S Bascom Ave 408-377-8920	<b>LOUISIANA - Kenner, 70082</b> 1900 Veterans Memorial Hwy 504-467-6321	<b>Cincinnati, 45215</b> 10133 Springfield Pike 513-771-8850
<b>El Cerrito, 94530</b> 6000 Potrero Ave 415-236-8870	<b>MARYLAND - Baltimore, 21234</b> 1713 E Joppa Rd 301-661-4446	<b>OKLAHOMA - Oklahoma City, 73112</b> 2727 N W Expressway 405-848-7593
<b>La Mesa, 92041</b> 8363 Center Dr 619-461-0110	<b>Reckville, 20852</b> 5542 Nicholson Lane 301-881-5420	<b>PENNSYLVANIA - Frazer, 19355</b> 630 Lancaster Pike (Rt. 30) 215-647-5555
<b>Los Angeles, 90007</b> 2309 S Flower St 213-749-0261	<b>MASSACHUSETTS - Præbody, 01960</b> 242 Andover St. (Rt. 114) 617-531-9330	<b>Philadelphia, 19149</b> 6318 Roosevelt Blvd 215-288-0180
<b>Mission Viejo, 92692</b> 28201 Marguerite Pkwy 714-495-9382	<b>Wellesley, 02181</b> 165 Worcester Ave (Rt. 9) 617-237-1510	<b>Pittsburgh, 15235</b> 3482 Wm Penn Hwy 412-824-3564
<b>Pasadena, 91787</b> 1555 N Orange Grove Ave 714-623-3543	<b>MICHIGAN - Farmington Hills, 48018</b> 29433 Orchard Lake Rd 313-553-4171	<b>RHOE (ISLAND) - Warwick, 02886</b> 558 Greenwich Ave 401-738-5150
<b>Redwood City, 94063</b> 2001 Middlefield Rd 415-365-8155	<b>East Detroit, 48021</b> 18149 E Eight Mile Rd 313-772-0416	<b>TEXAS - Dallas, 75201</b> 2715 Ross Ave 214-826-4053
<b>Sacramento, 95825</b> 1860 Fulton Ave 916-486-1575	<b>St. Joseph, 49085</b> Lakeshore Drive near Hilltop Road 616-982-3215	<b>Forth Worth, 76116</b> 6825-A Green Oaks Rd 817-737-8822
<b>Woodland Hills, 91364</b> 22504 Ventura Blvd 213-883-0531	<b>MINNESOTA - Hopkins, 55343</b> 101 Snady Oak Rd 612-938-6371	<b>Houston, 77008</b> 1704 W Loop N 713-869-5263
<b>COLORADO - Denver, 80212</b> 5940 W 38th Ave 303-422-3408	<b>St. Paul, 55108</b> 1645 White Bear Ave 612-778-1211	<b>North Houston, 77069</b> 5050 FM 1960 W 713-583-1163
<b>CONNECTICUT - Avon, 06001</b> 395 W Main St (Rt. 44) 203-678-0323	<b>MISSOURI - Bridgeton, 63044</b> 3794 McKevey Rd 314-291-1850	<b>San Antonio, 78216</b> 7111 Blanco Rd 512-341-8876
<b>FLORIDA - Mialeah, 33012</b> 4705 W 16th Ave 305-823-2880	<b>NEBRASKA - Omaha, 68134</b> 9207 Maple St 402-391-2071	<b>UTAH - Midvale, 84047</b> 58 East 7200 South 801-564-6626
<b>Jacksonville, 32211</b> 8262 Arlington Expressway 904-725-4554	<b>NEW JERSEY - Asbury Park, 07712</b> 1013 State Hwy 35 201-775-1231	<b>VIRGINIA - Alexandria, 22303</b> 6201 Richmond Hwy 703-765-5515
<b>Plantation, 33317</b> 7173 W Broward Blvd 305-791-7300	<b>Fair Lawn, 07410</b> 35-07 Broadway (Rt. 4) 201-791-6935	<b>Virginia Beach, 23455</b> 1055 Independence Blvd 804-460-0997
<b>Tampa, 33614</b> 4019 W Hillsborough Ave 813-886-2541	<b>NEW YORK - Amherst, 14226</b> 3476 Sheridan Dr 716-835-3090	<b>WASHINGTON - Seattle, 98109</b> 505 8th Ave N 206-682-2172
<b>GEORGIA - Atlanta, 30342</b> 5285 Roswell Rd 404-252-4341	<b>Jericho, LI, 11753</b> 15 Jericho Turnpike 516-334-8181	<b>Tulsa, 98188</b> 15439 53rd Ave S 506-246-5357
<b>HAWAII - Honolulu (Pearl City), 96782</b> 98-1254 Kaahumanu St 808-487-0029	<b>Rochester, 14623</b> 937 Jefferson Rd 716-424-2560	<b>Vancouver, 98664</b> 516 S E Chaklov Dr #1 206-254-4441
<b>ILLINOIS - Chicago, 60645</b> 3462-66 W Devon Ave 312-583-3920	<b>N. White Plains, 10603</b> 7 Reservoir Rd 914-761-7690	<b>WISCONSIN - Milwaukee, 53216</b> 5215 W Fond du Lac 414-873-8250
<b>Denvers Grove, 60615</b> 224 Ogden Ave 312-852-1304	<b>NORTH CAROLINA - Greensboro, 27407</b> 4620-C W Market St 919-299-5390	<b>NEW STORE OPEN:</b> <b>CALIFORNIA - Mission Viejo, 92692</b> Marguerite Pkwy 28201 Marguerite Parkway 714-495-9382



## Heathkit's 75-watt VHF All-Mode Base Amplifier

**\$279<sup>95</sup>**

- Add power to your home base or club repeater
- Nominal 10 watts of drive produces more than 75 watts
- A great repeater amp with rugged solid-state design
- FM, RTTY, single sideband and CW modes of operation
- No appreciable insertion loss in receiver sensitivity

A look at the VL-2280 is all it'll take to make you think about which amplifier is needed for your 2-meter base station transceiver. To reach out and be heard, this powerful amplifier will surpass your demands.

You probably hear stations that can't hear you. A one-sided rig with a hot receiver takes half the fun out of working 2-meters from a fixed location. But, with the Heathkit VL-2280 All-Mode Base Amplifier backing you up with 75 watts of working power, you can permanently bridge those communication gaps. And, you can give your signal a big boost when and where you need it most.

The VL-2280 is a rugged amplifier that was designed for station operators who expect dependable results from their gear. They can call upon it to perform for long periods of time under rigorous conditions. At home beside your favorite exciter or in the wild on Field Day, it'll stand up to any challenge.

Reviewers and owners have praised the VL-2280 for including the time-saving features of simple operation and easy self-serviceability they appreciate and recommend. A built-in power supply operates from 120/240 VAC, portable generator or even a 12 VDC backup battery while running remote or in an emergency. And, the VL-2280 has plenty of reserve to power most exciters directly from an accessory socket on the back panel, providing a regulated 13.6 VDC source at 4 amps maximum load.

High quality Heath engineering built in. Broadband circuitry maintains a stable, specified output across the entire 2-meter band without retuning. Extra large heatsinks provide more than adequate cooling, to give you a 50% duty cycle and more "on" time. An extremely clean signal results from low IMD products, with a special circuit design that gives ultra-low distortion SSB performance and switchable VOX delay. A built-in antenna changeover relay enables transmit mode immediately with either RF-sensed or manual keying.

More features: A convenient Standby/On switch lets your exciter run barefoot. The meter monitors drive or output power and relative internal DC voltage.

Who builds the best all-mode amplifier? You do! When the outstanding high performance of the VL-2280 is assembled and installed in your station, there's a personal measure of state-of-the-art quality workmanship added as well.

Whether you want to increase your range away from the repeater, or get in on the excitement of 2-meter DX, Heath makes it easy to save money and have fun at the same time. An enjoyable three-evening kit. Build and install the best!

Kit VL-2280, Shpg. wt. 32 lbs. . . . . **279.95**  
HDZ-63-3, 3-ft. RG-8/U jumper with PL-259 connectors, 1 lb. . . . . **4.95**

**VL-2280 SPECIFICATIONS:** Frequency Range: 144-148 MHz (aligned at 146 MHz). Power Input: 1 to 10 watts. Power Output: 75 watts nominal at 13.8 VDC with 10 watts of drive. 80-85 watts typical. I/O Impedance: 50 ohms. VSWR 2.1 maximum. Insertion Loss: Less than 0.6 dBc. Conducted Spurious and Harmonics: -60 dBc or better. IM Distortion: -24 dBc referenced to one of two tones. Third Order Harmonics: -30 dBc referenced to CW power. Operating Range: -4°F to 104°F (20°C to +40°C). Duty Cycle: 50%, 10 minutes on/10 minutes off. Power Requirements: 240 VAC at 3.5 amps or 120 VAC at 7 amps. 50/60 Hz. Dimensions: 5½" H x 13½" W x 12¼" D. Net Weight: 27 lbs.

## Deluxe 50-watt 2-Meter Amplifier adds DX clout



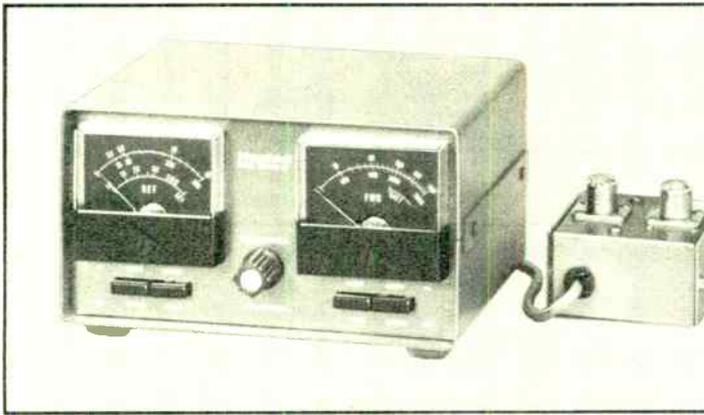
- Tuned input/output circuits reduce spurs and harmonics to -60 dB or better
- Easily assembles in four hours

Expand your capability. Latch onto more than one repeater. Join the fun of 2-meter DXing. Eliminate weak signals and make yourself heard from fringe areas. Increase your VHF fun with 50 watts out with only 15 watts in, or 20 watts out for 5 in and 40 watts out for 10 in.

The HA-202 puts extra clout behind your signal and draws less than 7 amps from your car battery (1 mA in standby). Has antenna changeover relay and sensing circuitry for completely automatic T/R switching. Emitter-ballasted configuration withstands VSWR up to 3:1, yet remains cool and continues to run. Covers any 1.5 MHz portion of 143-149 MHz band. Final alignment requires only a VTVM, wattmeter or SWR bridge. Rugged chassis mounts anywhere for a better signal from your mobile QTH. Includes SO-239 connectors for a direct hookup.

Kit HA-202A, Shpg. wt. 4 lbs. . . . . **64.95**  
HDZ-63-3, RG-8/U jumper with PL-259 connectors, 1 lb. . . . . **4.95**





## Dual HF Wattmeter measures up to 2000 W PEP

**\$99<sup>95</sup>**

- Reads PEP or average power from 1.8 to 30 MHz
- Has factory assembled and calibrated sensor
- Tune your transmitter for optimum output
- Enjoyable, easy-to-build two-evening kit

Is your station performing at peak efficiency on the low bands? Installed in your transmission line, the HM-2140A monitors forward and reflected power. A second scale on the reflected meter reads SWR directly from 1:1 to 3:1.

The Hams at Heath designed the HM-2140A to measure your transmitter's output up to 200/2000 watts PEP in the forward direction, and up to 50/500 watts reflected. Pushbutton-switched high and low power ranges plus a factory-tested sensor ensure precision readings. Another dual-position switch enables you to read PEP or Average power instantly. The precision RF sensor can be mounted in the cabinet, or up to four feet away.

Let Heathkit introduce you to the pleasure of kitbuilding, and the savings. This exacting instrument helps you get the very best performance from your amateur radio gear!

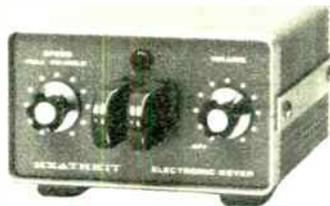
Completely portable, this instrument operates on a 9-volt battery (not included). Use the BATT scale and sensitivity control to check battery condition. When AC power is available, you can use the AC Battery Eliminator below.

The HM-2140A is housed in a ruggedly portable all-aluminum cabinet and has the charcoal- and night-brown colors of our latest state-of-the-art transceivers. Like them, this Dual HF SWR/Wattmeter offers you the reliable self-serviceability and satisfaction we pack into every Heathkit product.

Kit HM-2140A, Shpg. wt. 5 lbs. ....	99.95
PS-2350, 120 VAC Battery Eliminator, Shpg. wt. 1 lb. ....	7.95
HuZ-63-3, 3 ft. RG-8/U with PL-259 connectors, 1 lb. ....	4.95

## Electronic Keyer offers a choice of speed ranges

- Adjustable paddles let you send code so smooth you'll think they're part of your hand
- Compact base/portable keyer



Operating CW becomes an even greater pleasure when using the Heath Electronic Code Keyer. You select between two ranges as the kit goes together: 10-35 or 10-60 wpm; a front panel knob sets the sending speed.

Travel and tension of the paddles are adjustable, so you get the exact "feel" you like. True iambic operation means your CW signal is accurate and precise. This inexpensive keyer has features you'll appreciate: adjustable volume and sidetone frequency, a built-in speaker, weighted cabinet, removable line cord, headphone jack, 96" of shielded cable, connection for an external keyer, tune-up "hold" switch, receiver audio input and "power on" lamp. Three phono and one phone plug are supplied with the kit for your use as needed. Attractive two-tone emerald cabinet measures 3" H x 5" W x 7 3/8" D.

Kit HM-1410, Shpg. wt. 4 lbs. ....	59.95
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## Highly accurate Dip Meter covers 1.6 to 250 MHz

**\$79<sup>95</sup>**

- Another fine Amateur Radio value in kit form for the well-equipped hamshack
- Injection/absorption modes let you measure energized and de-energized circuits

The multi-purpose HD-1250 Dip Meter has dozens of practical uses in your lab and hamshack. The seven coils have phono plugs for easy installation and cover overlapping frequency ranges: 1.6-3.4 3.2-6.6, 6.3-13, 12.5-26, 25-51, 48-100 and 100-250 MHz. The coils are color coded for easy use, matching the colored meter scales.

Insertion and absorption wave meter modes of operation make the HD-1250 Dip Meter invaluable in solving hamshack problems. In the insertion mode, select the appropriate coil for the approximate resonant frequency of a de-energized circuit, and adjust Oscillator Level Control. Read the resonant frequency directly from the dial when the meter reading dips. Use the absorption wave mode with energized circuits to determine the resonant frequency of external RF energy. The Meter peaks at resonance.

The HD-1250 Dip Meter helps you find the approximate resonant and operating frequency of both energized and de-energized circuits. Let the HD-1250 Dip Meter go to work for you: fine-tune your transmitter circuits; adjust shunt and series traps; measure the Q of a tuned circuit; determine relative Q; find unknown capacitor values; find the value of RF and toroid coils; check and isolate parasitic oscillations; adjust your transmitter's neutralization capacitor; use as a relative field-strength meter, and measure antenna resonance.

Discover the pleasure and savings of kitbuilding. Heathkit's detailed manual will lead you step-by-step through assembly, adjustments and calibration - even if you are a first time kitbuilder. Two circuit boards make the Meter compact and construction easy. In two evenings, or less, you'll be using one of the most helpful instruments in Amateur Radio. For calibration, use a known frequency source or a frequency counter.

For a delicate instrument of this type, only exceptional-grade components are used for the most exact metering indications and injection signal fidelity. In the balanced Colpitts RF oscillator, silver mica coupling capacitors provide improved frequency stability. The detector uses a broadband MOSFET amplifier, hot-carrier diodes and a Q-multiplier for closer sensitivity and a better dip action. A responsive 150  $\mu$ A movement yields sharper resonance indications.

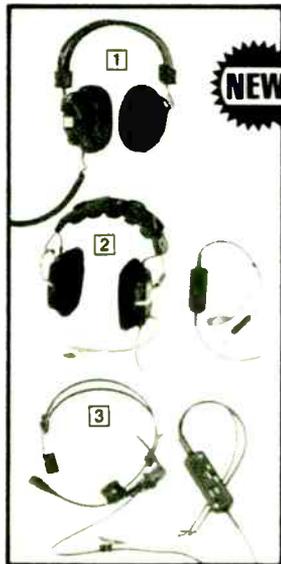
Rugged aluminum case Meter and accessories store handily in a molded gray carrying case for easy portability. Operates on one 9-volt battery (not included). Assembly manual has detailed section on applications to Amateur Radio.

Kit HD-1250, Shpg. wt. 4 lbs. ....	79.95
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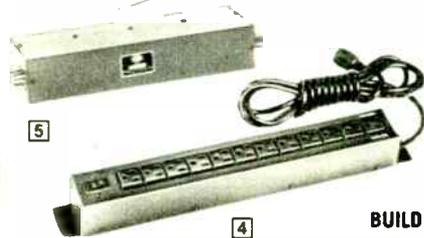
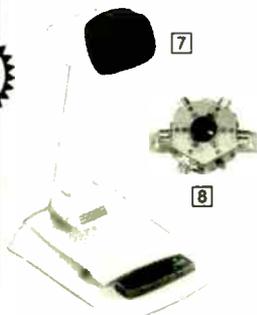
**HD-1250 SPECIFICATIONS:** Frequency Range: 1.6 to 250 MHz Controls: Tuning capacitor, oscillator level control and On/Off switch. Meter Movement: 150 microamperes. Solid-state Circuits: 1 NPN transistor oscillator, 1 dual-gate MOSFET amplifier and 2 diffused silicon hot carrier diode detectors Power Source: 9-volt NEDA Type 1604 battery. Net Weight: (Meter, case and coils) 2 lbs Dimensions: less coils, 2" H x 2 3/16" W x 5 7/8" D



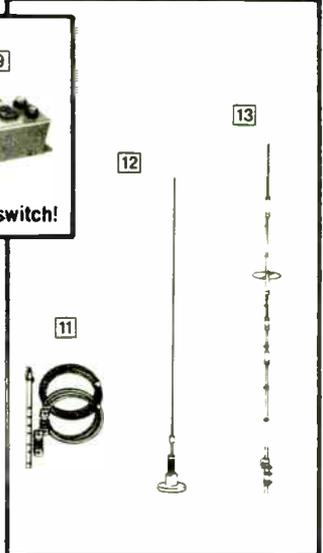
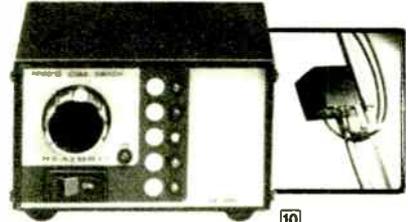
Alaska, Hawaii and Michigan Residents: Call 616-982-3411



**NEW**



Has no ON-OFF switch!



**BUILD A HEATHKIT HIGH-TECH HAMSHACK!**

**Reliable, money-saving accessories you can build which will improve your station efficiency**

**1 Low-cost, quieting headphones**  
**Copy more traffic:** Mura SP-104 Stereo Headphone has isolating ear cups, wide 40-15,000 Hz frequency response, individual volume controls and 2 1/4" dynamic speakers for clear comprehension. 8-ohm impedance. Ten foot coiled cord with plug.  
**HDP-1396**, Assembled, Shpg. wt. 2 lbs. . . . . **19.95**

**2 Low-noise ProCom 200 headset**  
**Fully adjustable Telex headset** for the amateur and professional offers almost hands-free operation. Boom-mounted, pivotal electret mic has selectable high or low impedance, 100-8000 Hz receiver/mic response. In-line on/off VOX control. Built for maximum comfort over long hours of operation.  
**HDP-1496**, Assembled, Shpg. wt. 2 lbs. . . . . **99.95**

**3 Lightweight ProCom 300 headset**  
**High-quality performance** in a featherweight headset with exceptional audio performance. 100-3500 Hz receiver/100-8000 Hz mic response. On/off VOX. Aviation-style, single-side earpiece receiver is ideal for listening to environmental sounds while monitoring the radio. Great for mobile operation.  
**HDP-1497**, Assembled, Shpg. wt. 1 lb. . . . . **99.95**

**4 Twelve-socket power Outlet Strip**  
**Multiplies convenience** by providing extra electrical outlets for your equipment in hamshack, workshop, office, basement or garage. Has eleven switched and one unswitched (for clock or memory save), fused 3-hole outlets with 10A maximum load. For 120 VAC.  
**Kit HD-1274**, Shpg. wt. 4 lbs. . . . . **24.95**

**5 Low-Pass Filter ends TVI trouble**  
**Solve emissive RF interference problems** with this fine low-pass Barker & Williamson filter. Provides a minimum of 70 dB attenuation. Cut-off frequency is 34 MHz. Less than 0.3 dB insertion loss. For 160-10 meters. 50Ω impedance. Rated for full legal power.  
**HDP-3700**, Assembled, Shpg. wt. 2 lbs. . . . . **34.95**  
**HDZ-63-3**, 3-ft. RG-8/U with PL-259s, 1 lb. . . . **4.95**

**6 Heath 'Antenna'™ dissipates RF**  
**We've made the original 'Antenna' even better!** Now this important device has improved specifications, better components and our famous low, build-it-yourself kit price. HN-31A now handles 1 kW of RF energy (2kW PEP) with VSWRs always less than 1.5:1 for frequencies up to 450 MHz. Provides ideal 50-ohm non-inductive load to your setup, and eliminates unnecessary QRM during tune-up, maintenance or alignment. Prolongs life of your finals. Holds one gallon of transformer oil (not supplied). Should be standard in every hamshack!  
**Kit HN-31A**, Shpg. wt. 3 lbs. . . . . **24.95**

**7 Ultra-modern Desk Microphone**  
**Cardioid pattern** of the Heathkit Dynamic Microphone produces 20 dB front-to-back ratio for higher signal-to-noise level. 150 Hz to 15 kHz response. Switch-selected high/low impedance and VOX or lockable PTT. Beige case with 6' coiled cord adds new style and bonafide class to your shack.  
**HDP-242**, Assembled, Shpg. wt. 2 lbs. . . . . **59.95**

**8 Coaxial Switch routes input RF**  
**Choose from up to five antennas** or interconnecting equipment quickly, efficiently. Switches one RF source to any one of several antennas or loads, while grounding all outputs not in use. Handles 2 kW PEP with maximum 1.1:1 SWR up to 250 MHz.  
**Kit HD-1234**, Shpg. wt. 1 lb. . . . . **19.95**

**9 NEW! Heathkit Smart Outlet Box**  
**The perfect work-saver!** Has ten switched sockets, one unswitched and one current-sensing "control socket." Lets you power up all gear plugged into switched sockets by turning on the one piece of equipment acting as "controller." MOV device protects from line surge and transient spikes to maximum 325 volts @ 6500 amps (70 joules one time, 35 joules repeated). Great for hamshack or computer room. Maximum "control" power is 250 watts @ 2A; max all other outlets is 1200 watts @ 10A.  
**Kit GD-1295**, Shpg. wt. 4 lbs. . . . . **49.95**

**10 Change antennas in seconds with a convenient Remote Coax Switch**  
**Saves money!** — replaces five expensive coax feedlines with just one; LEDs show which antenna is connected. Erasable front panel lets you label antenna positions. Accepts signals to 150 MHz; rated for full legal power. VSWR under 30 MHz is 1.05:1 or less; better than 1.2:1 under 150 MHz. Sixth LED position grounds all antennas at once for lightning protection. Almost no insertion loss — silver-plated switch contacts reduce attenuation to less than 0.2 dB at 100 MHz. 50-70 ohm impedance; SO-239 connectors. Requires 8-wire cable below. Shielded, weatherproof U-mount solenoid housing.  
**Kit SA-1480**, Shpg. wt. 8 lbs. . . . . **99.95**  
**IDA-1290-3**, 150-ft. 8-cond. cable, 6 lbs. . . . **23.95**  
**IDA-1290-2**, 100-ft. 8-cond. cable, 4 lbs. . . . **16.95**  
**IDA-1290-1**, 50-ft. 8-cond. cable, 2 lbs. . . . . **9.95**

**11 75-ft. Long-wire SWL Antenna**  
**Really helps you pull in distant stations.** Copper line with 30' lead-in, all insulators and hardware for easy setup. A must for the serious shortwave listener.  
**GRA-72**, Shpg. wt. 2 lbs. . . . . **9.95**

**12 146-148 MHz Mobile Antenna**  
**Cushcraft AMS-147 3/4-wave 2-meter mount** with 90 lb. grip-tight magnet in a chrome-plated base makes it easy to air a signal in many vehicles — even your boat. Stainless steel whip with thumb-lock adjustment needs no cutting; boasts 3 dB gain for more range. Includes PL-259 connector and coax.  
**HDP-1472**, Shpg. wt. 3 lbs. . . . . **37.95**

**13 Cushcraft AV5 has long DX reach**  
**Vertically-polarized omni-directional antenna** designed to provide complete CW and SSB coverage on 80-10 meters. Especially effective high-Q stabilized traps give wider bandwidth. SWR always 1.5:1 or less at resonance on each band. Self-supporting height is 25 ft. (7.4m). Full legal power. Built-in coax connector accepts PL-259 on your station feedline.  
**HDP-1473**, Shpg. wt. 10 lbs. . . . . **119.95**





## The all-new HW-9 Deluxe QRP CW Transceiver keeps you in touch with the world

Broad band circuits cover 250 kHz of CW in the 80, 40, 20 and 15 meter bands — expandable to 30, 17, 12 and 10 meter bands. Solid state T/R switching for full break-in.

**\$249<sup>95</sup>**

- Front panel relative signal/power strength meter
- Continuously variable RF output
- Receiver Independent Tuning
- Wide/narrow audio-active filter

Join the challenge of low power QRP in the world of five watts and below. The all new Heathkit HW-9 Transceiver sets the standard for comparison in wide dynamic range performance.

Add the HWA-9 Accessory Band Pack for the 30, 17 and 12-meter WARC bands and the lower 250 kHz of the 10-meter band.

Rugged and lightweight the HW-9 is ideal for portable operation. This QRP Transceiver can be powered from batteries, a lighter socket, solar photovoltaic array or 120 VAC 50/60 Hz with the PSA-9 Power Supply below.

The HW-9 provides operator convenience in covering the 3.5-3.75, 7.0-7.25, 14.0-14.25 and 21.0-21.25 MHz operating ranges. Install the HWA-9 Accessory Band Pack and expand this convenience to include the WARC bands at 10.1-10.15, 18.068-18.168 and 24.89-24.99 MHz, and the 28.0-28.25 MHz operating range. Use headphones or attach a speaker.

Totally new design of the transmitter and receiver sections brings state-of-the-art performance to avid QRP operators, newcomers and old timers alike. Micro-electronic circuits reduce transceiver weight, while providing a level of performance and features unexpected at this price. Among these features are: broadband design, wide dynamic range, automatic AGC, single conversion, balanced product detector, active audio processing and RIT.

Broadband design eliminates the need to tune circuits within a band. The wide-band front-end uses a double-balanced mixer and 4-pole crystal filter to handle wide dynamic range signals with ease and eliminate the customary RF amplifier in the receiver section. Automatic AGC circuits provide superior receiver performance and audio response.

A single conversion in the main signal path reduces spurious responses and maintains superior image rejection. Signals are pulsed through the sensitive front end with ease. A balanced product detector followed by active audio processing provide outstanding performance. RIT (receiver incremental tuning) permits tuning the receiver 1 kHz above or below the transmit frequency. Few other QRP CW transceivers offer as many features.



Detailed instructions take you through assembly and alignment, step by step. Only a VTVM or VOM, a frequency counter and dummy load are required to align the HW-9 Deluxe QRP CW Transmitter to specification performance.

After a few nights of kitbuilding fun, accept the challenge of QRP QSL-hunting with Heath's newest and best-ever low-power rig.

- Kit HW-9, Shpg. wt. 8 lbs. . . . . 249.95
- Kit HWA-9, Accessory Band Pack, Shpg. wt. 1 lb. . . . . 39.95
- Kit PSA-9, Accessory Power Supply, Shpg. wt. 4 lbs. . . . . 39.95

**HW-9 SPECIFICATIONS: TRANSMITTER:** — RF Output Power: 4 watts, except 3 watts on 10 meters. Transmitter Frequency Offset: App. 700 Hz. Antenna Load Impedance: At least 90% of rated power with less than 2:1 SWR. Protected against high SWR. Harmonic & Spurious Radiation: -35 dB & -40 dB minimum, at rated output. T/R Operation: CW, full break-in. **RECEIVER:** — Sensitivity: 0.2  $\mu$ V for readable signal; 0.5  $\mu$ V or less for 10 dB S + N/N. Selectivity: Wide, 1 kHz max. @ 6 dB; Narrow, 250 Hz @ 6 dB. Dynamic Range: 85 dB. Image & IF Rejection: 60 dB, min. Audio Hum Noise: -60 dB. Audio Output: 1 watt into 8 $\Omega$ . **GENERAL:** — Frequency Stability: Less than 150 Hz/hour drift after 30-minute warmup. Power Requirement: 11-16 VDC, 12.6 specified. Dimensions: 4 1/4" H x 9 1/4" W x 8 1/2" D.

## Matching Wattmeter and Antenna Tuner for the dedicated QRP operator



### 1 HF/VHF Wattmeter with 3:1 SWR bridge is superbly sensitive

- Wire for three different frequency ranges
- Compact, reliable, and above all, affordable

Put your best QRP signal on the air with confidence and keep your low-watt station at peak power efficiency with the responsive HM-9 Wattmeter. It simplifies continuous metering of exciter or amplified output level and gives you a quick, exact SWR read-out to fine-tune your antenna system.

An exclusive Heathkit option lets you wire the HM-9 for monitoring in three different ranges: 1.8-30, 50-54 or 144-148 MHz. QRP fans will love it. Active hams on the 2- and 6-meter VHF bands can use it to measure output of their barefoot and boosted HTs, mobile or base transceivers.

Kit HM-9, Shpg. wt. 3 lbs. . . . . 49.95

### 2 50-Watt Antenna Tuner with 4:1 balun gives you better match

- Designed for repeated dependability using the finest-quality components

When every watt counts there's no room for a mismatched loss of precious power.

The HFT-9 provides an exact, 100% Transmatch to a wide range of output impedances, with a built-in 4:1 ferrite balun. Connectors for coaxial feed, balanced line and long-wire antennas.

A large 12-tap, air-wound inductor with silver-plated wire and tap switch gives you an almost unlimited matching capability between 1.8 and 30 MHz. Continuously variable transmitter/antenna controls make optimum adjustments easy.

Kit HFT-9, Shpg. wt. 3 lbs. . . . . 54.95  
SAVER! QRS-9, HM/HFT-9 Pair, 14 lbs. . . . . 99.95



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

**HAMS! You've never seen a price this low on a rig so advanced...only from Heath!**



## The Heathkit HW-5400 Synthesized HF SSB/CW Transceiver is a price-performance triumph

NOW ONLY  
**\$499<sup>95</sup>**

- Save \$250 more on the world's most fascinating rig and experience performance others only dream of
- PLL-synthesized stability with crystal accuracy
- Patented 2-speed tuning knob with 50 Hz resolution
- Digital display with direct keypad frequency entry, two memories per band and mode/status symbols

**The world's first and only kit-form synthesized HF Transceiver:** For every ham who dreams of owning the finest quality, multi-purpose equipment they can "get their hands on," Heath has created a special new assemble-it-yourself rig.

**A long overdue standard of price-performance payback:** Heath breaks the cost barrier to having more sophisticated, dependable talk power and microtech flexibility for use while at home, in the field or on the road. The compact HW-5400 Synthesized Transceiver is a marvel of modern kit-form engineering design. Controlled and monitored by a custom 8-bit microprocessor, it yields quick-change versatility in adapting to uncertain band conditions. From the moment it arrives, you start an interfacing experience that will put the *original* sense of thrill, skill and adventure back into Amateur Radio.

**Three modes, eight bands and plenty of power for HF excitement:** The HW-5400 operates in USB, LSB, and CW on 80-10 meters with automatic sideband selection. Completely solid-state and broadbanded, it has full break-in (QSK) for proficient CW ops, sixteen memories, power supply activation at the transceiver panel, defeatable amplifier relay for quiet keying, maximum shielding on the PA, reverse and over-voltage protection as well as high VSWR forward power cutback circuitry for the cool-running finals.

**The HW-5400's high-resolution tuning system** employs a dual-speed technique so uniquely practical and efficient, Heath has applied for patent rights. An infrared optical shaft encoder and two rotation holes control the scan speed. One uses a capacitive-touch metallic insert so you can rapidly scan a band in 1 kHz increments, while tuning with the other lets you pick out closely-packed calls for more QSOs over a narrow frequency range at 50 Hz per step.

**Beats the QRM every time:** A tremendously versatile *Split-Memory Access* function lets you review and change the transmit frequency while in receive without missing a single word or fragment of code from the station in contact.

**Total Transceiver status at a glance:** Seven mode and function symbols left of the frequency display inform you of current mode, T/R status, split operation, split-access memory handling, and whether the transmit frequency is outside the band edge. They can be set to one of three brightness levels.

**Half the controls on most transceivers, twice the performance of many:** The HW-5400 front panel is clean and uncluttered, with all functions marked for easy operation. Three dual-concentric knobs command every aspect of signal isolation and maintenance. Essential vox and sidetone controls are located behind the nameplate, which flips open at your touch.

94/AMATEUR RADIO

**More microprocessor ingenuity:** With the inexpensive HWA-5400-3 Keypad option wired in, you've got extra pushbutton power and signal-capturing advantage. It allows instantly synthesized direct QSY to any position in the band, and permits fast DX, contest and net work when using the Split-Memory function. This cursor-controlled, single-digit, random or sequential access to any frequency and 50 Hz PLL accuracy improves contact agility.

**Matched to this Transceiver,** the HWA-5400-1 Power Supply/Speaker/Digital Clock provides a well-regulated, 13.8 volt source of DC power.

**As you build the 5400 kits circuit by circuit,** you'll learn their engineering details with hands-on understanding. The fully illustrated, step-by-step manual guides you all the way through assembly.

**For the price- and quality-conscious ham who wants the greater pride, knowledge and performance only hand-crafted gear can provide,** these kits offer the highest value for your hamshack dollar.

**With the knowledge you gain to keep it performing at peak efficiency,** the HW-5400 is the only rig to make real the dream of every amateur — a greater, more worthwhile return in pleasurable, year-to-year results on a premium investment. The new

HW-5400. If you've got the time, *this is the Transceiver!*

Kit HW-5400, Transceiver, 24 lbs. . . . . Was \$749.95, NOW ONLY 499.95

Kit HWA-5400-1, Power Supply, Shpg. wt. 39 lbs. . . . . 199.95

Kit HWA-5400-3, Frequency Entry Keypad, Shpg. wt. 1 lb. . . . . 59.95

Kit HWA-5400-2, Deluxe 2.1 kHz 4-Pole SSB Crystal Filter provides sharper skirt selectivity in the IF bandpass for ten total poles of filtering and optimum receiver performance. Shpg. wt. 1 lb. . . . . 59.95

**HWA-5400-1 SPECIFICATIONS:** Line Voltage: 120 240 VAC, 50 60 Hz. Output Voltage: 13.8 VDC at rated load. Protection: 20-ampere DC output fuse, 7- and 4-ampere slow blow fuses for 120 and 240 VAC primaries, respectively. Output Current: As required by Transceiver, up to 18 (20 peak) amperes during transmit. DC Output Regulation: 7% from receiver load to transmit load at 120 VAC primary; 4% additional with AC primary at 110-130 or 220-260 VAC. Ripple: 50 mV or less at rated load. Duty Cycle: 9 amperes DC continuous, 18 amperes at 50% (5 min. on, 5 off). Speaker: 4 ohms impedance, 300-3000 Hz response, 2 watts peak power. Clock: 4-digit blue fluorescent display in 12 or 24 hour format, synchronized to line frequency. Cabinet Dimensions: 4¼" H x 8½" W x 14" D (10.8 x 21.6 x 35.6 cm). Net Weight: 26 lbs. (11.8 kg).

**HW-5400 SPECIFICATIONS — GENERAL:** Overall Band Coverage: 80 through 10 meters, 10 MHz WWV; WARC bands operational. Frequency Coverage: 3.450 – 4.050, 6.950 – 7.350, 10.000 – 10.200, 13.950 – 14.400, 18.018 – 18.218, 20.950 – 21.500, 24.840 – 25.040, 28.000 – 29.750 MHz. Frequency Readout: 7-digit vacuum fluorescent display with special symbols. Readout Symbols: — (Split), ← (Out of band), L (LSB), U (USB), C (CW Wide), C (CW Narrow), M (Memory), T (Transmit). Readout Accuracy: To nearest 50 Hz. Frequency Control: Synthesized. Synthesized Lock Indicators: Display reads "PLL" and LEDs show which loops are unlocked. Transmitter is disabled. Dual Rate Frequency Tuning: Slow = 50 Hz per step, 1.25 kHz per knob rotation. Fast = 1 kHz per step, 25 kHz per knob rotation. Tuning Backlash: None. Split Frequency Operation: Transmit from memory frequency, receive from displayed frequency. Memory: Stores two frequencies per band. Frequency Stability: Less than 50 PPM drift from turn on. Modes: SSB Normal and Reverse; CW, Wide or Narrow. Operating Temperature: 0° to 40° C. Power Requirements: 11 to 16 VDC, 120/240 VAC with optional AC power supply. All specifications referenced to 13.8 VDC. RECEIVER: Sensitivity: Less than 0.35µV for 10 dB, S + N/N. Selectivity: With standard filter, 2.0 kHz minimum at 6 dB to 6 kHz maximum at 60 dB; with HWA-5400-2 optional filter, 1.8 kHz minimum at 6 dB; CW active audio filter, 250 Hz minimum at 6 dB centered at 700 Hz. Overall Gain: Less than 1 µV for 0.25 watt audio output. Audio Output: 2 watts minimum into 4 ohms; less than 10% THD. AGC: Selectable Fast or Slow (no more than 8 dB audio change for a 100 dB or greater input signal range). Intermodulation Distortion: 70 dB minimum at 25 kHz. Image Rejection: 80 dB minimum. IF Rejection: 100 dB minimum. IF Shift Tuning: ± 600 Hz in Receive only. Internally Generated Spurious Noise: All below 1.0 µV. Audio Hum and Noise: Greater than 40 dB below maximum output. Receiver Incremental Tuning: ± 350 Hz. TRANSMITTER: RF Output: High SSB, 100 watts PEP power minimum, except 80 watts on 10 meters. CW, 100 watts minimum, except 80 watts on 10 meters. Duty Cycle: Continuous SSB (voice), 50% receive-transmit ratio on CW; 5 min. on, 5 min. off. Load Impedance: At least 90% rated power with less than 2:1 SWR. Protected against high VSWR. Carrier Suppression: – 50 dB minimum from a 100 watt, single-tone (1000 Hz). Unwanted Sideband Suppression: – 50 dB minimum from a 100 watt, single-tone (1000 Hz). Spurious Radiation: – 60 dB minimum, referenced to 100-watt output. Third Order Distortion: – 30 dB minimum from a 100 watt PEP two-tone output. T/R Operation: SSB = PTT or VOX, CW = full break-in (simplex only). CW Sidetone: 700 Hz to speaker or headphones. Microphone Input: High impedance (25k ohm) with – 55 dBm rating. Operation with External Linear Amplifier: Linear relay, linear ALC rear panel connections. Front Panel Meter: Automatically-switched S-units in Receive, ALC in Transmit. Available Accessories: HWA-5400-1 AC Power Supply with 12/24-hour clock and speaker; HWA-5400-2 2.1 kHz SSB Filter; HWA-5400-3 Frequency Entry Keypad Kit. Cabinet 4¼" H x 11 ¼" W x 14" D (10.8 x 28.6 x 35.6 cm). Weight: 24 lbs. (10.9 kg).



Credit Card Orders Call TOLL-FREE: 800-253-0570

# Amateur Radio's most promising challenge – the SS-9000 Deluxe Synthesized HF Transceiver

## NEW LOW PRICES!

SAVE \$996 on the SS-9000,  
\$96 on the PS-9000 now!

- This is the Rolls Royce of transceivers: Fully microprocessor-based, entirely solid-state, broadbanded in design – delivers 100 watts to a 50 ohm load
- Microprocessor circuitry controls the entire operation of the SS-9000
- A built-in Terminal Interface with an RS-232 I/O port allows instant and direct control of operating parameters via ASCII terminal, modem or computer
- Nine-band operability, including the newly-allocated 10, 18 and 24 MHz WARC bands and WWV at 15 MHz

**Brave new Transceiver:** The Heath SS-9000 is a quantum leap forward in terminal-controllable communications gear. Consummate in every engineering detail, its design evolved with the future of Amateur Radio in mind, and those operators who are exploring the leading edge of convergent radio and computer technology. Streamlined for extraordinary results even without keyboard control, experienced amateurs will ultimately use it to establish new high standards for performance.

**Completely synthesized for absolute accuracy:** A crystal-controlled master oscillator provides exact reference to phase-lock the BFO and HFO for super stability and repeatability. Likewise, a single precise VFO is tied to each display through 256 bytes of CMOS Random Access Memory. This extended on-board storage capacity accepts three separate inputs per band (preserved with battery backup) for a total of 27 frequencies to recall and work at will.

**Two displays are better than one:** Smart operators know our unique dual digital display is more than a cosmetic frill. Simultaneous working readout gives serious contesters and DX hunters greater advantage in frequency-handling speed and agility. Pushbutton exchange with (and copy into) memory or opposite display permits instantaneous QSY. Place it under terminal control and you can enjoy a versatility in QSO capture that shatters all precedent.

**The Terminal Interface:** At the heart of your SS-9000, an "intelligent" controller circuit assists a serial interface in maintaining communications protocol between external requests, via front panel controls or terminal guidance, and the internal circuits on the synthesizer, T/R and audio circuit boards. It allows two-way control/monitor communication between the Transceiver and a video terminal (such as the H/Z-29 on page 38), hard copy ASCII teletypewriter, or computer (such as the HS-89 All-In-One on pg. 36).

**Total control, simple controls:** Commands are available to select, display and change the band, mode, all 27 operating and memory frequencies, passband shift, band scan and baud rates, lock and release one or all switches to their terminal-controlled or physical states and print all parameters. Keyboard command also allows you to place the SS-9000 in transmit or receive mode, assign and toggle T/R/Tr status on the dual readouts, and freely manipulate the three stored frequencies on each band, with full diagnostic error-prompting at the terminal. All keywords are short, and easy to learn.

**An SS-9000 can be connected to the Heathkit SA-1480 Remote Coax Switch.** When changing bands (either manually or via remote control, using the Motorized Band Switch) the proper antenna is selected automatically.

**Free software:** A 5¼" hard-sectored floppy diskette is supplied with every SS-9000. It demonstrates many ways of providing useful communication between a computer and the Transceiver, using graphics and video text to introduce you to its amazing control capabilities.

**The PS-9000 Power Supply/Speaker is a perfectly matched component:** As the SS-9000 powerplant, it provides 13.8 VDC for base operation with high temperature, short circuit and current surge protection. Each digital clock has independent 12- or 24-hour capability for local and UTC timekeeping.

**This is the HF Transceiver the world has been waiting for.** There is no other, no better system than the SS/PS-9000 team. See it at your nearby Heathkit Electronic Center. Try out the demonstration disk. Listen to what others say



about its performance advantages. Then put it on the air from your club or QTH. *And take command of the world's most capable Transceiver!*

**SS-9000, Assembled and tested, 35 lbs. . . . . Was \$2795, NOW ONLY 1799.00**  
**PS-9000, Assembled and tested, 33 lbs. . . . . Was \$295, NOW ONLY 199.00**

**PS-9000 SPECIFICATIONS – GENERAL:** Output Voltage: 13.8 VDC, regulated (adjustable). Maximum Output Current: 25 amperes intermittent (50%, 10 minutes on-off) and 15 amperes continuous. Power Requirements: 110 to 130 VAC at 6 amperes or 220 to 260 VAC at 3 amperes, 50/60 Hz. Regulation: Less than 4% from no load to 25 amperes. Ripple: Less than 2% at 25 amperes. Circuit Breaker: 20 amperes for 110 to 130 VAC primary, 10 amperes for 220 to 260 VAC primary. Current Limiting: Over-current protected (set typically for 28 amperes). Thermal Protection: Automatic shutdown with over-temperature on the heat sink. **DUAL CLOCK:** Display: Two independent readouts with four digits and a colon. Clock Format: 12- or 24-hour display. Accuracy: Determined by the line frequency (no cumulative error). Power Requirements: 120 or 240 VAC, 50 or 60 Hz., 3.5 watts. Cabinet Dimensions: 6¼" H x 9¾" W x 13¾" D (15.6 x 24.4 x 34.9 cm). Weight: 33 lbs (15 kg). Specifications apply when the Power Supply is used with the SS-9000

**SS-9000 SPECIFICATIONS – GENERAL:** Tuning: 180 Hz per step, 5 kHz per knob rotation with pushbutton up and down scan (rate is internally adjustable). Operation: Split transmit/receive or transceive from either readout. Synthesized Lock Indicators: Visual indication when synthesizer is unlocked. Transmitter is disabled. Frequency Coverage (MHz): 1.8-2.0, 3.5-4.0, 7.0-7.3, 10.1-10.15, 14.0-14.350, 18.068-18.168, 21.0-21.450, 24.890-24.990, 28.0-29.7, WWV @ 15.0 (Extended Frequency Coverage). Frequency Stability: Less than 3 ppm from turn-on for first 15 minutes. Less than 3 ppm/hour drift after 15 minutes warmup; Less than 20 ppm drift from 0°C to +40°C (single crystal-controlled 10 MHz frequency standard). Modes of Operation: LSB, USB, CW-Wide, CW-Medium, CW-Narrow, RTTY. Operating Temperature: 0°C to +40°C. Power Requirements: 11 to 16 VDC with a nominal current maximum of 25 amps at 100 watts CW output. Receiver current is 2 amps nominal. All specifications are referenced to 13.8 VDC at 25°C ambient. Real Panel Connectors & Control: Antenna (SO-239), Linear ALC In, Linear ALC Adjust, Low Power Enable, Spares (5), DC Power Input, CW Key Jack, External Transmit Audio In (2), Speaker Out, External Receiver Audio, T/R In, T/R Out, Mute, Mute (inverted), External Relay (linear), and RS-232 Interface. **TRANSMITTER:** RF Power output: SSE = 100 watts PEP minimum, CW & RTTY = 100 watts minimum. Load Impedance: 50 ohms. VSWR: Stable at any VSWR and load impedance. Cutback circuitry guarantees at least 80% of rated power at any VSWR less than 2:1 and a minimum of 15 watts at any VSWR. Carrier Suppression: 50 dB down from a 100 watt, single-tone (1000 Hz) output. Harmonic Radiation: 50 dB down below 50 MHz, 65 dB down above 50 MHz. Spurious Radiation: 50 dB down, except at 1.7 meters (40 dB down). Third Order Distortion: 30 dB down from a 100 watt PEP, two-tone output. Unwanted Sideband Suppression: 55 dB down from 100 watt, single-tone (1000 Hz) output. T/R Operation: SSB = PTT or VOX, CW = semi break-in. CW sidetone: 750 Hz tone, adjustable level. Microphone Input: High impedance (25k ohm) with -55 dBm rating. **RECEIVER:** Sensitivity: 0.3 µV for 10 dB (S+N)/N SSB in the 40 through 10 meter bands, 0.5 µV on the 160 and 80 meter bands. Selectivity: 2.1 kHz at 6 dB down, 5 kHz at 60 dB down. CW filters, CWM = 400 Hz at 6 dB down and 1.5 kHz at 60 dB down. CWN = 200 Hz at 6 dB down and 1 kHz at 60 dB down. Overall Gain: Less than 1 microvolt for a 0.25 watt audio output. Audio Output: 1.5 watts into 4 ohms at less than 10% THD. AGC: Fast-attack with switch selectable Off, Fast and Slow decay. Intermodulation Distortion (20 kHz spacing): -70 dB. Image Rejection: -80 dB (except -85 dB on the 17 and 12 meter bands). Second IF Rejection: -90 dB. First IF Rejection: -80 dB (except -60 dB on the 40 and 30 meter bands). Internally Generated Spurious Signals: All below 1 µV equivalent. RIT: ±250 Hz. Available Accessories: PS-9000 AC Power Supply/Speaker with built-in dual 12/24-hour clock and Customer Service Manual. Cabinet Dimensions: 6¼" H x 14" W x 13¾" D (15.6 x 35.6 x 34.9 cm). Weight: 35 lbs. (15.9 kg).



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## HL-2200 2kW Linear Amplifier has a trusted reputation and many convenience features



**\$799<sup>95</sup>**

- The ham world's most reputable high-power amp with the lowest price-per-watt in 2 kilowatt Linears
- Standby switch lets you remove the HL-2200 from RF line to go barefoot or perform tune-ups

When you compare, the HL-2200 has the rugged dependability, superior engineering sophistication and cost-effective intelligence that amateurs demand these days. And it gets big results.

**More power in the pile-ups:** A pair of world-famous 3-500Z's run at 2000 watts of QRM-busting PEP on sideband, and load to 1 kW for CW and RTTY. A broadband, pre-tuned pi input yields maximum efficiency with extremely low distortion over the 80-15 meter spectrum. A 100-watt exciter drives it to full output.

**More savings from the start:** When you build the HL-2200, you save money for other gear and you have an outstanding linear.

Kit HL-2200, Shpg. wt. 68 lbs. .... 799.95

HDZ-63-3, 3-ft RG-8/U jumper with PL-259 connectors, Shpg. wt. 1 lb. .... 4.95

**HL-2200 SPECIFICATIONS:** Band Coverage: 80, 40, 20 & 15 meters. Max power input: SSB, 2000 W PEP; CW, 1000 W; RTTY, 1000 W. Driving power: 100 W. Duty cycle: SSB, continuous voice modulation; CW, continuous (max. key-down 10 min.); RTTY, 50% (max. transmit time 10 min.) Third order distortion: -30 dB or better. Dimensions: 8¼" H x 14¾" W x 14½" D.

## SA-2060A Deluxe Antenna Tuner with dual wattmeter/SWR bridge has increased versatility

**\$249<sup>95</sup>**

- Permanent connection of three isolated antennas
- Select coaxial antenna, long-wire feed or bypass
- Eliminates the loss of precious, mismatched power

For the active ham who frequently likes to use both coaxial and single-wire or balanced ladder antennas while operating, the Heathkit SA-2060A Deluxe Antenna Tuner has all the power-handling capability and convenience you could ask for at a price that's hard to beat. It means a perfect match every time, 1.8-30 MHz, including MARS, CAP and the new WARC frequencies.

The SA-2060A combines the most useful and important station accessories in one compact, space-saving unit. By clearly indicating forward and reflected average power plus SWR, this 2 kW Tuner exactly matches the selected antenna to any frequency in the 160 to 10 meter spectrum. And it won't take long to get your SA-2060A on the air—this is an easy three-evening project.

Kit SA-2060A, Shpg. wt. 20 lbs. .... 249.95

HDZ-63-3, 3-ft. RG-8/U jumper with PL-259 connectors, 1 lb. .... 4.95

**SA-2060A SPECIFICATIONS:** Frequency Coverage: Continuous coverage, 1.8 to 30 MHz. Input Impedance: 50 at match. Impedance Transformation: 4:1 balun. Output Impedance: Wide range. Insertion SWR: Less than 1.1:1. Power Input Capacity: Full legal limit. Dimensions: 5¾" H x 14½" W x 13¾" D.



## µMatic Memory Keyer started a revolution in CW technology



**\$99<sup>95</sup>**

- Adds programmable excellence to all your CW
- Ten variable length buffers for 240 characters of text
- Four-level random practice mode has 6,400 different 3,000-character code copy training sessions

Patented "command" strings" let you store text in the buffers, select the speed, weight, spacing or message repeat count for each one, and link them together in any sequence you desire. A special editing feature lets you recover from errors. Enter text at whatever speed and weight are comfortable to you, and send them with any other setting you wish. Text can be added into a buffer message being sent. CMOS memory with battery backup retains the buffer contents, last-selected speed, spacing, weight and repeat count when the Keyer is without power.

Kit SA-5010, Shpg. wt. 3 lbs. .... 99.95

PS-5012, 120 VAC Power Adapter Cube, 1 lb. .... 15.95

**SA-5010 SPECIFICATIONS:** Speed Range: 1 to 99 WPM. Character/Word Spacing: Less than or equal to speed setting. Number of Buffers: 1 to 10. May be used to store text or commands. Buffer Size: 240 characters plus commands, total. Weighting: Normal plus 5 light and 5 heavy settings. Auto Message Repeat: 0 to 9 (sent 1 to 10 times). Keyer Output: Solid state: +250 volts @ 100 mA; -200 volts @ 40 mA. Memory Backup: Three 1.5-volt alkaline batteries (included)—1 year typical life. (No battery drain unless Keyer is removed from AC power source). Sidetone: Approximately 300 to 1500 Hz, adjustable. Power Requirements: External transformer (optional) or 11 to 16 VDC @ 200 mA. Dimensions (excluding paddles): 1½" H x 4½" W x 6" D.



**NEW** Join the RTTY revolution! Build the HD-3030 Terminal Interface and capture more fun



**\$249<sup>95</sup>**

- A "universal" terminal interface – works with any personal or home computer, such as Heath H-8 or H-89, Commodore, Atari, Radic Shack, Texas Instruments, Apple, IBM, etc.
- Built-in supply for noncomputer 20/60 mA TTY operation

Put your home computer to work for you capturing exciting new QSOs with Heath's compact, state-of-the-art HD-3030 Terminal Interface. With it, you can send or receive ASCII/Baudot RTTY and Morse Code messages around the world at up to 300 baud using any standard transceiver, TTY terminal or monitor and a micro-computer booted up with the appropriate software. Amateur or commercial operators and shortwave listeners will find it very efficient and easy to use.

**The features you need most for enjoyable copy:** Weak or distorted signals are no problem. Six poles of active preselect filtering deliver strong, readable tones that print clearly, even in a crowded band. Optional filters for 425 and 850 Hz audio shifts enable even more performance. With separate RTTY and CW demodulator boards, 170 Hz standard shift, crystal-controlled AFSK generator, capability for

full FSK with equipped transmitters, true mark/space detection, oscilloscope tuning outputs, front panel LED bargraph tuning, data and status indicators, the HD-3030 Terminal Interface has no equal in quality or function for the price. TTL and RS-232C I/O compatibility, plus a built-in loop supply make it a great buy regardless of the rig or printer you prefer!

A row of flag-type pushbuttons give the operator full up-front control of send and receive (including reverse shift) configurations. A convenient autostart relay energizes the rear panel AC receptacle for unattended start of computer and/or printer. An internal threshold adjustment sets the desired recognition level.

Kit includes a mate for the DB-25 socket. The step-by-step assembly manual supplies a pin-out diagram and criss-cross interconnect chart. Refer to the documentation supplied with your particular computer and its software to determine input/output signals required to insure proper interface.

Kit HD-3030, Shpg. wt. 8 lbs. .... **249.95**

**Universal 425/850 Hz Filter Circuit Board Accessory.** Provides frequency shift of 425 or 850 Hz (builder's option). Plugs directly into HD-3030 motherboard.

Kit HDA-3030-2, Shpg. wt. 1 lb. .... **14.95**

**170 Hz Preselector Filter Circuit Board Accessory.** Dramatically improves performance of standard shift tones by removing strong adjacent channel signals.

Kit HDA-3030-4, Shpg. wt. 1 lb. .... **19.95**

**HD-3030 SPECIFICATIONS:** Displays: LEDs for Power, Send, RDA, Mark, Space. Ten-segment bargraph tuning indicator. **PUSHBUTTONS:** Power, Operate/Standby, Send/Receive, CW/RTTY, Send/Receive (Reverse Shift), Preselect/Bypass, and 170 Hz, 425 Hz, 850 Hz (independent and interlockable audio frequency shifts). **REAR PANEL:** Loop jack input (100 VDC @ 20 or 60 mA); 25-pin DB-25 I/O connector for TTL and RS-232 computers, terminals or printers; 120 VAC/340 W auxiliary power outlet; groundpost; linecord. **CW DEMODULATOR:** Center Frequency: 750 Hz. -3 dB Bandwidth: 70 Hz. -20 dB Bandwidth: 240 Hz. Dimensions: 3" H x 7 1/2" W x 10" D. (7.6 x 19 x 25.4 cm).

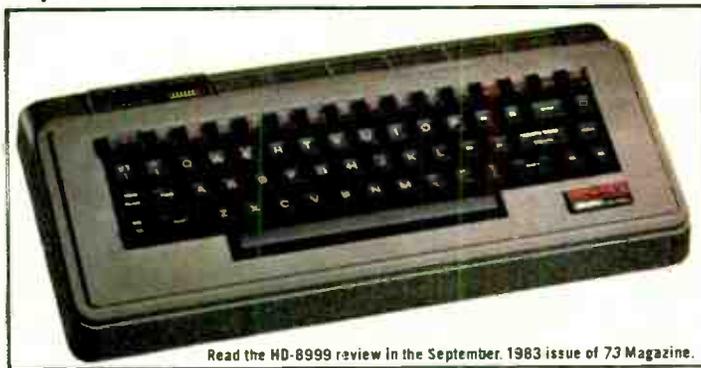
**SUPER CW Software** for Heath H-8 and H/Z-89 computers. Has auto CW-ID, user-configurable parameters, type-ahead buffer, clock, split screen, much more. Complete, easy-to-understand documentation. Requires HDOS 1.5 or above.

HDP-1010, Shpg. wt. 2 lbs. .... **49.95**

**SUPER RTTY Software** for Heath H-8 and H/Z-89 computers. Comprehensive ASCII/Baudot system uses full disk/graphics capabilities. Has tri-level screen display, on-screen clock, autolog, more. Requires HDOS 1.5 with 24K memory.

HDP-1020, Shpg. wt. 1 lb. .... **49.95**

**Super-versatile UltraPro™ CW Keyboard sends letter-perfect code with programmable ease**



Read the HD-8999 review in the September, 1983 issue of 73 Magazine.

**\$199<sup>95</sup>**

- The most intelligent microprocessor-based CW keyboard, with more functions and user-flexibility than any other
- Four-level random practice mode allows 1000 different and repeatable, 3000-character training sessions with unique 'copy' mode to teach typewriter proficiency "hands on"

The Hams at Heath have done it again! They've developed a CW keyboard of unsurpassed versatility that defines a new standard of price/performance value.

The HD-8999 UltraPro CW Keyboard represents the long-awaited third generation of code computers. It contains a host of specialized prompting features and a simplified operating system that minimize keying errors and increase the ease and accuracy of high-speed sending. Exclusive component-level diagnostic capability and two-key rollover (to keep up with proficient typists) make it the most advanced and first truly 'friendly' keyer. It uses a customized microprocessor and the latest

in comfortable, 'human engineered' keyboard designs as a foundation for the most productive CW operating aid you can own.

At upper left is the status panel, with a 4-digit green LED display to show a function in use and preset or changing values such as speed, spacing, weighting, serial number, remaining message character space, input error, tune mode, plus on/off condition of sidetone, keylock and individual buffer protection. To the right, a 3-color, 8-segment LED bar graph indicates the fullness of the 64-character type-ahead buffer. All ten message memory buffers are variable in size to avoid wasted space, and can be compiled, corrected or transmitted with only 1-3 keystrokes. The HD-8999 also has non-volatile CMOS RAM (batteries are included). All operating parameters can be set directly from the keyboard, and absolute timing accuracy is assured by an inboard crystal-controlled clock.

Built-in diagnostics perform a complete self-check upon power-up. The back panel has on/off rocker switch, non-polarized power socket, + and - keying phono jacks, reset switch, volume/pitch controls and a headphone jack.

Build the UltraPro yourself with one of our world-famous assembly manuals for real satisfaction and savings, while enjoying one of our most fascinating two-evening kits. The UltraPro is a professional-action unit that 73 Magazine called "... a compact gem of a keyboard that tends to turn the operator into the pro that the name implies." Order one today and feel the difference!

Kit HD-8999, Shpg. wt. 7 lbs. .... Was **\$249.95** NOW ONLY **199.95**

**HD-8999 SPECIFICATIONS:** Key Nomenclature: 1 through 0 and A through Z in a standard QWERTY format. SET, WPM, PRAC SPC'G, PROT/W/T, PREV/SN, LOAD, STOP, TONE/CLICK, TUNE, DELETE WORD/DELETE, HOLD, SHIFT (two), AR, SK, BT, ES, KN, AS, BK, DE and CQ. Punctuation: ?/'/'-(!); comma and period. **Speed Range:** 1-99 WPM. **Spacing:** less than or equal to speed. **Weighting:** Normal plus five 'light' and five 'heavy' settings. **Serial Number:** 1-1999, automatically generated. **Text Buffers:** 495 characters, total capacity. Individual buffers may be protected. **Keyer Output:** +25 V @ 100 mA; -200 V @ 40 mA. **Memory Backup:** Three mini-cells (included) with typical 1 year life. **Sidetone:** 300-1500 Hz adjustable. **Indicators:** 4-digit display plus SET, MSG, LOAD, PRAC and type-ahead buffer status LEDs. **Operating Range:** 32-140°F (0-40°C). **Power Requirements:** 7.5 to 11 VAC or 11-16 VDC, 450 mA max. Input for PS-5012 120 VAC Adapter (on pg. 97). **Dimensions:** 2 7/8" H x 15 1/2" W x 8" D.



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

**NEW**

# 40-Channel Aircraft/Marine/Public Service Scanning Radio finds the action



ONLY **\$249<sup>95</sup>**

Fill the hours with uninterrupted action as the GR-740 scans 40 channels across seven bands, at the touch of a button

- A quick and easy one-evening kit
- 40 channels of user programmable frequencies
- Microprocessor control and direct keyboard tuning in all seven VHF/UHF bands
- Only kit scanner to cover aircraft, marine and public service bands, all in one unit
- Fully synthesized tuning eliminates crystals
- Two speed scan/search of aircraft, marine and programmed bands, patented track tuning, channel priority, scan delay and full-featured display are but a few of the features

Seven band VHF/UHF coverage puts a wide variety of radio services at your fingertips. Receive hams, police government, U.S. weather bureau, forestry, conservation, mobile telephones, press, fire, aircraft, marine, utility services, business and industrial communications, hospitals, ambulances, highway and special emergencies, disaster relief, school buses, taxicabs, railroads, trucks, riot/narcotic squads and remote paging (if these services are used in your area). Scan your 40 preselected frequencies, search between two frequencies on a band, or have direct keyboard access to any frequency in the seven bands.

A versatile 24-key keyboard is divided into program and operation sections for rapid and easy use. Program frequencies into the two banks of 20 channels each. Operate by setting and controlling automatic scan and manual select, bank select, direct channel

access, service search, search and scan speeds, search limit/hold, priority channel, upper/lower frequency search limits and program the delay or lock-out of any frequency. Simply punch in the programs and operation you want.

**Direct channel access** permits instant tuning of a channel without stepping through interim channels. Or press one button to single-step through an entire 20-channel bank.

**Microprocessor control** also adds other convenient features. Some of these are: priority channel sampling every two seconds, with interrupt when a signal is detected; patented track tuning, for automatic, optimum reception across the full band without adjustment; full-featured display, to let you know how you've programmed your scanner and what it is doing; scan delay, for channels where replies are expected; and there is much more, at a lower price than competitive, assembled scanners.

**Automatic squelch** is factory-set for optimum reception and easy operation. An override permits manual adjustment of squelch. A telescoping antenna provides excellent reception, and the rear panel has an external antenna connector (a Motorola-type mating plug is included with the kit).

**Factory assembled, aligned and tested circuit boards** ensure optimum performance. Only minor adjustments are required when assembling this kit.

**GR-740, Shpg. wt. 8 lbs. . . . . 249.95**

**GR-740 SPECIFICATIONS:** Frequency Coverage: Low band (30-50 MHz), aircraft (118-136 MHz), 2-meter Amateur (144-148 MHz), High band (148-174 MHz), 70 cm Amateur (421-450 MHz), UHF band (450-470 MHz), UHF-T band (470.0125-512.45 MHz) **RF Sensitivity:** 0.4  $\mu$ V (30-50, 144-174 MHz) and 0.8  $\mu$ V (421-512 MHz).  $\pm$  5 kHz deviation 12 dB SINAD; Aircraft, 1  $\mu$ V for 10 dB S/N, 60% modulation. **IF Selectivity:** -55 dB @ 25 kHz. **Scan/Search Speed:** 5- or 15-channels per second. **Audio Output:** 0.75 watt RMS into 8-ohm load, 10% THD. **Front Panel:** Volume (on/off), squelch, display, keyboard, speaker, position A/B. **Rear Panel:** 13.8 VDC input, antenna connector, speaker connector, 120 VAC receptacle. **Antenna:** Telescoping, 50- to 70-ohm external connector. **Power Requirement:** 120 VAC, 50-60 Hz @ 20 watts; or 13.8 VDC @ 9 watts. Dimensions: 3 1/2" H x 10 3/8" W x 8" D.

## HD-1418 multi-mode SSB/CW/RTTY Active Audio Filter makes the tough ones easy to copy

**\$129<sup>95</sup>**

- Lowpass, highpass, peak and notch controls help you customize upper and lower bandpass edges to isolate desirable signals and reject heavy QRM

As today's bands become increasingly crowded, there's often a problem with too much interference to bother trying to copy a good signal. Heathkit has an easy, affordable way of effectively eliminating dogged interference - the HD-1418 Tunable Active Audio Filter. It tunes out unwanted QRM and improves the selectivity of receivers by a remarkable degree.

**Twelve total poles of filtering** can be combined to work as SSB & Notch, CW, CW2, SSB, SSB & Peak, RTTY and Fixed configurations with razor-sharp skirts. By giving full control over receiver bandpass characteristics, it can solve such problems as partially overlapped sideband signals, overmodulation splatter, close-packed CW stations, full RTTY reception through heavy interference, heterodyne whistles and noise that other filters find impossible to conquer.

**Simple to install** - just plug it in between receiver output and speaker. Filter is bypassed when off. Input Overload LED glows if signal exceeds 3 volts, so you can adjust output receiver gain for undistorted response.

**Versatile power requirements** make this Audio Filter usable almost anywhere. Just supply 7 to 13.5 VAC or 9 to 18 VDC, at 400 mA. For VAC operation, use the PS-5012 Power Cube on page 95.

Kit HD-1418, Shpg. wt. 3 lbs. . . . . 129.95



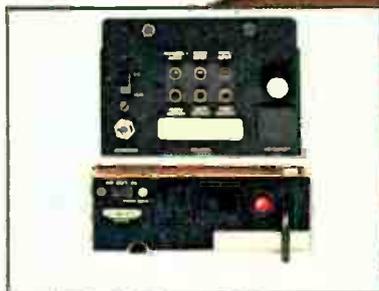
**HD-1418 SPECIFICATIONS:** High-pass Filter: 5-pole tunable elliptical, with 300-2500 Hz range at -6 dB. Low-pass Filter: 5-pole tunable elliptical, with 300-2500 Hz range at -6 dB. Notch/Peak Filter: 2-pole tunable, 300-3500 Hz range, 200 Hz width at 6 dB; 30 dB depth. **Input Impedance:** Hi-Z, 5k minimum. **Nominal Gain:** Unity. **Audio Amplifier Output:** 1.0 watt into 4 $\Omega$ . **Input/Output Connection:** 1/4" Audio phone jack; Tape Out, Input and Output RCA phono jacks; DC power connector. **Dimensions:** 1 7/8" H x 8 7/8" W x 6 5/8" D.

98/AMATEUR RADIO



# Heath's GR-3000 Deluxe 25" Television Computer System is a milestone in high-technology

For its picture alone, the GR-3000 is one of the finest state-of-the-art receivers on the market. But add up other built-in and optional features, and it offers performance that makes it a new kind of receiver. Have the most powerful Television in the world at your fingertips — meeting the needs for multiple-source programming and capable of expanding to meet the communication needs of tomorrow.



Versatile rear panel auxiliary connections and I/O port slots for future expansion

At first glance, your GR-3000 looks like a normal TV, but revolutionary new hardware, superior performance and advanced design make it the world's most talented receiver. And it's all available from your armchair or bed.

The Remote Control unit uses infrared telemetry to perform some never-before-possible computerized TV magic. Light-touch buttons have audible feedback and provide complete command of channel selection, volume, color, contrast, brightness and tint.

A special 3-line information display appears briefly on the screen by direct command or when channels are changed. It identifies the tuned station, current time in the selected 12- or 24-hour format, and current date. A fourth, accessory line shows the function in use or compass rotation and direct on status (when the Auto-Rotor is used). All this, at the touch of a finger.

Automatically set your antenna for optimum reception. The microprocessor-guided GRA-3000-2 Auto-Rotor Accessory Module seeks a maximum signal level when you select any of the 82 addressable channels. It memorizes antenna orientations and returns to them when those channels are selected. And, you can also change antenna direction directly, or fine-tune a direction with  $\pm 2$  degrees of resolution. Minimize ghosts and snowy pictures!

A "Learn" mode with eight channels of input space (94 bytes of soft memory) will let you custom-program up to eight different sequences of TV operation and repeat them with a single command. For example, you can program Receiver on/off, rotor headings and channel changes for preselected times — program daily or even weekly schedules, and use them for the full season. Three alkaline 'AA' cells preserve memory programs in case of a power outage, and they are good for up to a full year.

Four ways to choose a telecast: Direct Channel Selection tunes instantly with crystal-controlled PLL frequency-synthesis accuracy. Standard scan uses the Up and Down keys to skim through all received channels. Valid Scan pauses only on channels where a signal is present. Set Channel Scan lets you bypass any unwanted channels while scanning the full-available range.

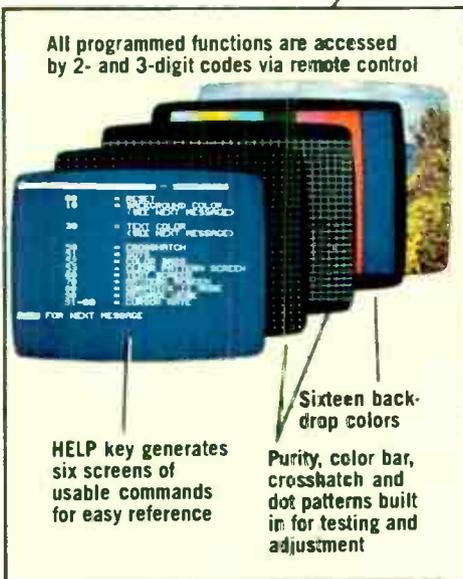
The GR-3000 is cable-compatible for immediate installation in equipped areas. Direct audio and video input and output jacks on the rear panel permit you to



56-key Infrared Remote Control functions

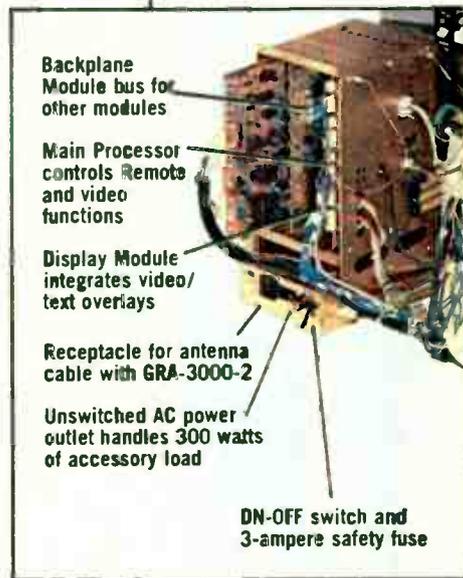


All programmed functions are accessed by 2- and 3-digit codes via remote control



HELP key generates six screens of usable commands for easy reference

Sixteen backdrop colors  
Purity, color bar, crosshatch and dot patterns built in for testing and adjustment



Backplane Module bus for other modules

Main Processor controls Remote and video functions

Display Module integrates video/text overlays

Receptacle for antenna cable with GRA-3000-2

Unswitched AC power outlet handles 300 watts of accessory load

DN-OFF switch and 3-ampere safety fuse

connect and switch between a video recorder/disc player or standard channel reception. Have maximum convenience on fully-equipped cable systems: convert (midband, superband and hyperband) to convenient UHF positions for easy push-button tuning. Two 6" x 9" and two 2" tweeters supply excellent sound.

Multi-level video display consists of five different display screens. First is the standard video screen; second is a backdrop screen which can be set for any of sixteen different colors; third is a pattern/text screen used for alignment/test purposes and built-in help messages; next is a 40-character display screen for configuring on-screen displays and messages; the fifth is a computer-generated screen, to display text and graphics generated by an external computer (when tied to a forthcoming Serial Interface Module).

Kit GR-3000, 129 lbs. Motor Freight ..... 999.95

Kit GRA-3000-2, Auto-Rotor Accessory Module, Shpg. wt. 2 lbs. .... 19.95

GDA-1184-1, Cornell-Dublier Electronics Rotor Assembly Model AR-40 required for proper Auto-Rotor operation, Shpg. wt. 11 lbs. .... 89.95

Custom-install the GR-3000 or order cabinet from page 101.



Alaska, Hawaii and Michigan Residents Call 616-982-3411

## The telephone in a TV—a System 3 exclusive with quality 25" family-sized color picture

- Custom installable, or with your choice of two beautifully styled cabinets. Best savings on Kit/cabinet systems, like the Large Classic shown at right
- All the amazing picture-improving benefits of System 3 technology, plus an inexpensive option of Advanced Space Phone convenience, too
- Time Control Programmer can be set to turn the TV on or off at any predetermined time once in every 24-hour period

A lot of your friends will buy color TV sets this year. You can build one! Both the outstanding value and magnificent rewards of this easy-to-build kit can be yours in as little as five fun evenings.

High fidelity picture sharpness is yours with a Peak Resolution Picture circuit that achieves 25% greater detail than ordinary TV by reproducing up to 330 lines of broadcast resolution. This comb filter eliminates vibrating, spurious color and makes picture detail 'pop out' sharp and clear for a lifelike degree of clarity found previously in only the most expensive, professional-quality video monitors. Our Tri-Focus picture tube has three concentrated focusing actions instead of just one—for cleaner, brighter image. The 100% modular chassis design of the GR-2501 guarantees outstanding reliability by using fewer interconnections, with all modules factory pretested and aligned before you unpack the kit.

Like a chromatic control center in your TV set, the sophisticated Color Sentry combines 8 automatic picture and color sub-systems for magnificent viewing pleasure. It maintains accurate color level, lifelike flesh tones, tint and contrast—even adjusts the picture brightness as surrounding room lighting changes. One button does it all for you...scene to scene, channel to channel...automatically!

A sharpness control lets you adjust the GR-2501's level of picture definition. Advanced digital circuits scan and lock on the broadcast signal, eliminating any kind of vertical and horizontal hold controls. A no-wear, quartz PLL Varactor electronic tuning system seeks out and fine tunes the exact station frequency. Because the tuners are electronic, they have no moving parts to corrode, erode or cause noisy picture problems. A power-sensing voltage regulator helps conserve energy by supplying only the power needed by the TV and maintaining a stable chassis voltage. Electronically self-regulating, it virtually eliminates the effects of household line variations and provides a more constant voltage for improved component and picture tube life. Solid-state automatic fringe-lock circuitry provides unshakable picture stability on fringe area reception, while a phase-locked AFC switch 'pulls in' off-frequency signals from cable or master antenna systems and video games. For optimum clarity, a picture control permits you to adjust the contrast and color levels, which maintain proper balance for varying room light conditions. Altogether, the most impressive picture you can build!

Heath System 3 means greater value. Together, the EFL Tri-Focus picture tube, cool-running Triple-Plus chassis, and advanced Color Sentry combine to create the sharpest, most realistic picture in Heath/Zenith history! You're assured of fewer service calls, greater reliability and ease of operation.

To maintain the GR-2501's outstanding picture fidelity over time, an automatic Color Clarifier circuit removes any magnetism in the picture tube that may cause noticeable color impurity each time the TV is turned on from a cold start.

Your new GR-2501 comes with our Computer Space Command Remote Control for scanned or direct access channel selection, on/off with variable volume, on-screen display of channel with current time, plus on-screen check or activation of the preset Time Control Programmer feature and using the Advanced Space Phone. An easy-to-read, on-screen channel/time display appears briefly when channels are changed, or recalled from set or remote control. Expanded 112-channel tuning capability lets you select from up to 42 cable offerings as easily as VHF and UHF, except scrambled premium services.

Advanced Space Phone is one option worth its price in convenience alone. With it, you can take or make calls anywhere in the world. A dialed number prints out on the TV screen, and in case you get a busy signal you can even program the remote to redial automatically. The TV set itself is readily connected to any telephone line to work as a sensitive speaker phone, so you don't have to leave your easy chair...and the whole family can participate in conversation! And if you don't want the other party to overhear what's being said in the room, there's even a Mute

As low as  
**\$649<sup>95</sup>**



Tri-focus matrix tube for improved, high-resolution picture sharpness

Sturdy all-in-one chassis design

Direct hookup to CATV and MATV

Modular, tested circuit boards cut kitbuilding time in half.

Crosshatch generator, diagrams and alignment tool provided for quick setup

Advanced Space Phone option lets you make and receive calls without getting out of your chair

**Simulated picture**

Easy-to-use control panel gives you the ultimate in TV viewing convenience

Switch mutes the ring of Advanced Space Phone

Blinking light quietly signals incoming call

Set channel scan to bypass any unwanted channels

Setting on-screen digital clock to display correct time is easy, too

Picture, tone, and color adjustments

Remote control operates Advanced Space Phone option

Display time, change channels and mute sound

button on the remote control you can touch for complete privacy.

Two 9" oval midrange-woofers and two 2½" tweeters provide rich, four-speaker sound to every program. A front panel tone control lets you balance bass and treble to your individual listening taste for enhanced wide-range presence that will surround you with a clear, natural sound and never-before-heard audio detail.

A convenient audio output jack can interface the TV soundtrack to an auxiliary input of your personal stereo system for clearly-amplified sound reproduction.

Put the GR-2501's custom-installable chassis behind a wall, mount it in a cabinet of your own custom design or save when purchasing your kit with one of the fine furniture cabinets featured on page 101. Clearly written and fully illustrated, the step-by-step assembly manual has all directions, dimensions and templates necessary to install the TV successfully. No instrument alignment is required. The kit includes a crosshatch generator which you build and use to perform the convergence and color purity setup. After just 15 hours average build time, you can touch the Power button on your GR-2501 and begin to admire a beautiful, lifelike parade of pictures you'll be proud to show off always.

The commanding 25" Heathkit GR-2501 has a lot more of what you're looking for—top-of-the-line features and performance plus the utmost in service simplicity at an affordable kit price! Add an extra dimension of pride to your television viewing this year. Build a GR-2501 and share the beautiful rewards with everyone.

Kit GR-2501, Shpg. wt. 113 lbs., Motor Freight ..... 649.95  
Kit GRA-2501-1, Advanced Space Phone, Shpg. wt. 2 lbs. .... 49.95



# Introducing Zenith's new VHS Video Recorders and Camera

## 1 VHS Hi-Fi for optimum quality

- Full-feature video cassette recorder
- Stereo, digital-like recordings

This revolutionary VHS video recorder is cable-ready with direct tuner access to 136 channels. The 14-day programmable tuner lets you select eight events, and you can record them at SP and EP speeds (LP is available for playback). An electronic tape counter provides a fluorescent display of remaining tape. Connect a camera to record video and two audio channels. Insert editing lets you dub your video or audio recordings. This recorder comes with a T-30 blank video tape.

When you view your tapes, you'll enjoy crisp, clean pictures — with the full-range of slow motion, stop-action, frame-by-frame and special effects. The included 23-function Space Command remote control gives you armchair access to On/Off, channel scan, fast forward, rewind, speed search, pause, slow and stop action and more. The Space Command even works with compatible TV sets.

VHS Hi-Fi lets you make superb audio recordings. The quality of your audio recordings will be limited only by the quality of your microphones. VHS Hi-Fi challenges digital recording with 80 dB dynamic range, Dolby reduction and up to 8 hours on a tape.

GDZ-4000, Shpg. wt. 25 lbs. .... 1049.95

## 2 Affordable VHS performance

- 14-day, one-event programmable tuner
- Still/pause and frame-by-frame video

Quality VHS home recording is more affordable than you might think. This compact recorder is loaded with features. Select the off-the-air channel you want with 14-position electronic tuning or use a video camera for home recordings. Have one-touch recording for instant, precise control. Record in SP or EP, for up to 8 hours on a single tape. Four-head scanning ensures clean and crisp pictures and excellent sound in SP, LP and EP playback. The cables you need are included. And microphone inputs permit audio dubbing.

GDZ-2000, Shpg. wt. 23 lbs. .... 474.95

GDZ-2000-1, Remote control, 1 lb. .... 24.95

Finest quality Zenith VHS tapes for your VCR

GDZ-2000-2, T-60, Shpg. wt. 1 lb. .... 7.95

GDZ-2000-3, T-120, Shpg. wt. 1 lb. .... 8.95

GDZ-2000-4, T-160, Shpg. wt. 1 lb. .... 14.95

GDZ-2000-5, T-120 SHG, for optimum quality, Shpg. wt. 1 lb. .... 12.95

## Modular design VCR

- Detachable Timer/Tuner and Video Recorder
- Instantly portable video cassette recorder

This full-featured VHS Recorder is cable-ready with direct access to 136 channels. The programmable timer lets you record eight events over a 14-day period. Record at SP and EP speeds, and edit your tapes with audio and video dubbing.

Detach the Video Recorder, put on the accessory shoulder strap, and you're ready for portable taping. A single cable connects the Recorder to a VHS video camera (such as the GRZ-1000 below). The optional Battery Pack recharges when the Recorder is docked with the Tuner/Timer — the charge light goes out when the battery is fully charged.

Full-featured playback: At SP, LP and EP speeds, with still/pause, frame-by-frame advance and slow motion, with 7X search speeds at SP and EP. Accessories include a shoulder strap, T-30 VHS tape and interconnect cables.

GDZ-5000, Shpg. wt. 19 lbs. .... 949.95

GDZ-5000-1, Battery Pack, 2 lbs. .... 39.95

GDZ-5000-2, Power Supply, 2 lbs. .... 49.95

GDZ-5000-3, VCR Case, 8 lbs. .... 44.95

## Compact, VHS Video Camera

- Super-sharp images with superior color
- High sensitivity makes low-light taping easy

Easy use and quality performance are two of the features most appreciated in video cameras — this VHS camera has those features, and more.

Compact, yet loaded with features, this Zenith Video Camera helps you get better images. The 1/2" high-band Saticon pickup tube delivers superior color and sharp resolution. And 20-lux, low-light sensitivity permits recording under a wide range of lighting conditions. A top quality 6X power zoom lens lets you frame the image you want, and with macro-focus capability. Auto-focusing eliminates the most common home-video problem. And an electronic viewfinder helps you get the picture you want — automatic viewfinder focus aids in setting focus points behind, on, or in front of your subject.

GRZ-1000, Shpg. wt. 6 lbs. .... 949.95

GRZ-1000-1, Camera case, 8 lbs. .... 29.95

Add a professional touch

Add exciting titles and credit lines to the tapes you film — for a professional touch. This generator lets your titles roll, crawl and zoom.

GRZ-1000-2, Character Generator, 1 lb. .... 99.95



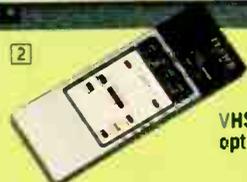
1



VHS Hi-Fi for ultimate performance



2



VHS Recorder with optional remote control



Compact, auto-focusing Video Camera

## Large Classic Console of majestic design

For the GR-2501 (on page 100) or our new GR-3000 Television Computer System (on page 99). Decorator-design has elegant oak veneer parquet top and sides with antique-finish metal hardware and latticework. Solidly constructed, select hardwood framing. Accepts four wide-range speakers, mounted two on each side of the screen. Size: 32 1/2" H x 50 1/2" W x 20" D with casters and tube cap.

GRA-715-25, 136 lbs., Mtr. Frt. . . 199.95

\$100 SAVER on Cabinet with GR-2501.

GRS-2501-5, Shpg. wt. 249 lbs., Mtr. Frt. .... 749.90



## Compact Classic Cabinet is a space-saving value

For the GR-2501 (on page 100) and our new GR-3000 Television Computer System (on page 99). Provides maximum efficiency in size and price. Antique brass-rubbed latticework and decorative hardware accent the beautiful, distressed-finish oak veneer tops and sides. Overall dimensions: 33" H x 43" W x 20" D with casters and tube cap. Accepts four speakers from kit, mounted in front, below TV screen.

GRA-705-25, 112 lbs., Mtr. Frt. . . 149.95

\$100 SAVER on Cabinet with a GR-2501.

GRS-2501-4, Shpg. wt. 225 lbs., Mtr. Frt. .... 699.90



Alaska, Hawaii and Michigan Residents: Call 616-982-3411

## By popular demand — Heath System 3 video realism in a 19" dia. Color Television Kit

**\$499<sup>95</sup>**

- The quality difference in TV — System 3 engineering yields a sharper color image and greatly improved convenience
- Astonishing, true-to-life picture fidelity and chroma detail will heighten your viewing satisfaction on every channel

**Improve TV? Yes.** Expand the sense of reality you experience and enjoy it more. This space-saving table-top model unites 19" size and spectacular System 3 technology in a meticulous kit design you'll take great pleasure in building. *And watching!* It's the perfect TV to add drama to any room where color lovers gather to watch the wide, wide world of video.

**Inside the GR-1901, you'll find circuit improvements** that offer enviable advantages over other color TVs. First, the Triple-Plus Chassis. Cool-running and 100% modular in design, it consists of a clean, uncluttered arrangement of modules with a minimum of interconnections. Every "complete system" module is 100% pre-tested and aligned for outstanding reliability.

**The Tri-Focus Picture Tube attracts your eye** with exceptional — almost three-dimensional — sharpness and detail. It uses an ultra-high-resolution EFL Electron Gun with three extended focusing actions to concentrate the beam and produce a smaller spot than is possible in one-gun sets. This precise horizontal alignment brings you an increased image crispness, better high-light definition and crystal clear resolving power, with proper levels of color intensity, tint and contrast.

**A new, advanced Color Sentry** corrects the picture 30 times per second. Eight essential hue and picture sub-systems work together to deliver critically sharp and vivid color reproduction every time...automatically!

**For extra depth and visual presence,** the amazing detail-adding PRP (Peak Resolution Picture) comb filter circuit achieves maximum optical resolution by reproducing all 330 lines of detail being transmitted.

**The GR-1901 gives you 112 UHF/VHF/CATV** channel capability without a converter (except for scrambled programs). Connect cable directly to the set, and you're in touch with 42 easily-selected cable channels.

**No fine tuning adjustments needed — ever!** In every System 3 television, a quartz controlled, synthesized channel tuner provides super accurate reception every time. Access a telecast and the computer selector instantly seeks out and phase-locks onto the exact broadcast frequency to keep the picture exceptionally fine all the time.

**A handy infra-red Computer Space Command** remote control offers direct access or two-way scanned channel selection, volume up/down, muted sound, recall of on-screen channel/time display, check or activation of the pre-set Time Control Programmer and on/off power control from anywhere in the room.

**The elegantly finished pedestal cabinet** measures 17%" H x 26%" W x 17%" D



Remote unit provides full-featured function control



Heath System 3 gives you the highest quality video



Self-serviceable modular chassis saves money, too

and includes detachable telescoping dipole and clip-on bowtie antennas. Provisions for external UHF/VHF and matched cable-ready CATV/MATV hookup are also provided, with switchable Normal/Special AFC.

**To match the pleasing performance** of what you hear to the clearly superior picture you see, a 1.5 watt amplifier and 5" acoustically optimized speaker send out warm, full-bodied sound. For truly room-filling response, the GR-1901 can be connected via an Audio Output jack to your high-fidelity system for richly-toned soundtracks that will enhance

your enjoyment of concerts, culture and film. Includes private earphone with 15' cord for discreet listening, and all tools for setup/alignment.

**Put a GR-1901 together.** Savor the hours of leisure achievement. Turn it on. Behold the overwhelming clarity and real-as-life picture it shows off. Touch the remote control. Then settle back for improved visual entertainment!

Kit GR-1901, Shpg. wt. 107 lbs. .... 499.95

GRA-1901-1, Mobile TV Cart (shown), Shpg. wt. 10 lbs. .... 24.95

## Heath Home Video Organizer kit switches multi-source RF

**\$59<sup>95</sup>**

- It's the versatile "control center" for your home video system
- Now switch from one program source to another without ever changing cable connections

Tired of tangling with a messy maze of cables behind your TV set? *Don't touch that connection* — the new Heathkit Video Organizer ends cable-juggling forever! Eight separate input and output jacks allow complete interconnection of your TV and UHF/VHF antenna, Cable, subscription TV decoder, VCR, videodisc player, game unit and home computer, or other auxiliary video equipment such as a satellite receiver or camera.

Ten front panel pushbuttons permit instant selection of any one of six different program sources for immediate viewing, and any one of three sources for recording. *You can even view one source while recording any other.* The Organizer has better than 60 dB isolation, less than 3.5 dB insertion loss and excellent RF shielding to eliminate electromagnetic interference and maintain pure picture quality. Pewter color side panels and walnut-grain metal top. This no-soldering, one evening kit includes three 75Ω 48" coax cables with F-connectors and an AC Power Adapter. Order it for more hours of uninterrupted video enjoyment!

Kit GS-4500, Shpg. wt. 7 lbs. .... 59.95

GSZ-4500, Assembled, Shpg. wt. 8 lbs. .... 69.95





## Heathkit introduces the first kit computers that are compatible with the IBM-PC...the HS-151 Personal Computer and the HS-161 Portable Computer



### The Heathkit Handy Index

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