

Heathkit®



The new high-performance standard in computers – the H-386 Desktop (page 54) – showing the high resolution capability of the new flat tension mask monitor (page 68)

40

TH
ANNIVERSARY
EDITION



Heath Company

P.O. Box 1288

Benton Harbor, MI 49022

Heathkit®



**FREE
GIFTS**

*See inside
back cover*

GR-9009 9" color TV
see page 11

*Build it yourself
we won't let you fail*



Heath Company

P.O. Box 1288

Benton Harbor, Michigan 49022

Heathkit®

World-famous step-by-step Heathkit manuals are the key to easy, enjoyable, and successful kit building...another reason why we can promise that **"We won't let you fail."**



PARTS INVENTORY: All components of the kit are checked against a parts list.



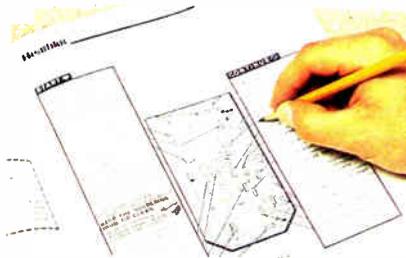
ASSEMBLY ORGANIZATION: The manual shows you how to organize for easy kit building.



PARTS AND ASSEMBLY ILLUSTRATIONS: We don't just tell you how to build one of our kits – we show you.



PROPER SOLDERING: Most Heathkit manuals teach reliable soldering for maximum kit life.



GOOF-PROOF STEP-BY-STEP INSTRUCTIONS: You check off each kit building step as it's completed.



INITIAL TESTING: Before final assembly, you test the kit to ensure that it's operating properly.



OPERATION: Turn kit "on" – and experience the pride and satisfaction of success!



MAINTENANCE: Save on service! Manuals show you how to trouble-shoot and make repairs.



TECHNICAL ASSISTANCE: Available by phone, mail, or at Heath/Zenith Computers & Electronics Centers.*

*Heath/Zenith Computers & Electronics Centers are units of Veritechnology Electronics Corporation in the U.S.



Dear Friends:

The Heath Company is celebrating its 40th Anniversary in the electronic kit business this year. Thanks to you, it's been a great 40 years for Heathkit products. We deeply appreciate your business.

As our own way of celebrating, effective with purchases made from October 1, 1987 and forward, we are changing our kit warranty policy to allow a full year of warranty coverage on every Heathkit product. The quality hasn't changed, though. It's still excellent. As always. And you can depend on it staying that way.

Many of you have written to me this past year. It's been wonderful to read your comments...especially the letters from first-time kit builders. Comments like "What a thrill it was when it really worked!" and "You'll never know the sense of pride this project gave me," are typical. Whether the writers were 7 years old or 70, it's clear that people have fun building our kits. They learn something about electronics and enjoy a very large dose of self-satisfaction.

Our thanks again to all of you for being such good friends and customers of Heath.

Seasons Greetings,

William E. Johnson
William E. Johnson
President, Heath
Company

40TH ANNIVERSARY NEWS

Heath Company announces the extension of its warranty protection on all electronic kit products to **ONE FULL YEAR**. Beginning October 1, 1987, all kit products will carry a one-year warranty.



Portable AM Radio is a fun first-time kit

SKILL LEVEL 1 The Heathkit Portable AM Radio kit is an excellent choice to welcome the first-time kit builder, whether youngster or adult, into the exciting world of kit building. The carefully planned assembly manual explains every step in plain language. And when it's finished, the radio's good tone and volume will surprise you, even when listening to distant situations.

The GR-1009 Radio features a high-gain antenna for pulling in distant AM stations and a 2-inch dynamic speaker for clear reception. A separate earphone is supplied so you can privately listen to your personally-built radio without disturbing those around you. The radio is housed in an attractive 3 1/4" H x 6 3/8" W x 1 1/4" D cabinet that is both sturdy and easy to clean. You can use a 9-volt transistor battery (not included) for portable operation. Or, use an optional PS-2350 Battery Eliminator (page 39) for use with normal 120 VAC outlets.

Kit GR-1009 Ship wt. 2 lbs. **\$19.95**

All the kits on these two pages are entry-level starter kits

SKILL LEVEL 1



Solid-State Mono Amplifier

SKILL LEVEL 1 Boost the audio to your headphones or to an alternate speaker system with the Heathkit AA-18 Amplifier. Of use it as an amplifier to an alternate TV speaker. This single channel amplifier delivers 3.25 watts of clean audio power (minimum RMS) into an eight ohm speaker. And this kit amplifier supplies power with less than 1.5% total harmonic distortion across the audio frequencies from 40 Hz to 20 kHz. The low-cost AA-18 has a conveniently located headphone jack on the front panel. The amplifier can be wired to operate from 120 VAC or 240 VAC at 50/60 Hz. 2 5/8" H x 7 3/4" W x 5 1/2" D.

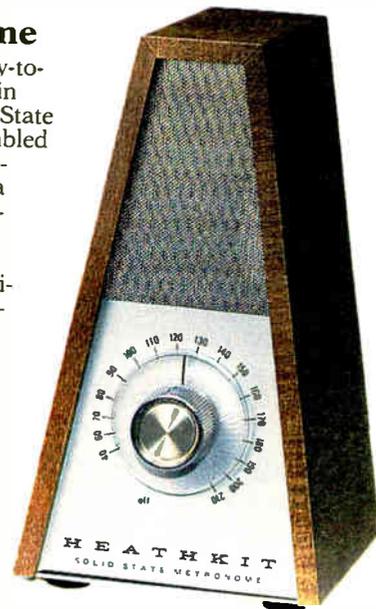
Kit AA-18 Ship wt. 4 lbs. **\$39.95**

Electronic Metronome

SKILL LEVEL 1 Here is a very useful and easy-to-assemble kit for those interested in electronics *and* music. The Solid-State Metronome can be quickly assembled in an hour or two. And when completed, the metronome becomes a tempo-teaching aid for music students with the sound of more expensive windup metronomes.

Tempos are continuously variable from 40 to 210 beats per minute. The volume is also variable from a soft thumping to a loud clicking. An attractive, cherry-finished cabinet is made of birch solids and veneers. Power is furnished by two 9-volt batteries (not included). 6 3/4" H x 3 3/4" W x 4" D.

Kit TD-1257
Ship wt. 2 lbs. **\$29.95**





Rechargeable Portable Light for any use

SKILL LEVEL 1 Light up those dark areas with a bright, yet eye-soothing fluorescent light. The Heathkit Portable Light can be set down or hung up to provide light that is safer to use than either candles or kerosene lamps. And with the AC and DC battery chargers that are included with this kit, you can recharge your light from any AC outlet or car cigarette lighter – over and over again. The rugged metal case makes this portable light perfect for camping or shop work. And it will come in real handy during a power outage. A single charge lasts for 6 hours. Light has dimensions of 10 $\frac{1}{8}$ " H x 3 $\frac{3}{8}$ " W x 5" D. Includes rechargeable battery.
Kit GD-1246-A Ship wt. 6 lbs. \$49.95



Battery Life Tester gives more than a good-bad indication

SKILL LEVEL 1 Check your batteries on most store testers and that's all you'll see. But with the Heathkit Battery Life Tester, you'll see on a wide 0 to 5 meter scale how much useful life still remains in that battery the store tester said was bad. This money-saving one-evening kit checks alkaline and carbon-zinc 9V and 1.5 AA, C, and D size cells, and 1.2V rechargeables. Every household should have one of these testers. 1 $\frac{5}{8}$ " H x 2 $\frac{1}{2}$ " W x 3 $\frac{1}{2}$ " L.

Kit GD-1703
 Ship wt. 1 lb. \$16.95

Radiation Monitor

SKILL LEVEL 1 Check suspected radioactive elements with this compact Geiger counter. The RM-4 Monitor uses the sensitive, industry-standard Geiger-Mueller tube to detect and warn of low levels of radiation – even "harmless" levels. For the ultimate in accuracy, the monitor can be calibrated to a standard traceable to the National Bureau of Standards Cesium 137 Gamma source as an option. A beeper indicates detected radiation and an easy-to-read meter shows measured levels on three selectable ranges. Comes with a convenient zippered carrying case with belt clip and a carrying strap. Requires a 9-volt battery (not included). 5 $\frac{3}{4}$ " H x 2 $\frac{7}{8}$ " W x 1 $\frac{1}{2}$ " D.
Kit RM-4 Ship wt. 2 lbs. \$129.95



Kit Skill Levels



To provide you with more information about our kits, we have assigned each a skill level from 1 to 3. This number reveals several important aspects about a kit: type of circuitry used from simple (1) to sophisticated (3); average build time from less than eight hours (1) to several evenings (3); and the number of parts on a circuit board from a few (1) to many (3).

And to make your kit building even simpler, each kit includes the world-famous Heathkit assembly manual. It is written so that even the most inexperienced person can build any Heath kit.



An alarm for the freezer

SKILL LEVEL 1 The freezer door left ajar or an unnoticed blown fuse almost certainly spells disaster for your freezer food, right? Not if you have the Heathkit easy-to-build Freezer Alarm. If the temperature inside your freezer rises above +20°F, both the two-speed beeping alarm and the red flashing LED spring into action. They'll go slowly at first, and pick up speed if the condition continues.

A two-hour kit that includes 20 feet of thin hook-up wire plus a temperature and a door ajar sensor. A real handy little friend! 1 3/4" H x 3 3/8" W x 4 7/8" L.

Kit GD-1183 Ship wt. 2 lbs. . . . \$19.95



Non-abrasive jewelry cleaner

SKILL LEVEL 1 Now you can use the same ultrasonic method popular with professional artisans, jewelers and coin collectors to clean and sanitize precious, delicate items. The Heathkit Ultrasonic Cleaner makes items that might otherwise be damaged by abrasive scrubbing or harsh cleansers sparkle like new. It literally vibrates dirt, stains and undissolved solids from hard-to-clean jewelry, watch parts, glass, coins, components, dentures, paint brushes and more. All delicate items, except pearls and turquoise, are safely cleaned without abrasion.

The Ultrasonic Cleaner uses ordinary laundry soap or softener for most cleaning jobs. Just fill the 6" L x 4" W x 2 3/8" D tank with one inch of solution and this gem of a cleaner is ready to go to work. Plugs into household AC outlet.

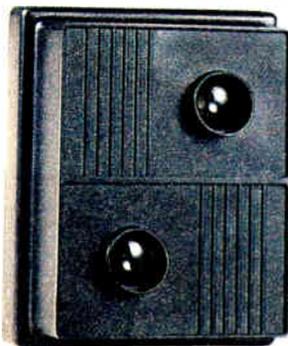
Kit GD-1151 Ship wt. 5 lbs. . . . \$99.95



Flood alarm

SKILL LEVEL 1 If you've ever experienced leaking water pipes or a seeping basement wall, you know what water damage can do. But with the Heathkit Flood Alarm, you can avert costly water damage. Spend less than three hours to build an alarm that will alert you to a water problem. Measures 1 3/4" H x 3 3/8" W x 4 7/8" L.

Kit GD-1701 Ship wt. 2 lbs. . . \$24.95



Electronic Security

SKILL LEVEL 3 Imagine having a guard on duty at your home all night long. Now you can have the same feeling of security with the Heathkit Photobeam Alarm Relay. It detects intruders instantly with a narrow beam of light that's reflected back to the Alarm by a mirror. When the beam is interrupted, the Relay can activate a lamp or any 120 VAC warning device up to 300 watts total. Housed in an attractive small-sized cabinet, the Alarm Relay serves as an inconspicuous sentry to your home. Measures 5 3/8" H x 4 3/8" W x 5 1/4" D.

Kit GD-1021 Ship wt. 3 lbs. . . . \$19.95



Your introduction to surface mount technology

SKILL LEVEL 2 Assembly of our Lightmeter kit (as featured in **Radio-Electronics** November 1987 issue) provides valuable hands-on experience with a surface mount device. We've even included special soldering procedures especially for surface-mountable components. Previous soldering experience is helpful.

We also offer a tool package (as pictured above) specifically for your work with surface-mountable components.

Kit SMD-1 Lightmeter. 1 lb. . . \$19.95
SMT-1 Tools. Ship wt. 2 lbs. . . \$39.95



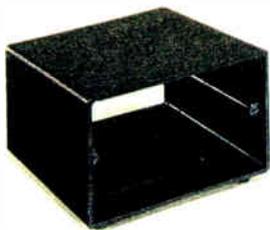
Timed Light Switch

SKILL LEVEL 1 The Heathkit Photoelectric Light Switch turns on selected lights in the evening and off at dawn—all automatically. It gives a "lived-in" look to your home when you're

away. Just plug in the switch, adjust the sensitivity and you have complete control of lamps or other AC-operated devices up to 150 watts.

The Photoelectric Light Switch is a unique form of insurance that's low in cost, but high in value. Measures 3 1/2" H x 2 5/8" W.

Kit GD-600 Ship wt. 2 lbs. . . . \$9.95



The final touch

SKILL LEVEL Finish up your SK-104 Audio Amplifier or SK-107 Stereo Synthesizer with this handsome black cabinet.

Kit SK-99 Ship wt. 1 lb. \$6.95



Get variable motor speed

SKILL LEVEL Save energy and wear and tear on any of your universal-type motor-driven devices. With the Motor Speed Control, you can use a large drill to cut through steel at slow speed without overheating the motor. It's ideal for use with electric hand tools and small household appliances. You will also learn the function of a diac and triac for AC control with this easy Starter Kit. Just follow the lesson in your optional Starter Kits Educational Manual. Operates on 120 VAC, 60 Hz. 2" H x 5 3/8" W x 3 3/8" D.

Kit SK-103 Ship wt. 1 lb. \$34.95

Learn Electronics while building Starter Kits

Turn Starter Kits into learning tools with the Starter Kits Educational Manual. It teaches you the electronic principles used in all of the SK-100 Series Starter Kits. With this manual, you'll gain additional satisfaction from kitbuilding by understanding the why and how behind your kit's operation.

Each kit is discussed in a separate lesson which is complete in itself. So, you need not follow a specific order as you choose and build Starter Kits.

Lessons include an introduction and learning objectives. Topics are broken down into small units for easier learning, and many of these units contain quizzes so you can measure your learning progress. A test at the end of each lesson checks what you have learned.

SK-100 Ship wt. 2 lbs. \$10.00

SAVER! Buy any two SK-100 Series Starter Kits (SK-100 thru SK-111) and get the SK-100 Manual FREE. Just write SK-100 on the order form and "No Charge" in the price column.



A low-cost stereo synthesizer

SKILL LEVEL Get more enjoyment from TV viewing with this dual mode Stereo Synthesizer. Pseudo-Stereo converts a mono input into two different channels for synthesized stereo and the mono mode allows straight through operation.

Used with the Starter Kits Educational Manual, the Stereo Synthesizer demonstrates the purpose of low-pass, high-pass and band pass filters. Order separate SK-99 Cabinet (at left). Requires 9V battery (not included) or PS-2350 Battery Eliminator (p. 39).

Kit SK-107 Ship wt. 1 lb. \$16.95



The Sound Flasher

SKILL LEVEL Add sparkle to your next get-together with the Sound Flasher. Watch the fun as music and voices in the room cause Christmas tree lights or lamps to brighten and dim in response to the ambient sound. Use the Sound Flasher to control up to 3 strings of lights. Also see how pulses control lamp brightness and learn about rectifier theory when used with the optional Starter Kits Educational Manual. Operates on 120 VAC, 60 Hz. 2 1/4" H x 3 3/8" W x 5 7/8" D.

Kit SK-109 Ship wt. 1 lb. \$16.95

STARTER KITS 1

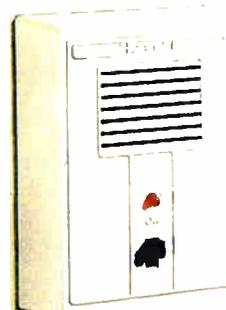


1-Watt Audio Amplifier

SKILL LEVEL Get extra sound and listening pleasure with the 1-Watt Audio Amplifier. It expands the sound of radios, portable tape players, TVs, intercoms or other audio equipment. For easy hookup between your audio equipment and speaker, the Amplifier has a phono input and output socket.

Learn how to change gain and frequency response with the optional Educational Manual. Order separate SK-99 cabinet (at left). Requires 9V battery (not included) or PS-2350 Battery Eliminator (p. 39).

Kit SK-104 Ship wt. 1 lb. \$14.95



An intercom system for the family

SKILL LEVEL Use the Heathkit Intercom to talk to a family member in another room of the house without leaving what you're doing. Or call someone to the phone without running to another room or shouting for them. Everyone will appreciate the convenience of this intercom system.

You can link up to four intercoms using two-conductor wire (at least two intercoms are required). The Intercom has excellent audio quality so you'll hear messages clearly. It runs for months on one 9V battery (not included) since current is drawn only when the unit is being used. The Intercom can also be powered by the PS-2350 Battery Eliminator (p. 39).

Follow the lesson in the optional Educational Manual to learn audio amplifier theory and matching different impedances. 4 1/2" H x 3 1/4" W x 1 3/4" D.

Kit SK-108 Ship wt. 2 lbs. \$19.95

The Heathkit Pledge

You will succeed. Carefully written instruction manuals help make certain that you clearly understand the assem-

bly and operation of your kit. And if you do have any questions, just call or write our Heath Technical Consultants (see p. 52) or consult your nearest Heath/Zenith Computers & Electronics Center.

With a team like ours behind you, you're sure to be a winner. After all, we've built our world famous reputation on this one simple pledge: **"We won't let you fail!"**



DC Power Supply

SKILL LEVEL 1
Power up your hobbyist kits, tape player or CB with the DC Power Supply. The Power Supply has a variable output from 4 to 18 volts and supplies 3 amps 50% duty cycle or 2 amps continuous. Included zener diodes change the output to either 9 or 14 volts to power DC equipment. Also learn the purpose of a power transformer, rectifier circuit, filter circuit and regulator circuit with the optional Educational Manual (p. 5). 3" H x 4½" W x 6½" D.

Kit SK-101 Ship wt. 5 lbs. \$39.95



FM Wireless Mic

See July
Kit Builder's
Journal

SKILL LEVEL 1
Entertain your friends or be a DJ for your own radio show with this FM Wireless Microphone kit. Transmit your voice to any FM radio up to 50 feet away. It's a fun and easy kit that you can build in less than one evening. Also learn about FM radio theory with the optional Starter Kits Educational Manual (p. 5). Operates on two watch batteries (included). Kit SK-106 Ship wt. 1 lb. \$9.95

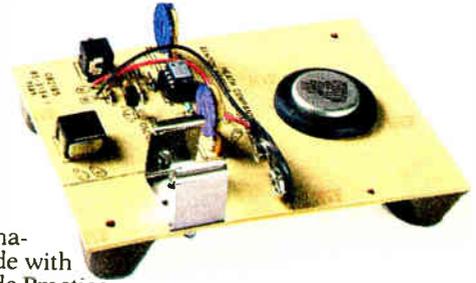
Hands-free speaker phone

SKILL LEVEL 1
Now you can continue with other activities during a telephone call. The Heathkit Speakerphone Starter Kit frees both your hands while you carry on a phone conversation. You can even answer your phone without lifting the handset from its cradle. Connect the Speakerphone to your phone line by plugging it into your standard modular telephone connector. This device is phone-line powered so you don't even need batteries. Volume, privacy and answer controls are all there is to operating the Speakerphone. As you build your kit, follow the matching Educational Manual lesson and learn about rectifiers and filters. 2" H x 5¾" L x 4¾" D. Kit SK-110 Ship wt. 2 lbs. \$39.95



Practice Morse Code with this Oscillator

SKILL LEVEL 1
Learn International Morse Code with this low-cost Code Practice Oscillator. Enter code on the built-in pushbutton or hook up your own keyer to the kit. Adjust the tone and volume to your liking. Besides being a great practice aid for beginners in Amateur Radio, this Starter Kit also demonstrates the use of the popular 555 IC timer when used with the optional Educational Manual (p. 5). Requires 9V battery (not included) or PS-2350 Battery Eliminator (p. 39). Kit SK-102 Ship wt. 1 lb. \$9.95



Attract fish with the Fish Caller

SKILL LEVEL 1
You'll find that it's easy to attract and catch fish with our simple-to-build Fish Caller. The Fish Caller produces a sound that travels through water to attract hungry fish to your area. You can relax and wait for the fish to come to you.

Learn about the 555 timer IC with the optional Starter Kits Educational Manual. Requires a 9V battery (not included).

Kit SK-105
Ship wt. 1 lb. \$4.95



Sound activated switch

SKILL LEVEL 1
Turn on a TV or a lamp from across the room - just by clapping your hands. The first time the Switch picks up a loud sound it turns on the device. The following loud sound turns the device off again. Used with the optional Starter Kits Educational Manual, this kit demonstrates the operation of a flip-flop circuit. Uses 120 VAC. 2¼" H x 3⅞" W x 5⅞" D.

Kit SK-111
Ship wt. 1 lb. \$16.95

Fischertechnik for the future engineer

Get a valuable head start into the world of engineering with an exciting system that combines learning and play. Fischertechnik offers unlimited creative possibilities with broad fundamental starter sets and add-on sets that develop specific skills in electromechanics, robotics, motors and gears, compressors and pneumatics. You'll find there's nothing comparable to this fun and innovative way to get to know and understand the dynamic world of engineering. Pieces are molded and assembled for durability and active, hands-on use. And because Fischertechnik components are made to last, they come with a full lifetime replacement guarantee!

Start your child's skill development

When you give your child the Start 100 construction set, he may think it's an exciting new toy filled with lots of possibilities. You know that it's really an intelligent playing system for your child to build and play with...to experiment with and learn from. Begin with Start 100 and your child learns to build and modify and finally, create new models of his own. Simple picture instructions show how to build 100 different models. For ages 12 and up.

BP-100 Ship wt. 3 lbs. **\$49.99**

SAVER! Purchase SK-101 Power Supply (page 6) with BP-571 or BP-572 only and get \$15 off the price of SK-101. Regularly \$39.95 Special **SAVER Price \$24.95**



Larger Start 200

Challenge your child with 200 different models from this extensive building set. A large page manual with easy-to-follow illustrations leads your child to quick and successful construction of simple models. Ages 12 and up.

BP-200 Ship wt. 5 lbs. **\$69.99**

SAVER! Take 10% off Start 200 when purchased with any system on this page.

Add graphics

For more sophisticated learning fun, the plotter/scanner lets your computer write. It combines two graphics units in one model for digital scanning of graphics copy and plotting graphics on paper using your computer. Requires BP-567 or BP-568 software package as listed with BP-572 Robotic Arm below. Requires 2 amps, 9 VDC. Power adapter not included.

BP-571 Ship wt. 6 lbs. **\$349.95**

3-Axis Robotic Arm

Build a robotic arm that features: positioning repeatability, ability to move up to 100 grams, easy-to-use software, and much more. Control with your home computer and required software package listed below. Requires 1.2 amps, 9 VDC. Power adapter not included.

BP-572 Ship wt. 7 lbs. **\$350.00**

BP-567 Software for Heath/Zenith and IBM PC's, Apple II, II+, IIe.

Ship wt. 1 lb. **\$99.99**

BP-568 Software for Commodore 64 and C-128. Ship wt. 1 lb. **\$99.99**

Motors + Gears

The Motors + Gears set contains all the parts your child will need to motorize either Start 100 or Start 200 models. The set contains gears, gearing components and battery holder. For ages 12 and up. Requires 4 "C" batteries (not included).

BP-300 Ship wt. 3 lbs. **\$59.99**



Experiment with ten robotic devices

Build devices and control them with your home computer. Requires BP-567 or BP-568 software package as listed with BP-572 Robotic Arm (below left). AC power adapter included.

GDP-1620 Ship wt. 4 lbs. **\$119.99**

Add-on sets provide for unlimited possibilities

Add-on set 100 brings Start 100 up to the construction level of Start 200.

BP-140 Ship wt. 3 lbs. **\$29.99**

Add wheels, cams, gears, chain, extenders and more with the 200 add-on.

BP-145 Ship wt. 3 lbs. **\$39.99**

Set up electro-mechanical control of models and demonstrate electrical principles with the electromechanics add-on set.

BP-320 Ship wt. 3 lbs. **\$89.99**

The pneumatics add-on set allows construction of air-operated models. Models can be operated by included "Blow Tube" or by BP-458.

BP-340 Ship wt. 3 lbs. **\$79.99**

The mobile compressor is a source of compressed air for models constructed using Start 100 and BP-340 add-on.

BP-458 Ship wt. 3 lbs. **\$79.99**

Fischertechnik systems now qualify for Master Builder points



Digital Weather Computer

SKILL LEVEL 3 The Heathkit Digital Weather Computer is an indispensable addition to your home. It's also great for industrial use or anywhere you need to know exact weather conditions. You'll use it every day to find out current conditions right where you live. Never again rely on weather information from a distant airport. It's up to date information is perfect for the outdoorsman, pilot or boater.

You'll appreciate the microprocessor controlled memory that stores weather data by date and time. High and low read-

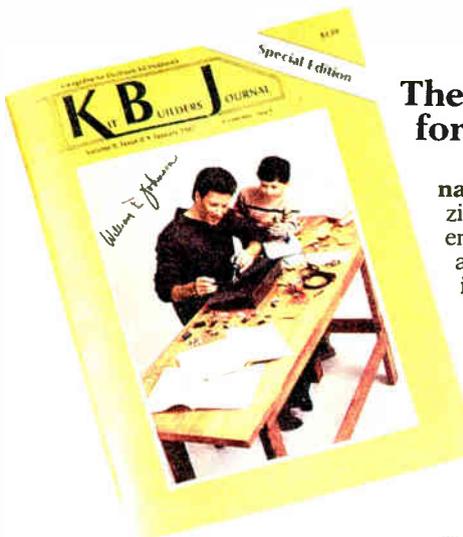
ings give you: the high temperature for the day, the low temperature from the previous night, and the time that the last high or low pressure front moved through your area. Check the rate of barometer change to tell you the severity of a storm and look at both wind direction and barometer readings to determine the near-future weather picture. With all this information at your finger tips, you'll always be prepared for the weather and you'll plan all your outdoor activities with confidence.

How does this amazing machine work? It has both a remote windcup and a weathervane transmitter with solid-state infrared sensors and optical encoding technology for unsurpassed accuracy. These mount to a compact boom assembly. The assembled IDW-4001 includes 100 feet of cable. Kit ID-4001 requires cable from ID-1290 accessories (p. 9).

Not only is the Heath Weather Computer finely-crafted for performance, but it's also attractive in appearance. This top-grade instrument is stylishly housed in a solid oiled-walnut cabinet. Measures 7 1/4" H x 16" W x 6" D.

Kit ID-4001 Ship wt. 15 lbs. \$399.95
Assembled IDW-4001 Ship wt. 25 lbs. \$699.95

Other Specifications: **DIGITAL CLOCK/4-YEAR CALENDAR:** Time Accuracy: Determined by accuracy of AC line. No accumulative error. **WIND VECTOR:** Accuracy $\pm 5\%$ or better. **Direction Display:** Accuracy: $\pm 11.25^\circ$. **THERMOMETER:** Temperature Range: -40° to 70°C ; (-40° to 158°F). Accuracy: $\pm 1^\circ$ on Celsius readings; $\pm 2^\circ$ on Fahrenheit readings. **BAROMETER:** Pressure Range: 28.00 to 32.00 in. Hg (inches of mercury), 948 to 1083 millibars. **Basic Accuracy:** $\pm 0.25\%$ plus $\pm 0.033\%/\text{C}$. **Operating Temperature:** Outdoor assemblies, -40°C to $+70^\circ\text{C}$ (-40°F to 158°F). Indoor Unit, 15°C to 35°C (59°F to 95°F). **Power Requirements:** 120/240 VAC. Provision for external battery connection for memory backup during power failures.



The magazine for kitbuilders

The **Kit Builder's Journal** is a new bimonthly magazine for the do-it-yourself enthusiast. It features a wide assortment of kit building information on Heath products, as well as other do-it-yourself projects. The Journal offers extra support as part of a rewarding and exciting hobby...kitbuilding.

The Kit Builder's

Journal features reviews of Heath kit products in every issue.

You'll find references throughout this catalog of products reviewed in

current KBJ issues. Also, KBJ offers discount prices for **subscribers only** on selected Heath products in each new issue.

Order KBJ-2000-NM today and get six big issues for only \$14.95. Use your VISA, MasterCard or Heath Revolving Charge. Call TOLL-FREE 1-800-253-0570 Monday thru Friday 8 A.M. to 5 P.M. Eastern Time. In Alaska and Michigan call 616-982-3411.

For orders outside the U.S. send your name and postal address to Heath Company, P.O. Box 1288, Benton Harbor, MI 49022. Rates in U.S. funds for Canada, APO/FPO and all others: \$22.95.



Measure rainfall with the Digital Rain Gauge

SKILL LEVEL 2 With the Heathkit Digital Rain Gauge, you'll know for sure when to water your lawn or garden, or sprinkle the flowers. Place the attractive display unit indoors and mount the outdoor measuring device on a roof, fence post or antenna tower. Your gauge will record rain in 1/100th's of an inch up to 9.99" or in 1/10 of an inch up to 99.9". There's no need to worry about power outages because a 9-volt backup battery (not included) powers memory and maintains accurate measurement during power loss. The display unit measures a compact 2 1/2" H x 7" W x 5" D. The sensor measures 9" in diameter x 9 3/8" H. Includes 60' cable and power cube for 120 VAC operation.

Kit ID-1795 Ship wt. 7 lbs. \$99.95

A digital clock that's sure to get you up on time

This reliable digital clock is also a fun and easy kit to build. It's perfect for anyone just getting started in kitbuilding. Build the kit as a gift for someone special or just give the kit itself as a gift to get someone else started in kitbuilding.

After completing this fun-to-build kit, you have an alarm clock you can rely on to get you up in the morning. The GC-1108 Digital Clock has a built-in battery backup feature to keep its internal clock circuits running and to keep you on time (9-volt battery not included).

In addition to being dependable, the GC-1108 is easy to read and operate. It displays hours and minutes, and the month and day, using four large, green LEDs. For comfortable reading at any time of day or night, the display's brightness automatically varies according to

the surrounding light. You can choose either a 12-hour or 24-hour display mode. In the 12-hour display mode, a red PM indicator will light during the appropriate time period. A snooze pushbutton on the top of the cabinet causes the alarm to sound at 9-minute intervals whenever you press it. Take as many 9-minute intervals as you like and set the alarm's volume level at high or low, whichever is right for you.

The GC-1108 is attractively styled in a dark grey cabinet that measures 2 $\frac{7}{8}$ " H x 7 $\frac{1}{8}$ " W x 4 $\frac{3}{8}$ " D. Operates on 120/240 VAC, 50/60 Hz.

Kit GC-1108 Ship wt. 4 lbs. \$24.95



Get the exact time with the Heath Most Accurate Clock

Experience the precision of a microprocessor-based time piece that is synchronized with the National Bureau of Standards cesium atomic clock. The patented Heath Most Accurate Clock locks onto the NBS radio station to give you the hour, minute, second and tenth-of-a-second in Universal Coordinated Time. With a "Hi Spec" accuracy of ± 10 milliseconds, this unique clock lets you switch to any of the world's standard 24 time zones. Not only do you get a bright digital readout of the time, but you can feed that data to your computer, listen to the NBS broadcast over the audio monitor and keep track of the data transmission. Powered with 120 VAC or 12 VDC, your Most Accurate Clock automatically resets to the correct time even after a power failure. An outdoor antenna is recommended but may not be required in your area. 3 $\frac{7}{8}$ " H x 9" W x 6 $\frac{1}{4}$ " D.

Kit GC-1000 Ship wt. 7 lbs. \$249.95

Accessory: **GCA-1000-1 RS-232C** Output Accessory for kit GC-1000. Required for use with a computer. Ship wt. 1 lb. \$49.95

Last call on our Wall Clock

With its simulated oak wood-grain finish cabinet, the Heathkit Digital Wall Clock lends style and versatility to any room in your home. The 1" high LCD digits

clearly and legibly display time in a 12- or 24-hour format. It runs up to two years on a single 1.5 "AA" alkaline cell (not included) and maintains quartz-crystal accuracy of ± 1 minute per year. 5 $\frac{1}{4}$ " H x 7 $\frac{1}{8}$ " W x 1 $\frac{1}{2}$ " D. *Limited quantities.*

Kit GC-1720 Ship wt. 2 lbs. \$49.95



Kitbuilding – A New Dimension In Product Ownership

At Heath Company we sell excellent kit and assembled products. But what makes us special is our kit product line. Owning a Heathkit product is special because it lets you do more than just use your product...you can learn from it. What's more, the electronic knowledge you gain by building it yourself helps you both in operating and servicing your kit – saving you time and money. And there's that unique bonus – the sense of pride and accomplishment you experience as a kit builder.

Fun sized 9"-diagonal color TV

SHILL
REV. 3 The GR-9009 9"-diagonal color television is designed to "get up and go." You can take this portable with you while you're camping, relaxing by the pool, working in the garage or preparing a meal in the kitchen. Now you can follow along with your favorite cooking or do-it-yourself program because this TV can go anywhere you go. It operates anywhere there's normal house current (AC) or from a 12-volt DC (negative ground) lighter socket in automobile electrical systems.

This easy-to-carry, ultra-compact sized portable with all its advanced features provides you with excellent performance wherever you take it. The Chromacolor Contrast picture tube features reflection-absorbing glass for exceptional contrast and color fidelity. You get bright, true-to-life colors with its black matrix and tinted phosphors. Plus, the in-line electron gun produces remarkable picture detail and dramatically improved edge and corner sharpness. Quartz-controlled electronic tuning has 178 channel capability and makes channel selection convenient and exact - with no moving parts to wear out or cause picture problems. Once adjusted, the TV maintains accurate color, tint and contrast with the auto-control color system. The system also blends color levels and tint for lifelike flesh tones and assures channel-to-channel color stability.

The GR-9009 portable is also easy to operate. Up/Down Channel Scanning can be programmed to scan your favorite

channels or all available channels. Or make instant channel changes simply by pressing the ENTER key after you've selected the channel number.

Most circuit boards are pre-assembled and the GR-9009 has a built-in cross-hatch generator. Includes a sun screen, earphone, built-in whip antenna, DC power cord and flush-mounted carrying handle. Cabinet measures 10 $\frac{1}{4}$ " H x 10 $\frac{1}{2}$ " W x 11 $\frac{7}{8}$ " D.

Kit GR-9009 Ship wt. 25 lbs. \$249.95



Save \$200 with this 45"-diagonal super screen TV

SHILL
REV. 3 You'll think you're a part of that nostalgic old western or hard-hitting game on the gridiron when television comes to life on this 45"-diagonal screen. And, you'll enjoy the realism of big screen viewing without crowding the living room. The GR-4500 takes no more floor space than a console TV.

A big sound system matches the big picture. The innovative Multichannel Stereo Sound System processes multi-channel television sound into exciting stereo. It also processes simultaneously telecast second audio programs or mono telecasts. The stereo power amplifier has an output of 5-watts RMS per channel with a frequency response from 100 Hz to 10,000 Hz into 8 ohms with 2% or less total harmonic distortion. You also get Bass, Treble and Balance controls. Plus, 6 $\frac{1}{2}$ " round woofers and 2 $\frac{1}{2}$ " tweeters deliver dramatic sound. Audio input/output jacks allow you to run the sound through your own hi-fi system or run other audio equipment through the television's stereo.

The remote control features Parental Control, Flashback and VCR functions. With Parental Control you can program the TV to make selected channels accessible only by entering a secret code that you choose. Touch the Flashback button to alternate viewing between two programs. Up/Down Channel Scanning can be programmed to scan your favorite channels or all available channels. Or use the remote to make instant channel selections.

Quartz-controlled electronic tuning ends the need for fine-tuning adjustments and has 178 channel capability. Liquid-cooled CRT's and optically-coupled lenses provide exceptional picture contrast and brightness. You'll always have comfortable viewing because the special black matrix screen absorbs room light to reduce glare and reflections. You can use the TV as a monitor for your VCR, video camera or video disc player. Conveniently switch between video services with your remote or front panel controls with the GSZ-4600 Antenna Switch on page 13.

All circuit boards except one are pre-assembled and the GR-4500 has a built-in cross-hatch generator. Includes cabinet. Uses 120 VAC/60 Hz.

Kit GR-4500 Ship wt. 256 lbs., Mtr. Frt.
Was \$1695.00 Now Only \$1495.00



Simulated TV pictures

Save \$50 on this 27" stereo TV – the Heathkit GR-2700



Slide-out panel gives you complete audio and video control

Take your 25" screen, cut out those rounded corners and flatten it out. You get 25 square inches more picture – a spacious 27" – diagonal picture. Then surround the screen with stereo sound. Finally, add features like Parental Control of selected channels, flashback to the football game you wanted to check, audio/video jacks, built-in stereo decoder and stereo control center, on-

screen display of time and channel, and remote control. Get all this and more when you build the GR-2700 kit TV. It has all but one circuit board pre-assembled and a built-in crosshatch generator. Plus, you can make alignment adjustments better in your home where the set will be used.

Besides the extra care and quality you put in when you build it, the GR-2700 features the newest Advanced System 3 television technology. Dark glass absorbs ambient light to provide a picture with exceptional contrast and color fidelity. A black matrix surrounds each phosphor element to produce deep, rich colors. The color picture is automatically corrected 30 times a second by the Advanced Color Sentry so you always have lifelike flesh-tones, and accurate color and contrast. Automatic CRT tracking ensures that colors remain vivid and true year after year. You get an incredibly sharp, realistic picture with the Advanced System 3's Chromacolor Contrast picture tube and peak resolution picture circuit.

The stereo decoder processes stereo telecasts, simultaneously telecast second audio programs, or mono telecast programs. The five-watt RMS per channel stereo amplifier has frequency response from 100 Hz to 10,000 Hz into 8 ohms with 2% or less total harmonic distortion. Separate bass, treble and balance controls are provided plus an Extended Stereo switch for enhanced stereo effect.

Quartz-controlled electronic tuning has 178 channel capability. Make channel selections on the set or with the included remote control. The GR-2700 must be assembled with the included cabinet. Cable ready.

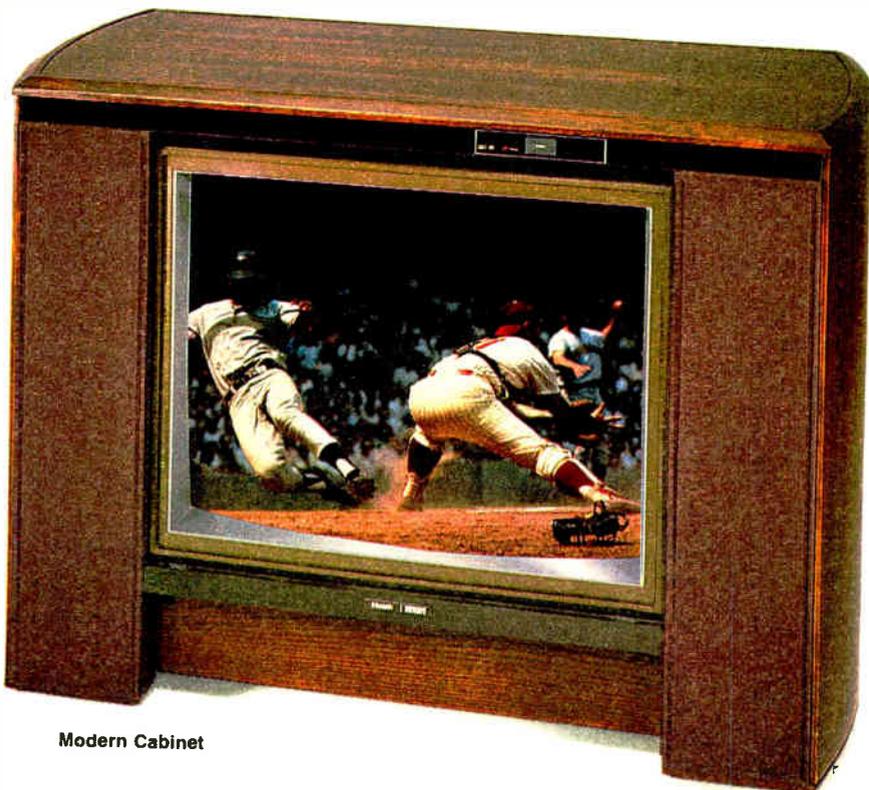
Configurations:

The 27"-diagonal TV with Modern Cabinet features a nutmeg oak veneer finish, concealed casters and two 3" x 6½" speakers. 29⅜" H x 41" W x 18½" D.

Kit GRS-2700-1 Ship wt. 208 lbs.,
Mtr. Frt. Was \$699.95 Now **\$649.95**

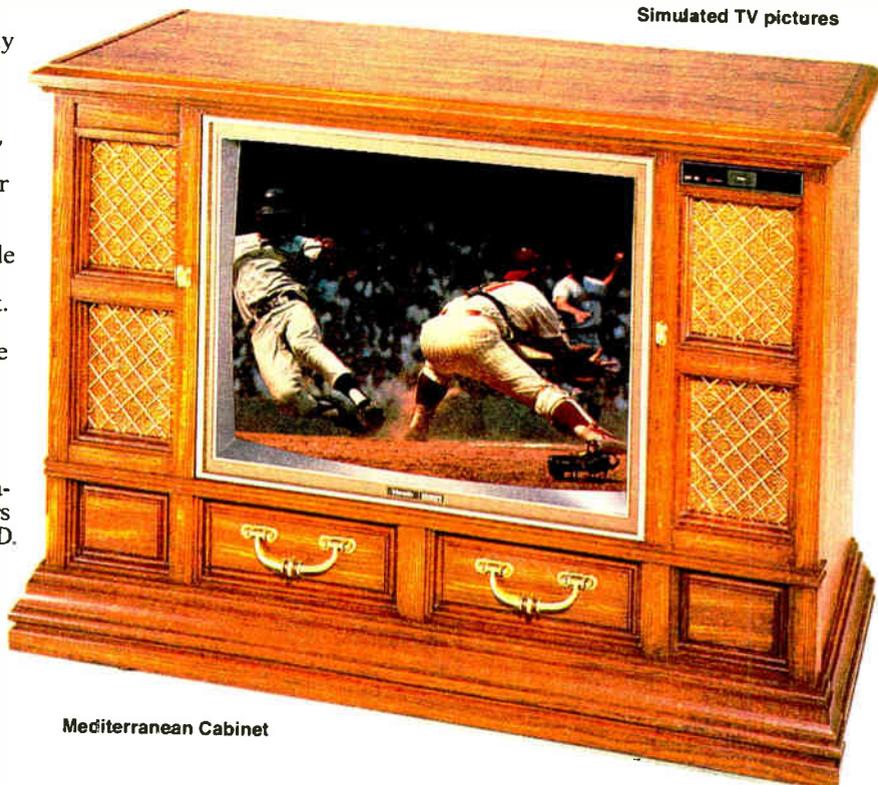
The 27"-diagonal TV with Mediterranean Cabinet has a simulated pecan finish, concealed casters and two 5" x 7" speakers. Measures 33" H x 47½" W x 18½" D.

Kit GRS-2700-2 Ship wt. 199 lbs.,
Mtr. Frt. Was \$649.95 Now **\$599.95**



Modern Cabinet

Simulated TV pictures



Mediterranean Cabinet

Convert pictures, slides or home movies to videotape

Enjoy the convenience of watching your slides and 8mm or 16mm home movies on TV, without the bother of setting up projectors and screens. The new BV-612 Converter makes it easy to transfer slides and movies to video. You can even add your own soundtrack using your VCR – either narrate the occasion or add music. It's an inexpensive way to make copies for your family and friends to enjoy as well. The converted tapes would make a perfect Christmas gift to remind someone of a special past occasion. Use the BV-612 with your own videocamera or camcorder. An adjustable tablepod mount allows for easy set-up with your projector and videocamera.

The new BV-614 Converter puts an end to unorganized photo albums and boxes filled with your photo prints. With the BV-614 Converter you can transfer photo prints up to 3½" x 5" to videotape. You get excellent results because a special lens/lighting system eliminates glare off the photographs. View your family album on TV and even add music or other audio through your VCR. It's simple and convenient using your own videocamera and the Converter's adjustable tablepod mount.

Assembled BV-612 Ship wt. 3 lbs. \$99.95
Assembled BV-614 Ship wt. 4 lbs. \$99.95

SAVER! Purchase both BV-612 and BV-614 at the same time and save \$50.
Separately \$199.90 SAVER Price \$149.90



We Won't Let You Fail – Building Instructions

We know how important it is that instructions be clear, concise and easy to understand. That's why we've spent a lot of time and effort to make our manuals complete and easy to follow.

Our manuals are written by technical experts and reviewed by a novice to ensure that all instructions are accurate and easily understood. All manuals use a pictorial format with instructions that reference well-drawn illustrations. Plus, more detailed drawings are placed wherever there is a need for clearer understanding of an assembly step. You'll also find that every manual contains an introduction to the assembly process, soldering information, a detailed parts identification chapter, kit operation section, troubleshooting chart and specifications.

If you ever need any help at all, just give our technical consultation line a call (see p. 52). Our specially-trained consultants are always there to answer questions and help you through the building process – we know that we succeed only if you do.

Video source selector

Switch between up to four video sources such as your roof antenna, cable service, video game, compatible computer or other RF input sources with your television's remote control or front panel control. Only for use with GR-1902, GR-1903, GR-2502, GR-4500 and GR-2700 televisions. Attaches to rear of TV set.

Assembled GSZ-4600
 Ship wt. 4 lbs. \$39.95





Computerize your
entire home from on-
screen room layouts

The SMARTHOME I Controller takes care of you and your home

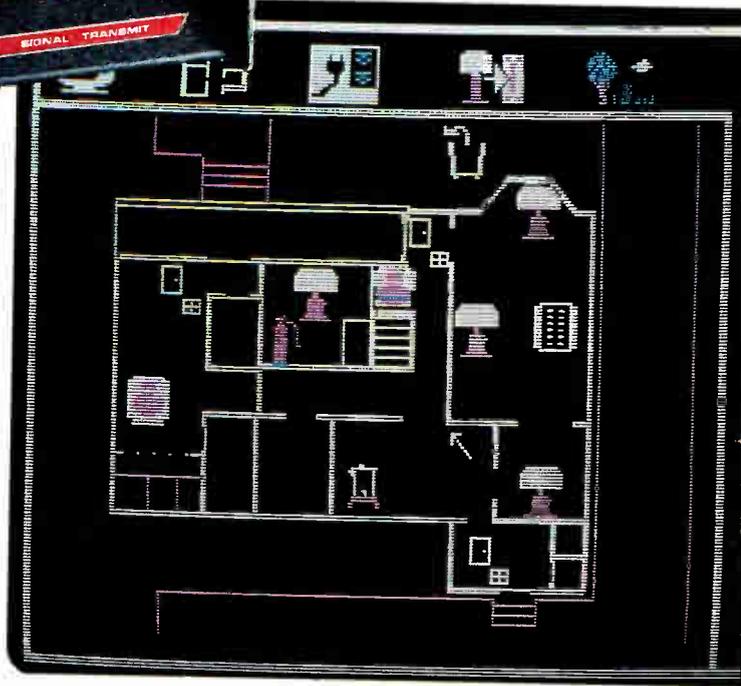
Awakened by the odor of fresh brewed coffee, you rise and walk through the already warm house. Lamps turn on to light your way and then shut off behind you. You hear the radio turn on in time for the morning news. When you leave an hour later, the radio and coffeemaker go off and the thermostat shuts down the furnace, leaving your home in safe, quiet silence while your electronic security system keeps watch. The SMARTHOME I system has again given you a comfortable start to another day.

The SMARTHOME system allows programmed, remote and sensor-activated control of home lighting, appliances, heating, air conditioning and a wide variety of electronic devices. Using software and your home computer you program the Controller to turn lights and appliances on and off or to dim lights at specific times. Use the software to draw your floor plan on your home computer's monitor and install lights and appliances with icons. Enter up to six floor plans and include outdoor fixtures. Then disconnect the Controller from your computer, plug it into a wall outlet and watch it run your home. Just plug X-10 modules (p. 15) into wall sockets and plug lamps or appliances into the modules.

Touch a button on the included remote control to dim a light or turn on the stereo. Add optional sensors for a complete home security system where appliances and lights are controlled by events the sensors detect as well as your preset patterns and remote control.

For even more protection, complete your system with the Alarm Center accessory. You determine what type of emergency each of four distinct alarms will indicate, and set up an emergency priority system. The Alarm Center operates on included AC power cube and comes with 12 V battery for up to 10 hours of backup power.

Kit GD-3800 Ship wt. 5 lbs. **\$299.95**



Order the required software for your home computer:

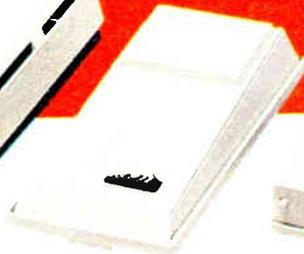
GDA-3800-1 Software for H/Z PC/IBM PC. Ship wt. 2 lbs.	\$99.95
GDA-3800-2 Software for H/Z-100 Series. Ship wt. 2 lbs.	\$99.95
GDA-3800-3 Software for Apple II, II+, IIe, IIc. Ship wt. 2 lbs.	\$99.95
GDA-3800-4 Software for MacIntosh. Ship wt. 2 lbs.	\$99.95
Accessories: Kit GD-3880 Alarm Center. Ship wt. 16 lbs.	\$299.95



SMARTHOME I
Controller and Alarm
Center bring intelligent
control and security to
your home



Smoke Detector/
Transmitter



Motion Detector/
Transmitter



Wired-Circuit
Transmitter



9



1



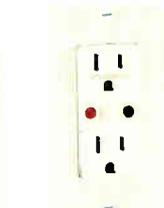
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3



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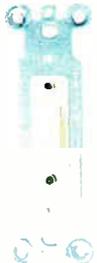


5

6



7



Get convenient home control with X-10 devices

1 Assembled BC-465 Lamp Module, 300 watts maximum load. Ship wt. 1 lb. **\$12.99**

2 Assembled BC-466 Appliance Module turns appliances on/off. 15 amp resistive load, 1/2 hp motor, 500 watt lighting, 400 watt TV/stereo. Ship wt. 1 lb. **\$12.99**

3 Assembled BC-284 Burglar Alarm Interface Module turns on selected lights, appliances, siren or selected lights can flash on and off. Ship wt. 1 lb. **\$39.99**

4 Assembled BC-245 Perpendicular-Pronged Air Conditioner Module. 240 VAC receptacle for 20 amp load. Ship wt. 1 lb. **\$29.99**

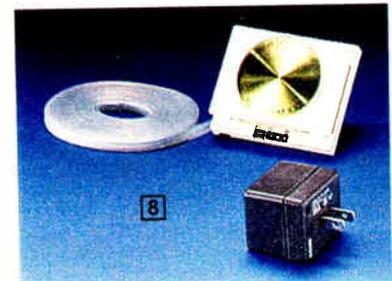
5 Assembled BC-227 Wall Receptacle Module rated at 15 amps. Ship wt. 1 lb. **\$24.99**

6 Assembled BC-467 Wall Switch Module, 500 watt load. Ship wt. 1 lb. **\$12.99**

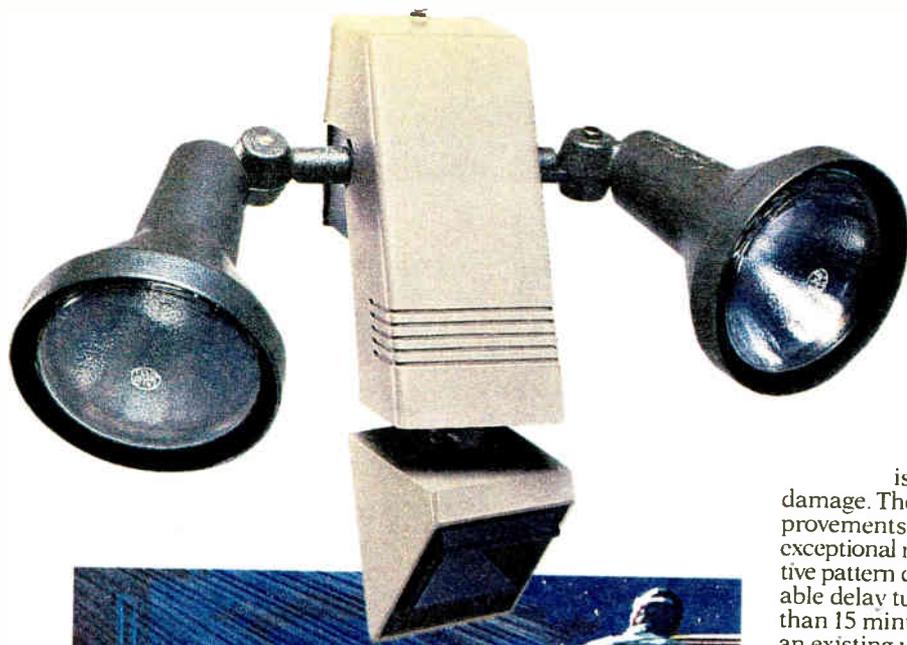
7 Assembled BC-4777 Three-Way Wall Switch Module, 500 watt load. Ship wt. 1 lb. **\$24.99**

8 Assembled BC-2807 Thermostat Set. Requires BC-466 Module. Ship wt. 1 lb. **\$19.99**

9 Kit GD-1530 RS-232C Interface allows computer control of 256 groups of modules with unlimited timing patterns. Ship wt. 3 lbs. **\$99.95**



8



Save \$10 now on the convenience Light Control

^{SKILL}
_{LEVEL} The Convenience Light Control brings you the latest in infrared technology to protect your property and stop your security worries. Now with the most sophisticated 8-sensor array available, the GD-3610 offers automatic lighting to greet guests, light your way at night, and even triggers from the heat of your car when you enter the drive. Security is a bonus as it provides the most effective deterrent to crime...light. Intruders believe they have been seen and, unlike other security systems, the intruder is scared off before breaking a window or causing other damage. The new 8-sensor array offers dramatic performance improvements over units using one or two sensors and lenses. With exceptional resistance to false triggering, the GD-3610 has an effective pattern coverage of over 40 feet wide by 60 feet long. An adjustable delay turns the light off after less than 1 minute or up to more than 15 minutes. Wire in the GD-3610 to control your lighting from an existing wall switch. A photo-transistor deactivates the Light Control during daylight hours, so you can simply leave your control switch on all the time. You can manually activate your controlled lights by turning the switch off and then back on again. Lights turn off automatically after delay. Operates on 120 VAC, 50 or 60 Hz. 14½" H x 5½" W x 4⅝" D.

Kit GD-3610 Ship wt. 5 lbs. Was \$99.95 Now Only **\$89.95**
Accessory: **Assembled GDA-3511-1** Dual Floodlight (light bulbs not included). Ship wt. 5 lbs. **\$29.95**



Keyless Doorlock

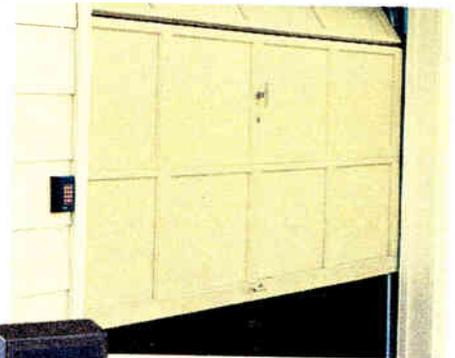
^{SKILL}
_{LEVEL} Leave your keys behind when out jogging or working in the yard. The Keyless Doorlock lets you in the house just by entering a four digit number of your choice. Change the code any time. For safety, the door always locks behind you. During power failures you can still use your key, or connect a + 12 VDC battery (not included) for backup power. The Doorlock replaces your

door frame strike plate, but you keep your lock and key. Professional installation may be needed on metal frame door jambs.

Kit GD-3830 Ship wt. 5 lbs. **\$79.95**

Other Specifications: **Power Requirements:** 120 VAC using included power cube. **Dimensions:** Keypad: 4½" H x 2¾" W x 1½" D. Control module: 4¾" H x 3" W x 1¼" D. Stroke mechanism: 5¾" H x 1¼" W x 1¼" D.

Easy enough for a child to use or give a neighbor access to your home while you are on vacation.

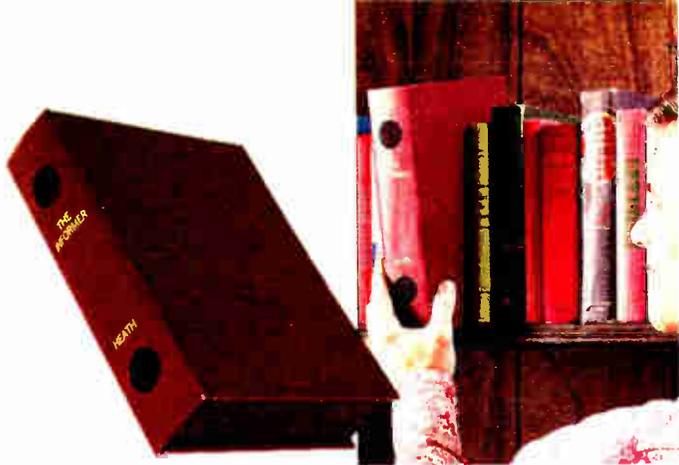


A keyless garage lock

^{SKILL}
_{LEVEL} Have access to your garage without a key or transmitter and never again take a chance on equipment being stolen from an open garage. The Digital Garage Door Lock works like the GD-3830 Keyless Doorlock (left) to activate your electric garage door opener. Easy to install.

Kit GD-3835 Ship wt. 2 lbs. . . **\$49.95**





Ultra-sonic intrusion alarm

SKILL LEVEL 1 Disguised to look like a hardcover book, the Informer sits quietly on a shelf until someone invades its field of surveillance. Ten-seconds after movement is detected, it triggers a lamp outlet to turn on a light. Thirty-seconds later it activates an alarm outlet to trigger any indoor buzzer alarm or outdoor bell you have connected to it. The delay time allows you to deactivate the audible alarm when you enter the area. The Informer is ideal for alerting you when your child leaves his bed. It can also be used as an automatic light switch in dark hallways or garages. Sensitivity is adjustable. Operates on 120/240 VAC. 10 1/8" H x 2 3/8" W x 7 1/2" D.

Kit GD-49 Ship wt. 5 lbs. \$79.95

SECURITY 



Get \$50 off the Security Sentinel

SKILL LEVEL 1 Suddenly you hear a commanding male voice state, "Warning. You are entering a secured area. Please exit immediately." Actually, it's the Heathkit Security Sentinel with its realistic digitized voice guarding your property. During darkness, the Security Sentinel issues the verbal warning and turns on lights when it detects an intruder. During the day, only the voice is activated.

Completely covers an area up to 40' by 40'. You can adjust sensitivity and the coverage area size and pattern to suit your needs. Use with up to 1200 watts of your lighting. 12 1/2" H x 5 3/4" W x 3 1/2" D. Requires 120 VAC, 60 Hz.

Kit GD-3810 Ship wt. 6 lbs. *Was \$149.95 Now Only \$99.95*



Relax while the Vacation Home Sentry monitors your home

SKILL LEVEL 1 Phone home while you're away to check on critical household conditions. The Vacation Home Sentry monitors the house temperature with its built-in sensor. If the temperature drops below 45°F, you hear a steady 5 to 10 second tone. If the temperature is normal, you hear silence. Add optional sensors to detect flooding, opened doors or freezer failure. Avert costly disasters by knowing about problems soon after they occur - not weeks or months later. Requires two 9-volt batteries. Batteries draw current only when the unit responds to a call. 1 5/8" H x 2 7/8" W x 4" D.

Kit GD-1702 Ship wt. 2 lbs. \$19.95





A dependable siren/PA for emergency use

SKILL LEVEL 1 This compact and mobile siren/PA is designed for the public service volunteer or professional. Open up traffic lanes with 55 watts of attention-getting automatic or manual wail, hi-lo emergency tone or yelp. Has a 20-watt address position or switch to the radio position for monitoring incoming calls while away from the vehicle. A low-noise, push-to-talk microphone breaks

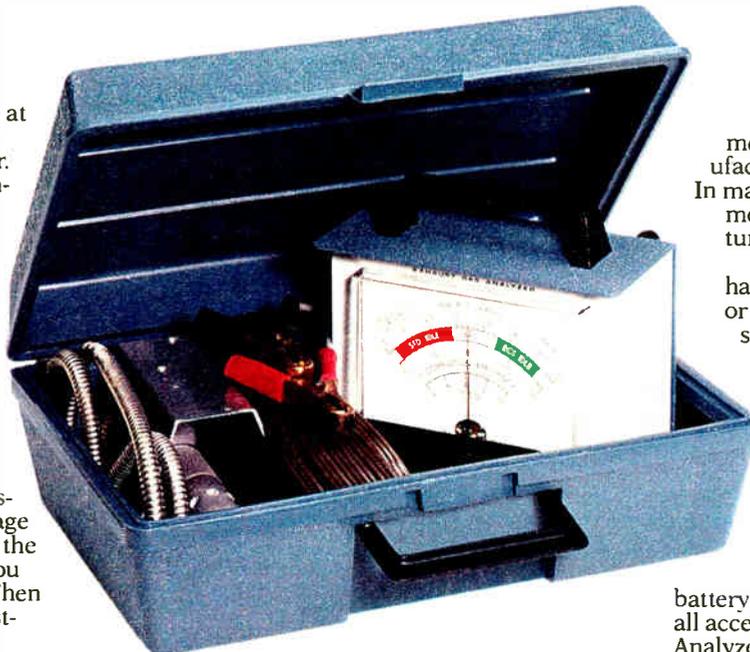
from any siren function to the audio-PA mode. **IMPORTANT:** This product is designed for use in emergency vehicles. Consult authorities before installing or operating. 2 $\frac{7}{8}$ " H x 8 $\frac{3}{8}$ " W x 7 $\frac{5}{8}$ " D.
Kit GD-1810 Ship wt. 6 lbs. . \$109.95

Accessories: Assembled GDA-18-1
 Weatherproof Exterior Horn Speaker.
 Ship wt. 10 lbs. \$109.95
Kit GDA-18-2 Concealed Grill Speaker.
 Ship wt. 10 lbs. \$109.95

Exhaust Gas Analyzer

SKILL LEVEL 1 Keep your engine running at maximum efficiency with the Heathkit Exhaust Gas Analyzer. Plus check your engine for minimum pollution, review the emission control system and see a resultant analysis on an easy-to-read scale.

The Analyzer is an instrument that shows the interaction of carburetor and ignition settings on a large meter. It works by comparing the thermal conductivity of exhaust gases with that of air and will indicate the air-to-fuel ratio, overall combustion efficiency and the percentage of carbon monoxide present in the exhaust. These readings help you determine best fuel economy. Then you can make the needed adjust-



ments or repairs to achieve manufacturer's engine specifications. In many states it's mandatory to meet clean air standards when tuning up engines.

The Analyzer is designed to hang on a partially open window or to sit on a level surface. The sensor, used to detect gases at the exhaust pipe, has a rugged and removable stainless steel flexible probe tip.

Everything stores neatly inside a durable case.

The Analyzer is not intended for use with Chrysler "lean burn" engines. A 7-foot cable enables you to use your car

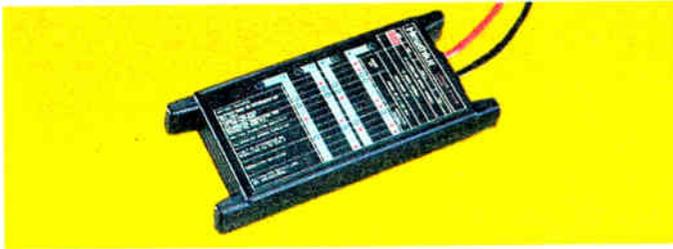
battery as a power source. Includes all accessories. The Exhaust Gas Analyzer is an easy one-evening kit.
Kit CI-1080 Ship wt. 6 lbs. . \$129.95



Add convenience to your car's wipers with a Delay

SKILL LEVEL You'll have a clear view of the road even when constant wiper action isn't necessary with this Wiper Delay kit. Easy to build and install, the kit includes a test lamp with instructions to locate and identify hookup leads in your wiring system. Designed to fit most single and 2-speed wipers. Incompatible with motor-reversing hidden wipers. Contact your auto dealer for wiring specifics. A quick one-evening kit.

Kit CH-1068 Ship wt. 2 lbs. \$21.95



Test charging systems

SKILL LEVEL Diagnose faulty components in your vehicle's charging system with accuracy and ease. A two-wire setup and three quick tests tell you if the battery has sufficient charge to reliably start the engine, if the battery is being charged by the alternator, if the voltage regulator is at fault (causing the battery to become overcharged) and if the alternator stator windings and rectifier diodes are functioning properly. No external power or battery required. 5½" H x 2¾" W x ¾" D.

Kit CI-2065 Ship wt. 2 lbs. \$24.95

See these assembled automotive products on page 98



CGW-1562 G-Meter indicates forces from 0.1 to 0.8G. Also, checks your battery in a 10 to 15V range.



CTW-1572 LED Graphic Tachometer indicates RPM from 0 to 6000 in 500 RPM steps. Also check battery voltage from 11.5 to 17.0 volts.



CMW-1570 Digital Engine Analyzer stores right in the glove compartment for ready assurance that your engine is running efficiently.



You can accurately watch your weight with the Digital Scale

Whether you're serious about losing weight or just a fitness enthusiast, you'll appreciate the Digital Scale's precision read-out on items from 2 ounces up to 300 lbs. Because it uses strain gauge technology, the Digital Scale eliminates the springs that wear out on conventional scales. The strain-gauge mechanism is sensitive to weight changes as small as 1/10th of a pound. A manual zero adjustment makes it easier to weigh small items with accuracy. All weights appear in bright LEDs for easy reading and in your choice of pounds or kilograms. Requires 6 "C" batteries. An easy two-evening kit.

Kit GD-1186 Ship wt. 9 lbs. \$99.95

Groundtrack metal locator

Your Groundtrack screens out pulltabs, bottle caps, ferrous and alloyed items, and leads you to valuable finds missed in the past by other metal locators. You'll know exactly where to dig with the help of Groundtrack's sensitive tuning and adjustable filtered background signals. This metal locator even combs ground submerged in up to two feet of water – imagine the valuables you might discover in a popular swimming area.

The detector remains silent until an object enters the 6" diameter field of detection. Then a clear tone sounds that grows louder as you approach vertical center. An easy-grip handle, height-adjustable shaft and 3 1/2 lb. weight make the Groundtrack extremely easy to handle. Use it with or without headphones. The telescoping shaft collapses to 22 1/2" for storage. Requires 6 "AA" batteries (not included) or optional Rechargeable Battery Pack (below) which includes AC outlet and DC car lighter socket chargers. An easy two-evening kit.

Kit GD-1290
Ship wt. 5 lbs. \$249.95

Accessories: GDA-1190-1 AC/DC
Rechargeable Battery Pack.
Ship wt. 2 lbs. \$29.95

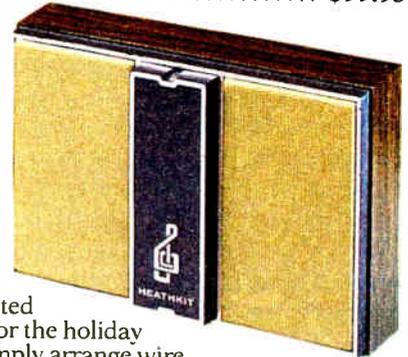
HDP-1396 Headphones
(pictured on page 31)
Ship wt. 2 lbs. \$14.95

See July
Kit Builder's
Journal

Programmable electronic doorbell

Watch your guests smile when they are greeted with a song chosen just for the holiday or a special occasion. Simply arrange wire leads on a one-octave "keyboard" inside the Programmable Doorbell to program any tune. The Doorbell comes with a songbook containing over 50 college, seasonal, Christmas and special occasion songs. The back door button activates a portion of the tune – so you know which door to answer. Volume, tone, speed and delay characteristics are adjustable. A two-evening kit. Requires standard 16 VAC, 50/60 Hz bell transformer. 5 3/4" H x 8 3/8" W x 2 3/8" D.

Kit TD-1089 Ship wt. 3 lbs. \$49.95



Last call on our three-tune electronic doorbell

Replace your ho-hum doorbell with one that offers your guests a unique and pleasant welcome. This doorbell plays your choice of three selections: an upbeat 4-note ring, a short selection of Beethoven's *Für Elise* or a longer selection of Rubinstein's *Romance*.

Electronically select different tunes for your front and back door. The 3-Tune Doorbell can be built and easily installed in one evening. The Doorbell operates on 2 "C" batteries (not included). For unlit doorbells. 4 3/4" H x 5 7/8" W x 1 1/4" D.

Kit TD-2089 Ship wt. 1 lb. Limited Quantities \$24.95





Discover heat leaks with this draft detector

SKILL LEVEL 1
The hardest part of reducing heat loss in your home is finding those leaks. Now you can easily detect heat loss areas with the Heat Sniffer. Just turn it on and adjust for silence. Then move the Sniffer's sensor along areas where heating/cooling losses

might occur. Changes in temperature set off a beeping alarm and a flashing LED – alerting you to heat loss. The Heat Sniffer can be used in temperatures from 59°-95°F. Operates on a 9-volt battery (not included). Has dimensions of 8¼" H x 1⅝" W x 2⅜" D.

Kit NE-2112 Ship wt. 2 lbs. . . . \$19.95



Furnace Air Cleaner

SKILL LEVEL 3
The Furnace Air Cleaner works with your heating or air conditioning system for air that is free of pollen, dust and cigarette smoke. The power supply mounts on a cold air duct and turns the filter on when the blower is running. A red LED indicates proper operation. The power supply operates one filter and runs on 120 VAC. Requires easy-to-install 1" filters. (Works with GD-2196). 3½" H x 4½" W x 10" D.

Kit GD-3196 Ship wt. 9 lbs. . . \$149.95

Accessories: **Assembled**

GDA-3196-1 16" x 20" Filter. Ship wt. 5 lbs. **\$99.95**

Assembled GDA-3196-2 16" x 25" Filter. Ship wt. 6 lbs. **\$99.95**

Assembled GDA-3196-3 20" x 20" Filter. Ship wt. 6 lbs. **\$99.95**

Assembled GDA-3196-4 20" x 25" Filter. Ship wt. 7 lbs. **\$99.95**



Credit card orders call TOLL-FREE:

1-800-253-0570

Alaska and Michigan residents call: 616-982-3411.
HELP in building your kit: see page 52



Refresh yourself with the Portable Air Cleaner

SKILL LEVEL 1
Now you can enjoy cleaner, fresher air in your home with the Heathkit Portable Air Cleaner. It solves your toughest air cleaning problems by efficiently removing dust, smoke and other pollutants from 6,000 cubic feet – that's a 25' by 30' room with an 8' ceiling. Every time you enter your home you'll appreciate the improved environment fresh air creates.

Three speeds tackle a variety of jobs and three filters work together to keep your air clean and fresh. It's an easy one-evening kit because the power supply, 3-speed fan control and filter are already assembled for you. Uses 120 VAC, 60 Hz. 26½" H x 17¼" W x 13½" D.

Kit GD-1297 Ship wt. 59 lbs. \$269.95

Accessories: **Assembled**

GDA-1297-2 Replacement Charcoal Filter. Ship wt. 2 lbs. **\$9.95**



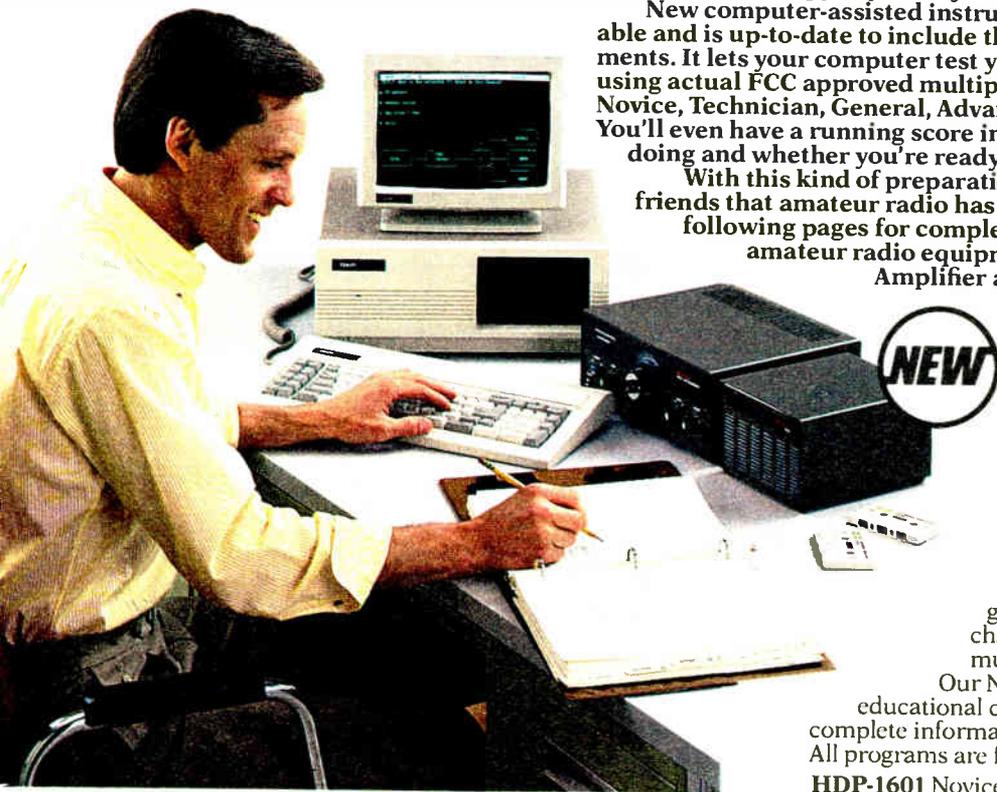
Amateur radio is even more exciting with new Novice Enhancement privileges for entry level hams

If you've ever considered joining the ranks of amateur radio operators, now is the time to get involved. The Novice license traditionally allows Morse Code operation, but now includes voice communication privileges and communication between home computers linked by radio. Now you can pursue amateur radio as a fun and exciting way to enter the world of high-technology communications.

Heath offers you all the support you need to get started in Amateur Radio. Courses ER-3701-A and ER-3702-A (below) provide you with the theory and background material needed to master the Novice, Technician or General Class exams. We're so sure that these courses will prepare you for the exams that we guarantee a full refund of your money in the event you don't pass. Just send us a copy of your rejection notice and return the course materials.

New computer-assisted instruction (CAI) software (below) is also available and is up-to-date to include the latest Novice Enhancement requirements. It lets your computer test you before you take the license examination using actual FCC approved multiple choice questions. Test yourself for Novice, Technician, General, Advance or Extra Class license examinations. You'll even have a running score in percentage to know how well you're doing and whether you're ready to take the actual exam.

With this kind of preparation, you're sure to gain all the fun and new friends that amateur radio has to offer. Take time to look through the following pages for complete information on our full line of quality amateur radio equipment including the new SB-1000 Linear Amplifier and HK-232 Pack-Kit Multi-Mode TNC.



Use your computer to study for amateur radio license exams

This computer software offers the most up-to-date FCC approved pool of questions for all five exams, including the latest "enhanced" novice class. The disk in each program contains both a CW practice program and complete multiple choice questions from the FCC approved pool of questions used for actual exams. The program will be revised each time the question pool changes. Since it's software, it can be updated much more quickly than printed material.

Our Novice ER-3701-A or General Class ER-3702-A educational course (below) is recommended for more complete information in addition to this exam study material. All programs are for use with Heath/Zenith and IBM PC's.

- HDP-1601 Novice program. Ship wt. 1 lb. \$39.95
- HDP-1602-T Technician program. Ship wt. 1 lb. \$39.95
- HDP-1602-G General program. Ship wt. 1 lb. \$39.95
- HDP-1603 Advanced program. Ship wt. 1 lb. \$49.95
- HDP-1604 Extra program. Ship wt. 1 lb. \$49.95

Move up to General Class

Enjoy all the added General Class privileges -- more frequencies to operate on, plus radio teletype, slow-scan TV, facsimile, and satellite activity. It's an impressive list of incentives that add up to more QSO's, QSL's, and thousands of new friends.

This text takes you through the material covered on the written test. Its in-depth coverage will give you more than enough information to pass either the Technician or General Class exams. Extra code practice brings your copy speed up to 15 words per minute. This gives you a two-word edge on the 13 wpm requirement. Four sample tests prepare you for the actual exam. When you pass your General exam, send us a copy of your license or notice to receive 5.0 CEU's. We guarantee you'll pass the General Class exam -- or we'll refund your money when you return the course materials with a copy of your rejection notice.

- ER-3702-A Ship wt. 21 lbs. \$64.95

Make new friends on the airwaves -- become a Novice Ham Operator

Join the world of Amateur Radio and communicate one-on-one with a diverse group of interesting people from all professions and in all countries. This course is guaranteed to help you earn a Novice ticket or we'll refund the full purchase price of the course. Everything you need to get your license is in this comprehensive, well-organized study package, including information on how you apply to take the latest Novice Class License test. Practice exams and a final examination give you confidence to pass the first time. Two cassette tapes explain the RST signal reporting system, review electronic circuit components, and cover practical circuits. You also learn International Morse Code in letter groups and improve your copy speed to 5 words per minute.

ER-3701-A Ship wt. 6 lbs. \$44.95

SAVER! ERS-3701 Save on the Novice Course and CW Oscillator on page 23. Plus get a 10% certificate good for up to \$10 off any Heathkit Amateur Radio product.

Ship wt. 9 lbs. . . . Separately \$64.90 Our System Price \$49.90



Build up your code speed with the CW Code Oscillator

SKILL LEVEL 1 Get your code speed up and pass your exam in a simple and inexpensive way with the CW Code Oscillator. This handy practice oscillator features a telegraph key with adjustable rebound, built-in speaker, volume and tone controls. The CW Code Oscillator even has a headphone jack for private listening so you won't disturb others. And once you get your license, it can serve as a side tone oscillator for any transmitter using negative-grid block keying. The CW Code Oscillator operates on a 9V transistor battery (not included). 2 $\frac{3}{8}$ " H x 4 $\frac{1}{8}$ " W x 4 $\frac{3}{8}$ " D.

Kit HD-1416-A Ship wt. 2 lbs. \$19.95



Novice CW Transceiver

SKILL LEVEL 3 Get off to a good start in Amateur Radio with the Novice CW Transceiver. To give you the best possible Novice CW transceiver we combined many of the quality features of the HW-9 Deluxe QRP CW Transceiver (page 29) with plenty of power for easy contact. Broadband design ends the need to tune circuits within the band. The wide-band front-end uses a 4-pole crystal filter to handle wide dynamic range signals with ease and eliminate the usual RF amplifier.

Use of single frequency conversion in the main signal path reduces spurious responses and maintains superior image rejection. The HW-99 also has a balanced product detector, an active-audio filter and AGC circuits for top performance. The power amplifier is VSWR protected. A front panel bar display indicates relative signal strength in receive and relative power in transmit. 4 $\frac{3}{8}$ " H x 11 $\frac{1}{2}$ " W x 10 $\frac{3}{4}$ " D.

Kit HW-99 Ship wt. 20 lbs. \$249.95

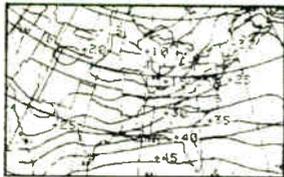
SAVER! Kit HW-99 includes a \$100 gift certificate good for any Heathkit product (except Educational Products). Requires a copy of your Novice license to redeem. Valid even if you get your Novice license after you buy the transceiver.

Companion Station Speaker to HW-99

SKILL LEVEL 1 The Heathkit SP-99 Station Speaker is a 3" communications receiver speaker housed in an attractive cabinet designed to match the HW-9 and HW-99. This 8 ohm speaker has a frequency response of 200 to 5000 Hz and can handle 1.5 watts RMS. 8" H x 4 $\frac{1}{2}$ " W x 6 $\frac{3}{4}$ " D.

Kit SP-99 Ship wt. 3 lbs. \$29.95

Other HW-99 Specifications: **TRANSMITTER: RF output power:** 50 watts, except 40 watts on 10 meters. **Transmitter Frequency Offset:** App. 700 Hz. **Antenna Load Impedance:** 50 ohms unbalanced nominal. **Harmonic and Spurious Radiation:** -40 dB minimum at rated output. **T/R Operation:** CW, full break-in to 30 WPM. **RECEIVER: Sensitivity:** Less than 1.0 μ V for 10 dB S + N/N. **Selectivity:** App. 450 Hz at 6 dB. **Dynamic Range:** 70 dB. **Image and IF Rejection:** 50 dB minimum. **Audio Hum Noise:** -40 dB. **Audio Output:** 1 watt into 8-ohm load. **GENERAL: Frequency Stability:** Less than 200 Hz/hr drift after 30-minute warmup. **Power Requirement:** 120 VAC at 60 Hz.



Now you can enjoy multi-mode operation with this single unit TNC



SKILL The Pack-Kit Multi-Mode TNC gives you the latest in Packet Radio and takes the hassle out of getting on RTTY. It lets you work CW at speeds you never dreamed of, gets you on AMTOR and ASCII and even lets you print Weather Facsimile pictures. Just adding the Pack-Kit to your radio and computer gives you everything you need to get on the air in every mode. You'll also need an Epson or compatible graphics type printer to print Weather Facsimile pictures.

The Pack-Kit TNC combines computer technology with amateur radio so you can explore packet radio and all its applications, plus explore the capabilities of additional modes. Connect both your HF and VHF rig at the same time and you can switch between VHF Packet and copying a W1AW RTTY bulletin on 40 meters with the push of a button. Work Packet in both HF (300 baud) and VHF (up to 9600 baud – above 1200 baud requires external modem).

A unique "SIGNAL" command causes the Pack-Kit to determine correct RTTY, ASCII or AMTOR mode for the signal you are listening to and presets baud rate and mode – it even inverts the signal if necessary. All you have to do is type, "OK." Use the "OPMODE" command to display full details of your current operating mode without having to change modes. Also, front-panel LEDs clearly display your present operating mode and the system status for more efficient and simple operation.

The Pack-Kit TNC supports all common baud rates for Baudot RTTY and ASCII, and CW from 5 to 99 WPM. Radio link rates are supported to 1200 baud (9600 with external modem) and computer data rates are supported to 9600 baud. What's more, there's no special software needed to operate the Pack-Kit TNC. You can use it with any modem communication package made to run on your computer or order "Ham-Pak" software (below) especially for use with the HK-232 and your Heath/Zenith or IBM PC. Plus, the HK-232 works with any other computer or terminal since it interfaces using an RS-232 industry standard serial port.

The Pack-Kit has all the features demanded by active amateur radio operators. For greater flexibility, two independent, selectable rear-panel connection ports provide interchangeable HF or VHF operation. All you need to do is connect your radio's PTT line, speaker output and microphone input.

The same connections work for all other modes, too – even CW. For excellent performance, the HK-232 uses an eight-pole bandpass filter followed by a limiter discriminator with automatic threshold correction to copy signals that could baffle other units. Also a high-performance feature, the answer-back memory permits autoanswer with message in both Packet and RTTY. It automatically responds to "WRU" requests with your station ID and system status. And for easy HF tune-up, the Pack-Kit TNC features a built-in front panel bar graph tuning indicator.

This outstanding value in performance, quality and unique new features is yours with the Heathkit Pack-Kit Multi-Mode TNC. It even includes our well organized and easy-to-understand operational manual with hook-up connections for most popular HF and VHF radios. The manual is available separately to anyone that is not purchasing the HK-232, but desires complete multi-mode TNC operational information (\$30 plus shipping). Operates on 12 VDC at 750 mA with 10% ripple or less. 2 1/8" H x 8 1/4" W x 11" D.

Kit HK-232 Ship wt. 5 lbs. \$279.95

Accessory: **HKA-232-2** "Ham-Pak" Communications Software Program for use with Heath/Zenith and IBM PC's. Ship wt. 1 lb. \$19.95



Get remote control with decoder

SKILL The Touch Tone Decoder lets you hear only the messages meant for you – eliminating extraneous monitor racket. Connect it in series with your receiver or scanner speaker. Turn it on and it mutes the speaker until it detects the unique DTMF code you have programmed. In addition, use the HD-1530 for operation of single functions in the control of a repeater, or as a secondary control link for autopatch ON/OFF. You can preset the "line open" time length for up to 8 minutes, or the user can enter a two-digit code to open and close the line at will. Requires 7.5 to 11 VAC or 11 to 16 VDC, or optional PS-5012 found on page 29. 2 1/8" H x 7" W x 5" D.

Kit HD-1530 Ship wt. 2 lbs. \$79.95

You'll be a great listener with this Shortwave Synthesized Receiver

SKILL LEVEL Designed specifically for the avid shortwave listener, the SW-7800 covers 150 kHz through 30 MHz continuously in 30 overlapping, 1 MHz bands. Broadband front-end circuits mean you don't have to tune circuits within a band. The wide-band front-end stages eliminate the usual RF amplifier so the Receiver can easily handle incoming signals within a wide dynamic range. Excellent image rejection is provided by an up-converting, double-conversion mixing design. Other features you'll appreciate include: AGC time constant switch; muting provision to allow operation with a transmitter; local/DX switch to protect against overload from very strong local stations; front panel jack for taping receiver material — unaffected by volume control setting; and telescoping whip antenna for local reception and portable operation. Mobile operation is possible using any 11 to 15 volt DC source at $\frac{3}{4}$ amp. Only a VTVM is required for receiver alignment. $4\frac{3}{8}$ " H x $11\frac{1}{2}$ " W x $10\frac{1}{2}$ " D.



Kit SW-7800 12 lbs. \$299.95
 Accessory: **Kit HDP-7800** High-performance trapped dipole antenna for use with any general coverage or shortwave receiver. Eight high-Q parallel-tuned traps reduce length and isolate various segments of the antenna for full coverage of 11, 13, 16, 19, 25, 31, 41, 49 and 60 meter bands. Ship wt. 3 lbs. \$64.95

Other Specifications: **Readout Accuracy:** Nearest 1 kHz. **Frequency Control:** Synthesized (PLL and LC VFO). **Modes:** USB, LSB, CW and AM (wide or narrow). **Sensitivity:** SSB/CW, less than $0.35 \mu\text{V}$ for 10 dB (S + N)/N; AM, less than $2.5 \mu\text{V}$ for 10 dB (S + N)/N. **Selectivity:** SSB/CW, 2.5 kHz min. at 6 dB; AM, 5.5 kHz min. at 6 dB. **Selectivity Shape Factor:** 1.5 at 6/50 dB. **Image Rejection:** 55 dB min. **OTHER: Antenna:** Built-in telescoping whip. Connection for 50 ohm, unbalanced, external antenna (SO239) and high-impedance wire. **Audio Output:** Internal speaker, jack for headphone or external speaker. **Muting:** External jack for use with transmitter. **Recorder Output:** Miniature phone jack. **Power:** 120 VAC, internally; 13.8 VDC at $\frac{3}{4}$ -ampere, externally.



Antenna Noise Bridge

SKILL LEVEL The Antenna Noise bridge reveals the cause of any mismatch between the station transmitter and antenna — so you can trim each antenna for the most effective transmission. A tone-modulated broadband noise signal is generated in the Antenna Noise Bridge and coupled to an impedance bridge. Then, using

your station receiver as an indicator, the impedance bridge is used to measure the resistive and reactive components of your antennas. It can also be used to preset an antenna tuner for faster tune-ups, to tune a quarter-wave transmission line and to measure the value of unknown capacitors and inductors. A front panel LED indicates power on and front panel controls give you a direct readout of resistive and reactive characteristics of the antenna being tested. Rear panel has an external power jack and coaxial connectors for the receiver and unknown antenna connections. Requires 9V battery or PS-2350 Power Supply (p. 39). $2\frac{1}{4}$ " H x $5\frac{1}{8}$ " W x 5" D.

Kit HD-1422 Ship wt. 2 lbs. . . \$49.95



VLF Converter

SKILL LEVEL Listen to the U.S. Submarine Fleet, European broadcasts and other distant transmissions below the standard AM band. The VLF Converter installs in your receiver antenna line to let you listen to the 10 to 500 kHz band from 3.510 to 4.010 MHz on your CW receiver. The converter contains a local oscillator generating a 3.5 MHz signal that, when mixed with the incoming VLF frequencies on your antenna, produces an RF signal that can be heard on any CW receiver capable of tuning 3.510 to 4.010 MHz. Requires 9V battery or PS-2350 Power Supply (p. 39) or any source of DC power, 8.5 to 14 volts. The VLF Converter measures only $5\frac{1}{8}$ " H x $5\frac{1}{8}$ " W x $2\frac{1}{4}$ " D.

Kit HD-1420 Ship wt. 2 lbs. . . \$49.95

Active SWL Antenna

SKILL LEVEL Perfect for portable use or locations where an outside antenna is not available, the Active SWL Antenna allows you to receive radio signals from 300 kHz to 30 MHz. And it acts as a high frequency preamplifier when used with an external 50 ohm antenna. Also you can use the HD-1424 as a preselector for both indoor and outdoor antennas. It has a built-in collapsible antenna and



provisions for a 50 ohm antenna. Requires 9V battery or PS-2350 Power Supply (p. 39). $2\frac{1}{4}$ " H x $5\frac{1}{8}$ " W x 5" D.

Kit HD-1424 Ship wt. 5 lbs. . . \$49.95



Double your antenna's bandwidth with a remote antenna matcher

Work both CW and phone segments in a band from only one antenna. The Heath Remote Antenna Matcher lets you adjust the length of dipole and vertical antennas to resonance on any band between 1.8 and 30 MHz. By inserting the Matcher's variable capacitor into the antenna's driven element, your 50-ohm coaxial-fed antenna can have double the bandwidth while maintaining a low VSWR. Mount the outdoor remote unit on a mast or tower leg or any suitable flat surface close to the feed point of your antenna. Lengthen your antenna by 10 to 15% and tune it for maximum power with the indoor control unit. The Matcher tunes out the added length. No extra wires are needed because the Matcher uses your coax or a simple 2-wire cable for connection to the remote tuner.

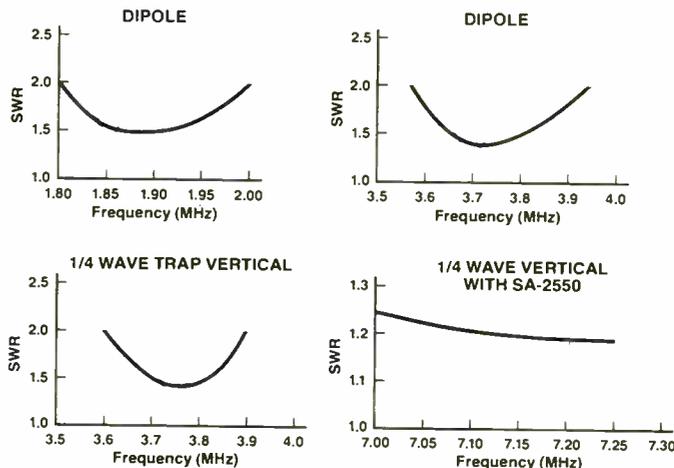
Bandwidth increase is typically over 100% with a 2:1 VSWR. Input capability is 1500 watts PEP. Does not double the bandwidth of 50-ohm beam antennas. Not for open- or balanced-type feed lines or random length wire antennas. Both the Remote and Control units are easy to build and install. Control unit measures 2½" H x 5½" W x 7" D. Remote unit measures 16⅜" H x 8⅝" W x 3⅞" D.

Kit SA-2550 Ship wt. 10 lbs. \$119.95

Bandwidth Improvement with the SA-2550

2.0:1 Bandwidth

— with SA-2550
— Reference Dipole



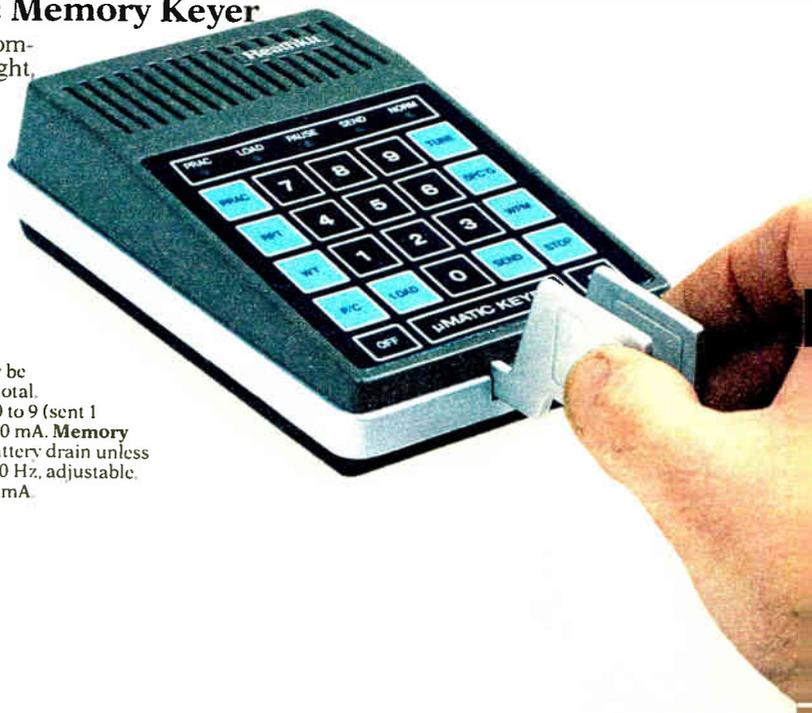
Revolutionize your CW with the μ Matic Memory Keyer

Add programmable excellence to all your CW. Patented "command strings" let you store text in 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 correct programming errors. Enter text and send with any setting you wish. Text can be added into a buffer message being sent. CMOS memory with battery backup retains the buffer contents and last selected setting when the Keyer is without power. 1⅝" H x 4⅞" W x 6" D.

Kit SA-5010-A Ship wt. 3 lbs. \$99.95

Accessory: Assembled PS-5012 120 VAC Power Adapter Cube. Ship wt. 1 lb. \$15.95

Other 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.



Credit card orders call TOLL-FREE:

1-800-253-0570

Alaska and Michigan residents call: 616-982-3411.

HELP in building your kit: see page 52



Deluxe Antenna Tuner

Use the Deluxe Antenna Tuner to exactly match an antenna to your transmitter at any frequency in the 160-10 meter HF spectrum. You get all the features of a first-rate antenna tuner combined with most of the features of a dual wattmeter. In addition, it includes the 160-Meter and WARC amateur bands.

The Tuner will effectively tune and match balanced or unbalanced feedlines, and single-wire and ladder lines at the full legal power limit of your station. With its continuously-variable inductor, you are assured of precise antenna-matching from 1.8 to 30 MHz, including the MARS frequencies, and all the newly-allocated bands. A convenient front panel counter enables you to quickly set the inductor to previously calibrated frequencies.

With a single switch you can select a dummy load, or any of three permanently-connected antennas, including a long-wire antenna. There's no need to connect and disconnect feed lines to load your transmitter into the dummy load.

Dual wattmeters read both forward and reflected average power, in two ranges, for more efficient low band operation. The wattmeter section of the Antenna Tuner installs directly into your transmission line to measure the power on all frequencies between 1.8 and 30 MHz. It measures output up to 200/2000 watts in the forward direction and up to 50/500 watts reflected. Dual meters indicate the forward and reflected power separately with a high degree of accuracy. A factory aligned and calibrated sensor head insures that you get the highest accuracy measurement. SWR indications on the reflected meter provide direct readings from 1:1 to 3:1.

The silver-plated straps and roller contact assembly minimize RF loss at high frequencies. And the large feed-through insulators withstand high-voltage RF. The Antenna Tuner handles power inputs up to 2000 watts PEP on SSB and 1000 watts CW. With its factory-calibrated components, easy-to-read dual wattmeters, and front panel controls, this Deluxe Antenna Tuner is an indispensable addition to your system. Measures 5 $\frac{3}{4}$ " H x 14 $\frac{1}{2}$ " W x 13 $\frac{7}{8}$ " D.

Kit SA-2060-A Ship wt. 20 lbs. \$269.95

Specifications: **Frequency Range** (continuous tuning): 1.8 to 30 MHz. **INPUT POWER CAPABILITY: SSB:** 2000 watts (peak). **CW:** 1000 watts. **Input Impedance:** 50 ohms. **Output Impedance:** Wide range. **Balanced to Unbalanced Transformation:** 4:1 balun. **Meter Functions:** Forward and Reflected average power, and SWR. **METER RANGES: Forward** (2 ranges): Low - 0-200 watts. High - 0-2000 watts. **Reflected** (3 scales): Low - 0-50 watts. High - 0-500 watts. SWR - 1:1 to 3:1. **WATT-METER ACCURACY** (full scale): **200 W and 2000 W (FWD), 500 W (REF):** $\pm 5\%$ (AVG). **50 W (REF):** $\pm 7.5\%$ (AVG). **Insertion SWR:** Less than 1.1:1.



You Have A Friend To Talk To

We're proud of our technical consultation team. They are highly trained specialists in their own areas. Whether you own a computer, TV or an educational, amateur radio, instrument, weather or home electronics product, a simple phone call is your direct line to a consultant who knows all about your product. Just call the number assigned to your product area listed on page 52 of this catalog or inside the assembly instruction manual included with your kit. Our consultants, available during regular business hours, will promptly and courteously troubleshoot any problem you might have. This same professional help is also available through your nearest Heath/Zenith Computers & Electronics Center (consult telephone white pages).

We feel that, as our special customer, you've put your confidence in us as your partner. And partners support one another. That's why we've set up a service and support network that keeps us in close touch with you. Even if you want to write us for information or answers, we'll do our best to answer your written correspondence within three business days of receiving your letter.

In keeping with our partnership, we fully understand that without you, our company would not exist. That's why we do all we can to make sure you successfully build your product. We want you to feel good about the product you buy. We want you to feel good about yourself.

Get reliable high-performance with this new linear amplifier

NEW You get unparalleled performance at an affordable price with the new Heathkit Linear Amplifier. It's a completely self-contained, grounded grid linear amplifier that is designed to operate at 1000 watts PEP output on SSB or 850 watts output on CW and 500 watts RTTY. The SB-1000 covers 160, 80, 40, 20 and 15 meter amateur bands with tuned input filters your solid state rig will like, and also includes WARC and most MARS bands at 80% of rated output.

The Amplifier uses a single 3-500Z tube in a high efficiency circuit for top performance. And its hypersil steel E-I core transformer takes up less room, runs cooler and gives you more high-performance power. Other selected features include door knob caps in critical RF circuits, adjustable ALC so it works with any rig, a stiff full-wave power supply with computer grade capacitors, a quiet computer-style fan, and plate and load controls with smooth vernier tuning. Front panel meters are illuminated and grid current is continuously monitored for protection and long tube life. For contesting, add QSK capability with optional SBA-1000-1 accessory board. Operates on 240 VAC, 60 Hz, at 7½-A maximum or 120 VAC, 60 Hz, at 15-A maximum. Cabinet measures 8¼" H x 14½" W x 13¾" D.

Kit SB-1000 Ship wt. 57 lbs. **\$739.95**
Accessory: **SBA-1000-1** QSK Board. 3 lbs. **\$189.50**

Other Specifications: **INPUT:** Circuit type: Pi-network. Maximum VSWR at resonance: 1.3:1 or less. Minimum 2:1 VSWR bandwidth: 20% or greater. Maximum drive power permissible: 100 W. Typical drive for full power output: 85 W. **OUTPUT:** Circuit type: Pi-L network. ½ hour continuous carrier: 500 watts. 30 second continuous carrier: 850 watts. ½ hour PEP two-tone test: 850 watts. 30 second PEP two-tone test: 1000 watts. **POWER**



See July
Kit Builder's
Journal



SUPPLY: Circuit type:

Voltage doubler. No load voltage: 3000. Full load voltage: 2700. Full load current: 0.45 amp. Regulation: 10%. Transformer: 22 lbs. Hypersil steel. Maximum draw at rated output: 12 amps at 120 V 60 Hz. TUBE: Type: 3-500Z. Continuous dissipation: 500 W. Warm-up time: 10 seconds. Estimated life: 20,000 hours. GENERAL: Metering: Dual meters; plate volts, plate current, grid current, power output PEP. ALC: Adjustable, 0-20 V, negative going, phono jack. MARS/WARC: Yes, set to nearest amateur band. Keying: Requires contact closure or sink of +12 VDC at 100 mA, phono jack. RF Connectors: SO239. Line Connector: NEMA 5-15P, standard 120 V three wire. Frequency Coverage: All amateur bands from 1.8 to 21 MHz, including WARC and most MARS. Third Order IMD at Rated Output: -35 dB.



Ham spectrum monitor

NEW Continuously monitor your signals with the Station Monitor that displays SSB, TRAP or RTTY. Also use it with a receiver to view other audio signals or use as an oscilloscope. Solve common problems such as improper alignment or tuning, insufficient or excessive drive, poor carrier or sideband suppression, regeneration, parasitics and CW key clicks. For testing, the Monitor displays audio signals from 10 Hz to 40 kHz with good sync capability and high input sensitivity. In addition, it has a 10:1 vertical and horizontal input switch attenuator, with constant input impedance.

Add the Pan Adapter Module board to view other signals within ± 20 kHz or ± 100 kHz from the frequency. For receivers with IFs of 3.395 MHz and 8.83 MHz. Operates on 120 VAC, 60 Hz. 1⅜" H x 11¼" W x 12⅞" D.

Kit HO-5404 Ship wt. 13 lbs. **\$249.95**

Accessory: **Kit HOA-5404-1** Pan Adapter Module. Ship wt. 2 lbs. **\$99.95**

SAVER! Kit HOS-5404-1 Includes both HO-5404 and HOA-5404-1 Accessory. Ship wt. 15 lbs. **\$249.95**

Other Specifications: **RF SAMPLING SECTION:** Frequency Coverage: 80-6 meter (3.5-54 MHz). Sensitivity: ¼" vertical deflection at 10 watts. ¾" vertical deflection at 100 watts. **VERTICAL AND HORIZONTAL AMPLIFIERS:** Sensitivity: 60 mV per ¼" vertical deflection.



CW Keyboard

NEW Microprocessor-based CW keyboard has specialized prompting features and a simplified operating system that minimize key errors and increase the ease and accuracy of high-speed sending. Four-level practice mode. 2⅞" H x 15½" W x 8" D.

Kit HD-8999 Ship wt. 7 lbs. . **\$149.95**

Other Specifications: **Speed Range:** 1-99 WPM. **Spacing:** Less than or equal to speed. **Weighting:** Normal plus five 'light' and five 'heavy' settings. **Serial Number:** 1-9999, 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. **Sidestone:** 300-1500 Hz adjustable. **Indicators:** 4-digit display plus SET, MSG, LOAD, PRAC and type-ahead buffer status LEDs. **Power Requirements:** 7.5 to 11 VAC or 11 to 16 VDC. 450 mA max. Input for PS-5012 120 VAC Adapter (at right).

Deluxe QRP CW Transceiver

SKILL LEVEL 3 Superior design of the transmitter and receiver section sets this transceiver apart from the others. Microelectronic circuits reduce transceiver weight, while providing a level of performance and features unexpected at this price. Features like: continuously variable RF output up to 4 watts, front panel relative signal/power strength meter, wide dynamic range, AGC circuits, single conversion, product detector, and active audio filter. Receiver Incremental Tuning (RIT) lets you tune the receiver 1 kHz above or below the transmit frequency. You get CW coverage in 80, 40, 20 and 15 meter bands, expandable to 30, 17, 12 and 10 meter bands with the HWA-9 Accessory Band Pack. Ideal for portable operation, the HW-9 can be powered from batteries, lighter socket, solar photovoltaic array or by 120 VAC with the PSA-9 Power Supply. 4¼" H x 9¼" W x 8½" D.

- Kit HW-9** Ship wt. 8 lbs. **\$199.95**
- Accessories: **Kit HWA-9** Band Pack. 1 lb. **\$29.95**
- Kit PSA-9** Power Supply. Ship wt. 4 lbs. **\$19.95**

Other 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 μ V for readable signal; 0.5 μ 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 Ω .



SAVER! QRS-9 Save on the matching HM-9 Wattmeter and HFT-9-A Antenna Tuner. Ship wt. 14 lbs. Separately \$89.90 **Our System Price \$84.95.**

QRP Wattmeter

SKILL LEVEL 1 Your low-watt HF or VHF station will operate at peak power efficiency when you are using the responsive HM-9 wattmeter. This HF/VHF wattmeter with 3:1 SWR bridge simplifies continuous metering of exciter or amplified output level. Plus it gives you a quick, exact SWR readout for fine-tuning your antenna system. Wire the HM-9 for monitoring in three different ranges: 1.8-30, 50-54 or 144-148 MHz. Has dimensions of 2½" H x 5¾" W x 7" D.

- Kit HM-9** Ship wt. 3 lbs. **\$39.95**

100-watt antenna tuner with 4:1 balun

SKILL LEVEL 1 You can have almost unlimited matching capabilities with the HFT-9-A. It provides an exact 100% transmatch to a wide range of output impedances with a built-in 4:1 ferrite balun. Has connectors for coaxial feed, balanced line and long-wire antennas. A large 12-tap, air-wound inductor with silver-plated wire and tap switch allows precise matching capability between 1.8 and 30 MHz. Adjustments are easy with continuously variable transmitter/antenna controls. Has dimensions of 2½" H x 5¾" W x 7" D.

- Kit HFT-9-A** Ship wt. 3 lbs. **\$49.95**

Multi-mode Active Audio Filter makes the tough ones easy to copy

SKILL LEVEL 4 Twelve total poles of filtering can be combined to work in SSB & Notch, CW, CW2, SSB & Peak, RTTY and fixed configurations with razor-sharp skirts. Solve such problems as partially overlapped sideband signals, overmodulation splatter, close-packed CW stations, full RTTY reception through heavy interference, heterodyne whistle and noise. Versatile power requirements make this Filter usable almost anywhere. Just supply 7-13.5 volts AC or 9-18 volts DC. 1⅞" H x 8⅞" W x 6⅝" D.

- Kit HD-1418** Ship wt. 3 lbs. **\$79.95**
- Accessories: **Assembled PS-5012** 120 VAC Power Adapter Cube. Ship wt. 1 lb. **\$15.95**

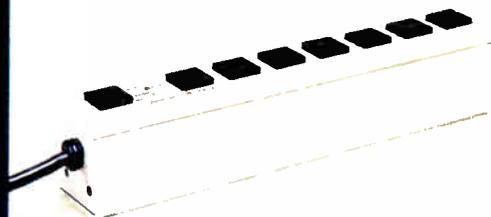
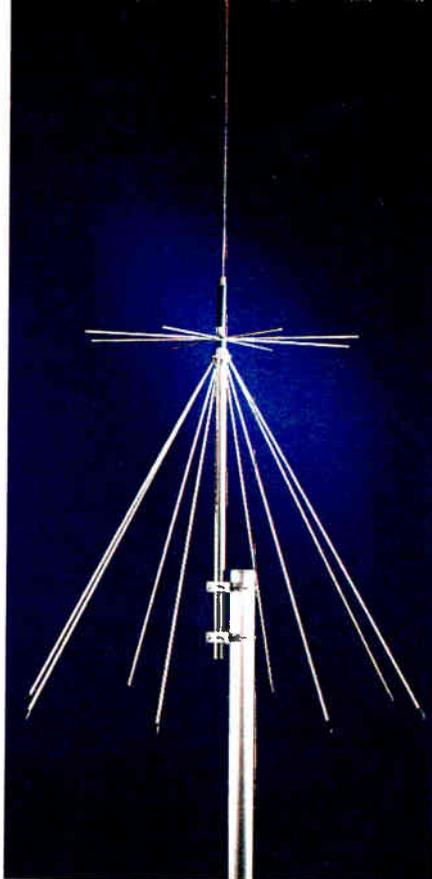


Save \$10 with this high performance broadband antenna

The HA-2513 Antenna can effectively cover amateur radio, public service, CB, police, fire and government frequency bands. Transmit with up to 200 watts of power with SWR below 2:1 on all ham bands between 50 and 1300 MHz. Ultra-wideband design offers excellent reception from 25 to 1300 MHz.

Compact and lightweight design enables the HA-2513 to be installed almost anywhere, even on apartment balcony railings. Vertically polarized, omnidirectional pattern unity gain. Stainless steel parts and hardware. A 50' coaxial cable is included. Requires 1-2" mast. 5½' high.

Kit HA-2513 Ship wt. 6 lbs.
Was \$79.95 Now *Only* **\$69.95**



This outlet box is smart

Flip on your transceiver and your whole system powers up. Smart Outlet Box turns on six other units when the device plugged into its control socket goes on. Our highest quality – it offers surge protection, noise filtering. 2¼" H x 14¼" W x 2¾" D.

Kit GD-1495 Ship wt. 5 lbs. . . **\$59.95**



Outlet Strip

Twelve-sockets multiply convenience by providing extra electrical outlets for your equipment. Eleven fused 3-prong outlets can be switched on and off. A twelfth outlet provides constant AC for a clock or equipment with memory saver circuitry. Rated at 10-amp maximum load. 12' cord. 2¼" H x 15½" W x 2¼" D.

Kit HD-1274 Ship wt. 4 lbs. . . **\$24.95**



1.6-250 MHz Dip Meter

Use this multi-purpose Dip Meter to find approximate resonant and operating frequencies of either energized or de-energized circuits. Also, it helps adjust traps, detect parasitic oscillations and harmonics, measure unknown Q/L/C values, locate sources and frequencies of RF energy, or can be used as a signal generator, relative field strength meter or receiver alignment tool. Requires 9V battery. 2" H x 2¼" W x 5⅞" D.

Kit HD-1250 Ship wt. 4 lbs. . . **\$89.95**

Other specifications: **Controls:** Tuning capacitor, oscillator level, ON/OFF **Meter Movement:** 150 µA. **Solid-State Circuits:** 1 NPN transistor oscillator, 1 dual-gate MOSFET amplifier, 2 diffused silicon hot carrier diode detectors.



Dual HF Wattmeter

Achieve peak efficiency on low bands. The HM-2140-A monitors both forward and reflected power in your transmission line. A second scale on the reflected meter reads SWR directly from 1:1 to 3:1. Output is measured up to 200/2000 watts PEP (± 5%) forward direction and up to 50/500 watts reflected. Pushbutton switch to high or low power ranges for precise readings. Dual-position switch lets you read PEP or Average power. Requires 9V battery or use 120 VAC with the PS-2350 Battery Eliminator. 4⅞" H x 7½" W x 6⅞" D.

Kit HM-2140-A Ship wt. 5 lbs. **\$99.95**

Accessories: **Assembled PS-2350** Battery Eliminator. Ship wt. 1 lb. **\$7.95**

Coaxial Switch

Manually route one RF source to any one of several antennas or loads, while grounding all outputs not in use. Switch from up to 4 antennas or interconnecting equipment. Handles 2 kW PEP with maximum 1.1:1 SWR to 250 MHz. Built-in mounting brackets. Mount width: 4¼"

Kit HD-1234 Ship wt. 1 lb. . . . **\$22.95**



A 75' SWL antenna

Long-wire 75' SWL antenna helps you pull in distant stations. Has copper line with 30' lead-in; all insulators and hardware.

GRA-72 Ship wt. 2 lbs. **\$14.95**





SWL Antenna

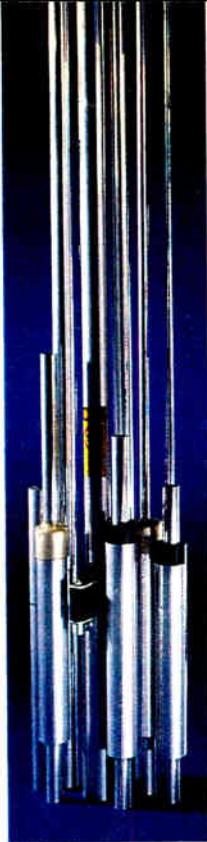
This specially designed short wave listening antenna comes completely assembled and ready to use. Sturdy 14-gauge HDP-7800 antenna covers 60-49-41-31-25-19-13-11 meters. A high performance trapped dipole with an overall length less than 43 feet.

Assembled HDP-7800
Ship wt. 3 lbs. \$64.95

Lengthen your DX reach

Cushcraft AV5 vertically polarized omnidirectional wideband antenna covers CW and SSB on 80-40-20-15-10 meters. Handles 2000 watts PEP. 25' high. Some assembly required.

HDP-1473 Ship wt. 10 lbs. ... \$119.95



Fixed station mic

Shure's CONTROLLED MAGNETIC Fixed Station Microphone was designed with Amateur radio features. It offers dual selectable output impedance and frequency response tailored for intelligibility. Select Normal or VOX operation.

Push-to-talk switch bar for momentary or locked operation.

Assembled HDP-444
Ship wt. 3 lbs. \$59.95

146-148 MHz Antenna

Cushcraft AMS-147 3/8-wave 2-meter mount with 90 lb. grip-tight magnet. Boasts 3 dB gain for more range. Stainless steel whip with thumb-lock adjustment and chrome-plated base.

Some assembly required. Includes PL-259 connector and coax.

HDP-1472
Ship wt. 3 lbs. \$29.95



Remote Coax Switch

Switch antennas from inside your station with the Remote Coax Switch. Remote and indoor control unit connect through your coax cable to eliminate multiconductor control cable. Tower- or mast-mounted remote operates up to 4 antennas. Handles 2000 watts PEP and has a VSWR of 1.15:1 or less. Frequency range is from 1.8 to 54 MHz with

impedance of 50 to 70 ohms and loss at 54 MHz of less than 0.2 dB. Uses 120 VAC. Control: 2 3/8" H x 5 1/2" W x 7 1/2" D. Remote: 7 3/8" H x 8 3/8" W x 4 1/2" D.

Kit HD-1481 Ship wt. 5 lbs. \$79.95

Innovative Phone Patch

New design and circuitry make this Phone Patch a break-through in transferring audio signals between a phone line and two-way radio equipment. It provides a high degree of electrical

isolation and is FCC registered. Normally uses phone line voltage or uses 9 VDC battery assistance in very low voltage conditions (battery not included). Built-in detector circuit for adjustment with VTVM or VOM. 1 3/4" H x 5 3/4" W x 3 3/4" D.

Kit HD-1515 Ship wt. 2 lbs. \$49.95



Heath Antenna Dummy Load

Eliminate unnecessary QRM during tune-up and minimize mistakes

while performing 'hot' gear maintenance or alignment. Handles 1 kW of RF with VSWR's less than 1.5:1 up to 450 MHz. Requires 1 gallon mineral or transformer oil.

Kit HN-31-A Ship wt. 3 lbs. ... \$19.95



Low pass filter

Solve emissive RF interference problems with this low-pass Barker & Williamson filter for 160-10 meters. Minimum 70 dB attenuation. Cut-off frequency of 34 MHz, less than 0.3 dB insertion loss. 50 ohm impedance. Rated for legal power

Assembled HDP-3700
Ship wt. 2 lbs. \$34.95

Quiet headphones

Quiet and comfortable 8-ohm headphones have 40 to 15,000 Hz frequency range, 2 1/4" speakers, individual volume controls, 10' cord.

Assembled HDP-1396
2 lbs. \$14.95





Computer Oscilloscope turns a personal computer into a 50 MHz digital storage oscilloscope

Keep up-to-date with the latest in computer-based instrumentation...the Heathkit Computer Oscilloscope. It is a sophisticated accessory that turns a PC computer into a powerful dual trace 50 MHz digital storage oscilloscope. It is also a powerful diagnostic tool that can increase your testing, troubleshooting and servicing capabilities. The Computer Oscilloscope allows you to perform tests, display and record measurements, and even help analyze the results. A test instrument with this ability is hard to beat in terms of convenience, versatility and cost.

All scope functions are controlled from the keyboard of your computer. The computer's monochrome monitor screen displays your choice of either one or two channels on a graphic



Upgrade scopes and computers with 50 MHz storage scope capability

Although a personal computer may not yet be a common test instrument to be found on every service or hobby bench, you'll most certainly find the workhorse oscilloscope. For these scope users we enhanced the computer oscilloscope interface described above. We made it work with and tremendously improve the operation of low-bandwidth scopes. And it still works with a personal computer. This allows scope users to retain all the features and specifications of the above interface until they purchase a personal computer to fully utilize the capabilities of the interface.

With the Heathkit Digital Memory Oscilloscope you get the maximum in versatility, flexibility and

cost-effectiveness. Right now you can upgrade your low-bandwidth, single-channel bench scope into a powerful dual trace 50 MHz storage instrument capable of displaying fast digital pulses. And do it at a cost well below any comparable scope.

Get laboratory-instrument features like a ten-step 5 mV/div. to 5 V/div. sensitivity, three display modes, and solid waveform displays from three trigger modes. All operations are controlled from the clearly marked front panel of the Memory Oscilloscope. All scope settings are plainly identified by bright LED indicators. Waveforms are sharply displayed on the CRT of the scope being upgraded.

Then when it's time to take advantage of computer-based instrumentation, all you'll need is a personal computer. With this combination you gain a powerful diagnostic tool that features waveform storage on a floppy disk.

The Digital Memory Oscilloscope is a money-saving solution for many applications, even computer-equipped engineering workstations. Inexpensively add accurate testing and waveform analysis to engineering programs, word processing and other business applications. This is a big plus to tight budget situations.

Your scope must have a 5 MHz or greater bandwidth, one vertical channel with 0.5 V/division sensitivity, ability to trigger from a second source, and triggered sweep (on the plus slope of a TTL level signal) to properly work with the Digital Memory Oscilloscope. Two BNC to BNC coaxial cables are also needed. For use with your personal computer, the same requirements are needed as for the IC-4802 Computer Oscilloscope

(page 33).

Kit ID-4850 Ship wt. 11 lbs. \$499.95

Assembled SD-4850 Ship wt. 11 lbs. . \$750.00

Specifications: The same as for the IC-4802 Computer Oscilloscope (page 33) except for the following additions.

OSCILLOSCOPE OUTPUT: Vertical: 4 volts peak-to-peak (oscilloscope setting is 0.5 V/div vertical, 1 ms/div horizontal). **Trigger:** TTL level.



8 x 10 division graticule. Also on-screen are menus showing all scope function selections. At the touch of a key you can obtain automatic readouts of voltage, time and frequency at any point on a waveform. Even store waveforms on a floppy disk for later analysis or comparison. All you'll need is a null-modem cable (like the HCA-52 on page 65) to connect the Computer Oscilloscope to your Heath/Zenith, IBM PC or compatible computer.

Kit IC-4802 Ship wt. 10 lbs. **\$399.95**
Assembled SC-4802 Ship wt. 11 lbs. **\$575.00**

Specifications: **VERTICAL: Display Modes:** Y1, Y2, Dual. (All displays except 500 μ s/div are chopped. 500 μ s/div uses an alternate display.)
Deflection Factor: Sensitivity: 5 mV/div to 5 V/div; 10 steps in a 1-2-5 sequence. Accuracy: Within 3% \pm 2 bits (20° C to 30° C); 5% \pm 2 bits (10° C to 40° C), referenced to 20 mV/div. **Vertical Response:** DC Coupling: 5 mV to 5 volts/div. DC to 50 MHz. AC Coupling: 5 mV to 5 volts/div. 10 Hz to 50 MHz.

Rise Time: 7 ns or less. Overshoot: Less than 5%. Maximum Input: 125 volts peak combined AC and DC. **HORIZONTAL: Time Bases Ranges:** 20 s/div to 500 μ s/div; Real Time Sampling, 200 μ s/div to 10 ns/div; Equivalent Time Sampling. **Positions:** 29 steps in a 1-2-5 sequence. **Accuracy:** Within 3% \pm 2 bits (20° C to 30° C); 5% \pm 2 bits (10° C to 40° C), referenced to 1 ms/div. **TRIGGER: Source:** Y1, Y2. **Coupling:** Same as vertical input. **Modes:** Automatic Baseline, Normal, Single Sweep. **Level:** Variable over at least eight divisions; 256 steps. **SYSTEM REQUIREMENTS: Operating Software:** Microsoft MS-DOS version 2.0 or later; Microsoft GW-BASIC version 2.0 or later (both not supplied). GW-BASIC is not required to run the compiled version of the scope program. If you develop your own software, you can use the Oscilloscope with any computer that has RS-232 serial communications and graphics capabilities. **Operating Hardware:** PC-compatible computer with RS-232 card, color graphics card, single 5 $\frac{1}{4}$ " disk drive, 128K RAM (minimum), such as the Heath/Zenith Personal Computer series. **GENERAL: Vertical Resolution:** 8 bits (1 part in 256). **Record Length:** 512 samples. **Interface:** RS-232C. **Baud Rate:** 110 to 9600 baud (selected by internal jumper). **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 4 $\frac{1}{2}$ " H x 12 $\frac{1}{2}$ " L x 10" W. **Weight:** 8 lbs.

Heath/Zenith Computer-Based Instruments



Wide assortment of test modules

- Assembled SW-3020** Expansion Chassis. 2 lbs. . . **\$1525.00**
- Assembled SW-3023** Programmable Triple Power Supply. Ship wt. 1 lb. **\$1490.00**
- Assembled SW-3031** Low Distortion Oscillator. Ship wt. 1 lb. **\$1045.00**
- Assembled SW-3022** 11 MHz Function Generator. Ship wt. 2 lbs. **\$1395.00**
- Assembled SW-3024** Digital Multimeter. Ship wt. 2 lbs. **\$1200.00**
- Assembled SW-3025** Universal Counter. Ship wt. 2 lbs. **\$1390.00**
- Assembled SW-3032** IEEE 488 General Purpose Interface Bus (GPIB) Module. Ship wt. 1 lb. . . **\$400.00**
- Assembled SW-3028** Versatile Instrument Operating Software. Ship wt. 1 lb. **\$385.00**
- Assembled STS-4750** 16 Channel Digital Logic Analyzer. Ship wt. 6 lbs. **\$2950.00**
- Assembled STS-4800** 32 Channel Digital Logic Analyzer. Ship wt. 9 lbs. **\$3800.00**

Digital Logic Analyzers

Industrial Computer can be rack mounted



Industrial Color Monitor with 13" CRT can be rack mounted



For industry, science and education

Heath/Zenith Computer Based Instruments Group helps you to extend your industrial and laboratory measuring and testing capability with computer-based instruments. And these factory-assembled instruments are also well suited for many instructional applications in colleges and vocational schools.

The Heath/Zenith Computer Based Instrument System is a fully integrated, computer controlled testing and data acquisition system. And with its Versatile Instrument Operating Software (VIOS) umbrella, the System provides full integration of all instruments with a Heath/Zenith Industrial Computer...great for ATE applications.

- Assembled SW-3000** Industrial Heath/Zenith AT Personal Computer. Ship wt. 39 lbs. **\$4900.00**
- Assembled SW-3010** Industrial Monitor. Ship wt. 42 lbs. **\$900.00**

Heath/Zenith Computer Based Instruments Group offers a complete line of assembled computer-based instruments for commercial use only. To receive a free brochure detailing these advanced products call 616-982-3411 or write to Heath/Zenith Computer-Based Instruments Group, Dept. 599-980, Benton Harbor, MI 49022. **33**



Convert your PC into a versatile logic analyzer



SKILL LEVEL 3 Transform your PC-compatible computer or standard terminal into a high-performance logic analyzer. The IC-1001 Logic Analyzer Kit is a versatile test instrument that can be used to troubleshoot or verify the proper operation of a wide variety of circuits that contain sequential and/or combinational

logic. And with the included specific software, the Analyzer is fully keyboard configurable and menu driven.

With its 16 input lines, the Logic Analyzer can check a 16-bit wide data bus or 16 separate logic test points in circuits with clock speeds up to 10 MHz. Acquired data can then be displayed on-screen in state or timing displays including hex/octal and ASCII equivalents, an address relative to triggering and other information. This data can then be saved on disk for later examination or comparison. Other advanced operations include a check-sum capability with bit selection for easy comparison of acquired data and the ability to search this data for a specific bit pattern.

The Analyzer is also capable of using a terminal or computer using terminal emulation software. Used with a computer, an HCA-85 cable (page 63) is also needed along with the MS-DOS operating system (Ver. 2.0 or later). The IC-1001 is powered by an included 120 VAC wall cube and has dimensions of 1 3/4" H x 9 1/4" W x 8 1/2" D.

Kit IC-1001 Ship wt. 4 lbs. **\$269.00**

Other Specifications: **Depth:** 2046 words. **Logic Compatibility:** 5 volt TTL or CMOS. **Input Impedance:** All inputs >1 megohm, 10 pF. **Serial Protocol:** RS-232.

A hobbyist's dual trace 10 MHz oscilloscope with lab-grade accuracy

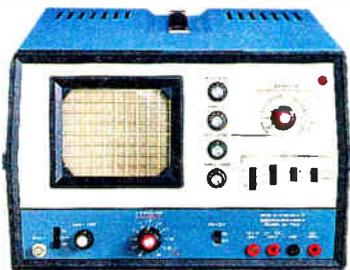
SKILL LEVEL 3 This dual trace 10 MHz Oscilloscope kit is made to precisely display a wide range of waveforms. Waveforms such as those encountered by electronics engineers and research scientists. Outstanding features like a fast 35 ns rise time, triggered sweep and excellent 10 mV sensitivity make it a versatile high tech tool. Yet its low price makes it affordable for every service technician's bench or hobbyist's work shop.

Kit IO-4210 Ship wt. 38 lbs. **\$379.00**

Specifications: **VERTICAL: Deflection Factor:** Sensitivity: 10 mV/cm to 20 V/cm. Attenuator: 11 steps in a 1-2-5 sequence. Variable: Continuous between steps to approximately 60 V/cm. Accuracy: Within 3% (10°C to 40°C). **Vertical Response:** DC Coupling: DC to 10 MHz (-3 dB) at 6 cm. AC Coupling: 2 Hz to 10 MHz (-3 dB) at 6 cm. Rise Time: 35 ns. Overshoot: Less than 5%. **Vertical Input:** Maximum: 400 V peak combined AC and DC. **Vertical Modes:** Display: Y1, Y2 or Test. **HORIZONTAL: Time Base:** Ramp: 0.2 s/cm to 200 ns/cm. Positions: 19 steps in a 1-2-5 sequence. Variable: Continuous between ranges to approximately 0.6 s/cm. Accuracy: Within 3% (20°C to 30°C). **External:** Sensitivity: 0.1 V/cm (approximately). Frequency Response: DC to 1 MHz (-3 dB). **TRIGGER: Internal:** Automatic and Normal: Adjustable over 10 divisions. Slope Selection: + or -. **GENERAL: CRT:** Graticule: 8 x 10 cm. **Power:** 108 to 132 VAC, 60 Hz. **Dimensions:** 7" H x 12 7/8" W x 19 1/4" D. **Weight:** 22 lbs.



Close-out price on an excellent single trace oscilloscope



SKILL LEVEL 3 All the important features a beginner in electronics or a hobbyist will likely ever need in a scope. The IO-4105 is being used in countless homes, workshops and school labs across the country. It is compact, versatile and easy to build. And it displays many types of waveforms in different electronic circuits with its 5 MHz bandwidth. All signals are rock steady due to a very stable triggering circuit using triggered sweep with auto-

matic sync...a feature found on more expensive scopes. There is also a special setting that makes it easier to trigger on the vertical signals of a TV. This setting passes low frequencies while rejecting high ones.

The IO-4105 is a winner at a marked down price. Order and save today on this easy, four-evening kit.

Kit IO-4105 Single trace 5 MHz Oscilloscope. Ship wt. 25 lbs. *Was \$279.95 . Limited Quantities At \$229.00*

Specifications for both IO-4105 and IO-4205 Oscilloscopes: **VERTICAL: Bandwidth:** DC to 5 MHz, -3 dB. **Attenuator:** 1-2-5 sequence, calibrated and variable. **Rise Time:** 70 ns. **Overshoot:** ≤5%. **Impedance:** 1 MΩ, 38 pF. **Sensitivity:** 10 mV/cm. To 20 V/cm in 11 ranges. **SWEEP: Type:** Triggered. **Range:** 200 ms to 0.2 μs in seven steps, plus variable. **Trigger Source:** INT/Ext/Line. **Trigger Modes:** AC/DC/TV; + / - Slope; Auto/Norm. **HORIZONTAL: Sensitivity:** 0.1 V/cm. **Bandwidth:** DC to 1 MHz. **Impedance:** 1 MΩ, 50 pF. **Ext Horiz Input:** X1 and X10 attenuator and variable. **GENERAL: CRT:** 5DEP31F 8 x 10 centimeter viewing area. Blue-green, medium-persistence phosphor. 5" round, flat face tube. **Accelerating Potential:** Approximately 1.6 kV. **Graticule:** Screened, 8 x 10 centimeters. **Power:** 110-130 VAC or 220-260 VAC, 50/60 Hz. **Dimensions:** 8" H x 13" W x 17" D. **Weight:** 15 lbs.

Our best kit scope – an outstanding performer at an affordable price

 Dual trace capability, wide 25 MHz bandwidth with $\pm 3\%$ accuracy, 16 ns or less rise time, and low 5 mV/cm sensitivity add up to a laboratory-grade oscilloscope that is ideal for the wide range of measurements found in general electronics shops, development labs and scientific research facilities. And its priced so that even a hobbyist can take advantage of this indispensable tool.

This scope features a variety of operating and triggering modes including X-Y operation. A special test function displays the characteristic I-V curve of components like transistors and diodes for a quick check of suspect parts.

Kit IO-4225
Ship wt. 28 lbs. ... \$499.95

Specifications: **VERTICAL:** Display Modes: Y1, Y2, Dual, (Alt Chop selected by Time/Cm switch. Chop frequency is approximately 200 kHz). **CHANNELS Y1 AND Y2:** Deflection Factor: Sensitivity:



5 mV/cm to 10 V/cm. 11 steps in a 1-2-5 sequence. Variable: Continuous between steps to approximately 30 V/cm. Accuracy: Within 3% (20°C to 30°C). **Vertical Response:** DC Coupling: 5 mV/cm to 10 V/cm, DC to 25 MHz. AC Coupling: 5 mV/cm to 10 V/cm, 10 Hz to 25 MHz. Rise Time: 16 ns or less. Overshoot: Less than 5%. **Maximum Vertical Input:** 400 volts peak combined AC and DC. **HORIZONTAL: Modes:** A, A intensified by B, B, X-Y, Ext. Horiz. **A Time Base:** Ranges: 100 ms/cm to 0.1 μ s/cm. Positions: 19 steps in a 1-2-5 sequence. Variable:

Continuous between ranges to approximately 300 ms/cm. Accuracy: Within 3% (20°C to 30°C). Magnifier: X5.

B Time Base: Ranges: 0.5 ms/cm to 0.1 μ s/cm. Positions: 12 steps in a 1-2-5 sequence. Accuracy: Within 3% (20°C to 30°C). **External:** Sensitivity: 0.1 V/cm (approx.). Frequency Response: DC to approx. 1.2 MHz. **TRIGGER:** Source: Y1, Y2, EXT. Line. **Coupling:** AC, DC, TV-V, TV-H. **Modes:** Automatic baseline, Normal. **GENERAL:** 1-Volt P-P CAL Accuracy: $\pm 5\%$. **CRT Type:** 8 x 10 cm mesh with internal graticule. **Power:** 120/240 VAC, 50/60 Hz. **Dimension:** 6" H x 12" W x 20" L. **Weight:** 19½ lbs.

Heathkit Component Tracer simplifies troubleshooting

 Reduce troubleshooting time with the Heathkit Component Tracer. Part signal generator and part curve tracer, this handy instrument uses patented display circuitry to help you quickly trackdown faulty components in problem equipment.

This dual trace test instrument lets you see the operational quality of a component or circuit. See the unique "signatures" of resistors, capacitors, diodes, transistors and other components. Use the solid trace to test components, in circuit or out. Use the second dotted trace to compare good components, or even entire circuits, to an unknown.

The Component Tracer will save you many hours of troubleshooting by giving you an instant electronic evaluation of active and passive devices. Two sets of colored leads are included with this great bench testing tool.

Kit IT-2232 Ship wt. 15 lbs. \$249.95

Specifications: **Display Mode:** Channel A, Channel B, Dual. **Channel A:** Solid line trace. **Channel B:** Dotted line trace. **Test Voltages:** 5 V and 50 V P-P. **Current Limits:** 5 V P-P at 5 mA; 50 V P-P at 0.5 mA. **CRT:** 3RP1A, round 3" flat face. **Accelerating Potential:** 1.2 kV. **Power Requirements:** 120/240 VAC, 50/60 Hz, 22 watts. **Dimension:** 4" H x 10" W x 12½" D. **Weight:** 8½ lbs.



Credit card orders call TOLL-FREE:

1-800-253-0570

Alaska and Michigan residents call: 616-982-3411.

HELP in building your kit: see page 52





Economical and portable 3½-digit full-function digital multimeter

SKILL LEVEL 2 The Heathkit Digital Multimeter is a smart way of putting a full function meter on your work bench without straining your budget. This push-button manual ranging meter features diode and internal battery test, blanking, polarity and overrange indicators, built-in battery charger for rechargeable batteries and auto decimal point location. The IM-2260 is input protected and comes with test leads.

Kit IM-2260 Ship wt. 5 lbs. **\$129.95**

Specifications: **VOLTAGE RANGES:** DC: 2 V, 20 V, 200 V, 1000 V, 750 V. **Basic Accuracy:** $\pm(0.5\%$ of reading + 1 count). AC: 2 V, 20 V, 200 V, 750 V. **Basic Accuracy:** $\pm(1.0\%$ of reading + 3 counts). **Frequency Response:** 40 Hz 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 Ω , 20 k Ω , 200 k Ω , 2000 k Ω , 20 M Ω . **BASIC ACCURACY:** $\pm(0.25\%$ of reading + 1 count). **Power:** Heath PS-2404 120 VAC Adaptor (p. 37) or six 1.5 volt batteries. **Dimensions:** 3" H x 8½" W x 11" D. **Weight:** 2¾ lbs. (excluding batteries).



Handheld 3½-digit full-function DMM

SKILL LEVEL 2 A single rotary switch enables fast and convenient selection of voltage, current and resistance ranges plus capacitance ranges. Also check a transistor's h_{FE} . This compact DMM features a liquid crystal display with large easy-to-read numbers, autopolarity, autozero, a diode and audible continuity checker, and a low battery-warning. Overload protection is provided. A tilt-stand bail allows convenient positioning for a better viewing angle. Safety-designed test leads are included.

Kit IM-2320 Ship wt. 5 lbs. . . **\$69.95**

Assembled SM-2320

Ship wt. 1 lb. **\$79.95**

Specifications: **VOLTS DC: Ranges:** 200 mV, 2 V, 20 V, 200 V, 1000 V. **Resolution:** 100 μ V. **Accuracy:** $\pm(0.5\%$ of reading + 1 digit). **VOLTS AC: Ranges:** 200 mV, 2 V, 20 V, 200 V, 750 V. **Resolution:** 100 μ V. **Accuracy:** $\pm(1.25\%$ of reading + 4 digits). **AMPS DC: Ranges:** 200 μ A, 20 mA, 200 mA, 10 A. **Resolution:** 0.1 μ A. **Accuracy:** $\pm(1.0\%$ of reading + 1 digit), except for $\pm(2.0\%$ of reading + 3 digits) on 10 A range. **AMPS AC: Ranges:** 20 mA, 200 mA, 10 A. **Resolution:** 10 μ A. **Accuracy:** $\pm(1.5\%$ of reading + 3 digits), except for $\pm(2.5\%$ of reading + 4 digits) on 10 A range. **OHMS: Ranges:** 200 Ω , 2 k Ω , 20 k Ω , 200 k Ω , 2 M Ω , 20 M Ω . **Resolution:** 0.1 Ω . **Accuracy:** $\pm(0.75\%$ of reading + 1 digit), except for 200 Ω , and 20 M Ω ranges. **CAPACITANCE: Ranges:** 2 nF, 20 nF, 200 nF, 2 μ F, 20 μ F. **Resolution:** 1 pF. **Accuracy:** $\pm(2.0\%$ of reading + 4 digits). **Power:** One 9V battery (not included). **Dimensions:** 7" H x 3½" W x 1¾" D. **Weight:** 11.9 ounces.

More features
for less money

From The Start We Make Kit Building Easy

Even the package your kit comes in is especially designed to make your kit building a little easier. Everything is

packed in sections so that locating a part is quick and easy. And there's little chance you'll mix up pieces because

you only remove a part from the box when you need it.

Hand-held 512 MHz frequency counter with a low 10 Hz display resolution

The IM-2400 Frequency Counter is an ideal compact and portable frequency counter for checking mobile car, boat and airplane transmitter frequencies. A seven-digit LED display gives an excellent 10 Hz resolution in the low 50 Hz to 50 MHz range and a 100 Hz resolution in the high 40 MHz to 512 MHz range. A pivoting stand supports this precise instrument at a convenient viewing angle.

Kit IM-2400 Ship wt. 3 lbs. . . . \$149.95
Assembled SMA-2400-1 Telescopic Antenna Ship wt. 1 lb. . . . \$9.95
Assembled PS-2404 120 VAC Battery Eliminator/Charger Ship wt. 1 lb. . . . \$7.95

Specifications: **INPUTS:** Frequency Range: 50 Hz to 50 MHz, 40 MHz to 512 MHz. **Sensitivity:** 25 mV RMS guaranteed (10 mV RMS typical). **Input Impedance:** 1 M Ω shunted by <24 pF on low range and 50 on high range. **Input Protection:** 150V RMS to 100 kHz derated to 10V RMS at 50 MHz on low range, 5V RMS on high range. **TIME BASE:** Frequency: 10 MHz. **Stability:** \pm 1 PPM. **Temperature Stability:** \pm 10 PPM, 0°C to 40°C. **GENERAL:** Gate Time: 1 second or 0.1 second (switch selected). **Power Requirements:** Five 1.2 volt nickel-cadmium batteries (included) or external battery charger/eliminator. **Dimensions:** 1 $\frac{1}{2}$ " H x 3 $\frac{1}{2}$ " W x 8 $\frac{3}{4}$ " L. **Weight:** 13 ounces with batteries.

Power Line Monitor

The IM-2203 Line Voltage Monitor warns you of problem-causing AC line conditions by displaying the line voltage at any AC electrical outlet. AC voltage is displayed on an easy-to-read 3 $\frac{1}{2}$ -digit LED display with a basic accuracy of 1.5%.

If the line voltage falls below a value that you set or is completely interrupted, a Fault LED indicator lights to alert you of line voltage problems. The fault threshold can be adjusted over a 90 to 120 VAC range. A front panel reset button cancels the fault indicator.

Kit IM-2203 Ship wt. 3 lbs. . . . \$39.00

Specifications: **Operating Range:** 85 to 140 VAC, 60 Hz. **Accuracy:** \pm (1.5% of reading + 1 count). **Fault Adjustment Range:** 90 to 120 VAC. **Fault Indication Response:** 16.7 ms (1 cycle of 60 Hz) typical, 33.3 ms (2 cycles of 60 Hz) maximum. **Display:** 3-digit, 0.43" high-brightness LED. **Resolution:** \pm 1 VAC. **Power:** 5 watts maximum at 120 VAC, 60 Hz. **Dimensions:** 3 $\frac{1}{4}$ " H x 5 $\frac{1}{2}$ " W x 1 $\frac{1}{4}$ " D. **Weight:** 8 oz.



An excellent oscilloscope calibrator comparable with models costing \$500

Keep your scope up to specs at all times with the Heathkit Precision Oscilloscope Calibrator. It provides all the extremely accurate signals you'll need for making critical scope adjustments and calibrations. Use it to calibrate other test equipment and also use it as a precise signal source.

Kit IG-4244 Ship wt. 6 lbs. . . . \$149.95

Specifications: **TIME OUTPUT SIGNAL:** Range: 0.5 s to 10 ns square wave in a 1-2-5 sequence. **Accuracy:** 0.015%. **Amplitude:** 0.5 s to 20 ns - 100 mV to 1V peak, 10 ns - 100 mV to 0.5V peak. **Rise Time:** <1 ns. **Leading Edge Aberrations:** <2% of peak-to-peak amplitude or 10 mV, whichever is greater. **Output:** 50 Ω nominal. **VOLTAGE OUTPUT SIGNAL:** Ranges: 1 mV to 100V peak square wave in a 1-2-5 sequence. **Accuracy:** Within 1% into a \geq 1 M Ω load when calibrated with an external voltmeter. **Rise Time:** < 5 μ s. **Frequency:** Approximately 1 kHz. **SINE WAVE OUTPUT SIGNAL:** Frequency: Approximately 1 kHz. **Amplitude:** Approximately 1 volt peak-to-peak. **GENERAL:** **Power Requirements:** 120/240 VAC, 50/60 Hz, 25 watts maximum. **Operating Temperature:** 10°C to 40°C. **Dimensions:** 3" H x 7 $\frac{1}{4}$ " W x 9 $\frac{1}{2}$ " D. **Weight:** 4 lbs.



Oscilloscope calibrator

SKILL LEVEL 3
 All it takes is two evenings of your time to put this generator together. Then use it to keep most scopes up to their specifications. It supplies all your precise time signals and accurate voltage signals.
Kit IG-4505 Ship wt 4 lbs. **\$59.95**

Specifications: **TIME SIGNAL:** Range: 0.5 s to 1 μ s square wave in a 1-2-5 sequence. **Accuracy:** 0.01%. **Amplitude:** Approx. 200 mV peak. **Rise Time:** \leq 4 ns. **Overshoot:** \leq 3%. **Output:** 50 Ω terminated cable. **VOLTAGE SIGNAL:** Ranges: 1 mV to 100 V peak square wave. **Accuracy:** Within 2%. **Rise Time:** \leq 2 μ s. **Frequency:** DC, 2 Hz to 10 kHz in a 1-2-5 sequence. **GENERAL:** **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 2 $\frac{3}{4}$ " H x 9 $\frac{1}{8}$ " W x 4 $\frac{1}{4}$ " D.



A versatile universal counter

SKILL LEVEL 3
 Technicians, hams, engineers...this top-of-the-line 512 MHz digital counter delivers long and reliable performance. It lets you know in a bright half-inch high 8-digit LED display the frequency being measured down to 0.1 of a cycle. It also displays period and frequency ratio. And with this counter's accuracy you can adjust 2-way radios and others to within FCC specs. Features a trigger level control, oven-housed crystal, a front panel standby switch and a rear panel time base jack. Build this counter in four evenings.

Kit IM-2420 Ship wt. 9 lbs. **\$289.95**

Assembled SM-2420 Ship wt. 9 lbs. **\$350.00**

Accessories: **Assembled SMA-2400-1** Telescopic antenna. Ship wt 1 lb. **\$9.95**

Specifications: **FREQUENCY MEASUREMENT:** Range: Input A, 5 Hz to 50 MHz. Input B, 40 MHz to 512 MHz. **Sensitivity:** 25 mV RMS (4 to 15 mV RMS typical). **Display Resolution:** Input A, 0.1 Hz to 10 Hz. Input B, 1 Hz to 1000 Hz. **PERIOD MEASUREMENT:** Input: Input A only. Range: 5 Hz to 10 MHz. **Display Resolution:** 100 ns to 0.1 ms in decade steps. **RATIO B/A MEASUREMENT:** Input Frequency Limits: Input A, 5 Hz to 25 MHz. Input B, 50 MHz to 512 MHz. **Effective Range:** From 1.6 to 1.024 x 10⁸. **OSCILLATOR:** Frequency: 10 MHz. **Crystal Aging Rate:** $<$ 1 PPM/yr. **Stability:** \pm 0.2 PPM, 0 $^{\circ}$ to 40 $^{\circ}$ C. **GENERAL:** **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 4 $\frac{1}{4}$ " H x 10" W x 12 $\frac{1}{2}$ " D.

An accurate digital frequency counter in everyone's price range

SKILL LEVEL 3
 Put accurate and dependable frequency measurement capability on your work bench at an affordable price. Precisely measure frequencies from 10 Hz up to 225 MHz. And a crystal-controlled time base provides an excellent \pm 10 parts-per-million long term accuracy. These are specifications that make this counter a valuable instrument for engineers, technicians and hobbyists.

This Heathkit Frequency Counter is also easy to operate making it an ideal instrument for beginners. The eight-digit display always shows the measurement in MHz for quick reading of frequencies with a resolution as low as 1 Hz. Even allows indirect frequency checks using the telescopic antenna (at left). Two-evening build time.

Kit IM-2410 Ship wt. 6 lbs. **\$139.95**

Specifications: **Display:** 8-digit LED. **Frequency Ranges:** 10 Hz to 50 MHz. 20 MHz to 225 MHz. **Sensitivity:** 10 Hz to 50 MHz range: 25 mV RMS maximum (10 mV typical) from 10 Hz to 30 MHz and 50 mV RMS maximum from 30 MHz to 50 MHz. 20 MHz to 225 MHz range: 25 mV RMS maximum (10 mV typical). **Input Impedance:** 1 M Ω shunted by \leq 24 pF. **Input Protection:** 150 VAC up to 100 kHz, derated to 5 VAC from 160 MHz to 225 MHz. **Internal Time Base Frequency:** 3.58 MHz. **Temperature Stability:** \pm 10 PPM from 0 $^{\circ}$ C to 40 $^{\circ}$ C. **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 3 $\frac{1}{8}$ " H x 7 $\frac{1}{4}$ " W x 9 $\frac{1}{8}$ " D. **Weight:** 5 lbs.



Check any capacitor quickly and easily with this portable meter

Whether on the bench or out in the elements you'll always have the right instrument in your hand to measure the capacitance of any capacitor with the Heathkit Auto-Ranging Digital Capacitance Meter.

To verify capacitor tolerances or to select and match capacitors for critical circuit applications just plug in the component and press the power button. Automatically the range is selected and indicated by a lit pF, nF, μ F, or mF LED. The reading appears on a 3½ digit liquid crystal display for all values ranging between 0 pF and 199.9 mF.

Get the correct value of large, chassis-mounted parts and easily make cable capacitance checks with an included extension cable. A Kelvin (4-terminal) error-canceling input connector and a zero offset control compensate for stray capacitance and ensure display accuracy.

Use this handheld instrument to preset trimmer capacitors, measure complex series-parallel capacitor networks, or sample production components for quality assurance. It takes about 11.0 hours to assemble.

Kit IT-2250 Ship wt. 3 lbs. **\$159.95**
Accessories: **PS-2350** 120 VAC Battery Eliminator.
Ship wt 1 lb. **\$7.95**

Specifications: **Ranges:** 199.9 pF, 1999 pF, 19.99 nF, 199.9 nF, 1.999 μ F, 19.99 μ F, 199.9 μ F, 1999 mF, 19.99 mF. **Accuracy:** 199.9 pF, 1999 pF, 19.99 nF, 199.9 nF ranges: $\pm(0.2\%$ of reading $- 1$ count $- 0.5$ pF). 1.999 μ F through 199.9 mF ranges: $\pm(5\%$ of reading $+ 1$ count). Using laboratory standards. **Battery Indicator:** Displays "Lo Batt" when battery voltage is down to approximately 5 volts. **Power:** 9-volt battery (NEDA 1604, not included), or Heath PS-2350 120 VAC Battery Eliminator. **Dimensions:** 2" H x 3¼" W x 7½" L. **Weight:** 16 ounces with battery.



Save \$70 on Digital L/C Bridge

To verify that a 10 pF capacitor or 10 mH inductor are precisely what they are supposed to be, you need the Digital LC Bridge. This versatile instrument will even check the associated dissipation or loss factor of the component as well.

A four-point Kelvin input connection eliminates the variable effects of components with large lead lengths or large lead diameters. A null control also eliminates stray capacitance on the lower ranges. Separate real panel connectors allow the application of a DC voltage for batch testing or the hookup of a plotter for charting capacitance and voltage curves.

Kit IT-2240. Ship wt. 11 lbs. . . . ~~Was \$269.95~~ **Now \$199.95**

Specifications: **INDUCTANCE: Ranges:** 200 μ H to 2000 H in 8 decade steps. **Accuracy (± 4 counts):** $\pm [0.5\%$ (L) $+ 1.5\%$ (L) x D $+ 0.5$ μ H] for readings from 10 to 2000 counts when the Bridge is calibrated using laboratory standards. **CAPACITANCE: Ranges:** 200 pF to 2000 μ F, 8 decades. **Accuracy (± 2 counts):** $\pm [0.5\%$ (C) $+ 1.5\%$ (C) x D $- 0.5$ pF] for readings from 10 to 2000 counts when the Bridge is calibrated using laboratory standards. **DISSIPATION: Range:** 000 to 1999, limited to D x μ F = 1000 on 2000 μ F range. **Accuracy (± 20 counts):** $\pm 3\%$ for value displays greater than 200 counts. **GENERAL: Overvoltage Protection:** Input protected against ± 20 VDC VAC (5 seconds maximum), or capacitor up to 2000 μ F charged to 50 VDC and by an internal 1-ampere fuse. **Power:** 120 VAC, 60 Hz. **Dimensions:** 3¼" H x 10" W x 12½" D.

Measure RF voltages with this probe

Provide high voltage RF measurement capability for DC voltmeters with 10 and 11 megohm input impedances. This probe provides a DC voltage approximately equal to the positive peak value of the AC voltage in the circuit under test up to 100 MHz. An easy one-evening kit.

Kit PK-3-A Ship wt. 1 lb. **\$14.95**

Deluxe 10:1 and direct 1:1 combination probe

A flexible probe ideal for all frequency counter and scope uses from DC to 10 MHz in X1 position, DC to 100 MHz in the X10 position. Includes several adaptors and probe tips.

Assembled PKW-105 Ship wt. 1 lb. **\$34.95**
Assembled IOA-3220-1 Pouch with two probes.
Ship wt. 1 lb. **\$64.95**



Oscilloscope probe

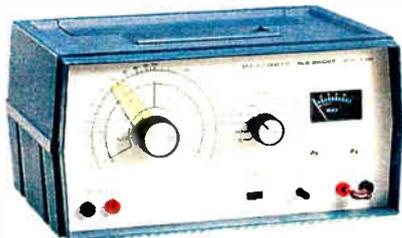
This low-capacitance scope probe is extremely helpful in tracing waveforms in TV circuits without causing signal distortion from overloading or frequency discrimination. Has switchable direct and X10 positions. Use the X10 position for minimum capacitive loading of the circuit. Use the X1 position for maximum sensitivity.

Kit PK-1 Ship wt. 1 lb. **\$16.95**



Regulated high voltage power supply

Use this power supply to test new ideas and circuits in stereo vacuum tube amplifiers and amateur radio gear. Or, power any circuit up to 400 volts DC with this well regulated variable-output high voltage power supply.



Versatile RLC Bridge

A general-purpose instrument from the 5280 test series. Use it to check the values of unknown or obliterated

Separate panel meters allow you to accurately monitor current and voltage. Built-in is a 0 to -100 volt DC bias supply so you can adjust the operating range of a vacuum tube. Separate 6.3 and 12.6 VAC heater filament voltages are readily available from front panel binder posts. And the heater voltages can be left on while the high voltage is disabled by a front panel switch.

Kit IP-2717-A Ship wt. 19 lbs. **\$189.95**

Assembled SP-2717-A

Ship wt. 20 lbs. **\$250.00**

Specifications: **B+ VOLTS: Voltage:** 0 to 400 volts DC, regulated. **Current:** 0 to 100 mA continuous, 125 mA intermittent. **Regulation:** Output variation less than 1% from no load to full load. **Ripple:** Less than 10 mV RMS. **C- VOLTS: Voltage:** 0 to -100 volts DC at 1 mA. **FILAMENT VOLTS: Voltage:** 6.3 VAC at 4 amperes or 12.6 VAC at 2 amperes. **GENERAL: Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 5½" H x 13¾" W x 11¼" D. **Weight:** 16 lbs.

resistors, capacitors and inductors. Front panel terminals are provided for components under test and for an external standard. The stackable cabinet also has a storage compartment.

Kit IB-5281 Ship wt. 5 lbs. **\$59.95**

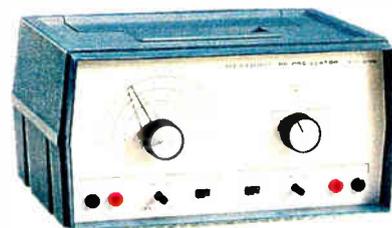
Specifications: **Resistance Ranges:** 10Ω to 10 MΩ in three ranges. **Inductance Ranges:** 10 μH to 10 H in three ranges. **Capacitance Ranges:** 10 pF to 10 μF in three ranges. **Oscillator Frequencies:** 1 kHz, 10 kHz. **External Standard Range:** 1:1 to 10:1. **Power:** Two 9-volt transistor batteries (not included) and/or IPA-5280-1 Power Supply (page 41). **Dimensions:** 5¾" H x 11" W x 7¾" D. **Weight:** 3¼ lbs.

Our most economical power supply

In less than three and a half hours you can put together a truly handy power supply (pictured at right). With its variable 1 to 15 volt DC output, you can use it for many digital and analog circuit applications. Even use it as a substitute for batteries when checking out portable equipment. Terminals on the rear panel allow you to control this supply's output with either an AC or DC voltage.

Kit IP-2728 Ship wt. 5 lbs. **\$49.95**

Specifications: **Load Regulation:** Less than 50 mV, no load to full load. **Ripple and Noise:** Less than 5 mV. **Current Output:** 500 mA max. **Current Limiting:** Adjustable 10 mA to over 500 mA. **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 4¾" H x 5½" W x 5¾" D. **Weight:** 3¼ lbs.



Low-cost RF Oscillator

Part of the 5280-series of test instruments, the IG-5280 provides AM modulated or unmodulated RF signals in five overlapping bands. Use the wide 310 kHz to 100 MHz frequency range to align receivers covering the AM, FM, television, longwave and shortwave broadcast bands. Calibrated harmonics make this generator usable all the way up to 220 MHz.

All RF frequencies are indicated on a large, easy-to-read dial scale. And a continuously variable attenuator provides output signals up to 100 mV RMS. The 1 kHz RF modulator also serves as a convenient audio signal source. The cabinet of the IG-5280 is stackable and features a handy storage compartment.

Kit IG-5280 Ship wt. 5 lbs. **\$59.95**

Specifications: **RF OUTPUT: Frequency:** 310 kHz to 110 MHz in five bands. 100 MHz to 220 MHz using calibrated harmonics. **Voltage:** Approx. 100 mV RMS. **Internal Modulation:** 1 kHz. **AF OUTPUT: Frequency:** 1 kHz. **Voltage:** Approx. 2 volts RMS. **GENERAL: Power:** Two 9-volt transistor batteries (not included) and/or IPA-5280-1 Power Supply (page 41). **Dimensions:** 5¾" H x 11" W x 7¾" D. **Weight:** 3¼ lbs.

Know your test equipment inside and out by building it yourself





Triple output DC supply

SKILL LEVEL The IP-2718 Tri-Power Supply is a must for every test bench with a 5 VDC and two 0 to 20 VDC outputs. Separately or in combination, this supply furnishes the vast majority of power requirements for most any test and measurement application. And its front panel meter lets you monitor voltage or current without tying up a multimeter.

A special built-in tracking circuit maintains the voltage difference between supplies when working with operational amplifier circuits. Each of the supplies can be operated independently from one another, either floating or referenced to another AC or DC source, or referenced to ground. All the supplies may be connected in series to provide up to 45 volts DC.

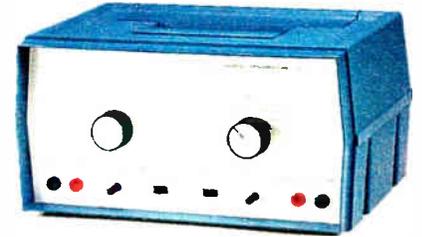
Kit IP-2718 Ship wt. 12 lbs. . . \$119.95
Assembled SP-2718 12 lbs. . \$200.00

Specifications: **Outputs:** 5 VDC +5% at 1.5 amps. Two outputs at 0 - 20 volts DC at 0.5 amps, continuously adjustable. **Regulation:** <0.1% on 20 V supplies. <3% on 5 V supplies. **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 4½" H x 10¼" W x 9" D. **Weight:** 10 lbs.

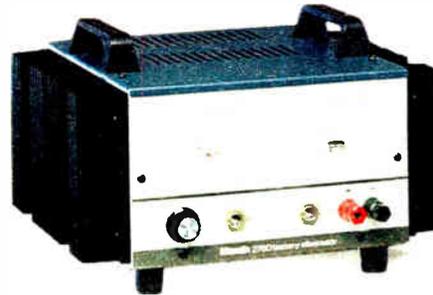
Quick-build Audio Generator

SKILL LEVEL Put together the IG-5282 Audio Generator from the 5280-series of test equipment in less than one evening. Then use its sine and square wave outputs as a signal source for harmonic distortion measurements, as an external modulator for RF generators, or in tests of audio amplifiers for gain or frequency response. Also use the square wave output to trigger digital instruments.

Both sine and square wave outputs are independently adjustable. And both signals may be used simultaneously or independently. The stackable cabinet has a convenient storage compartment.
Kit IG-5282 Ship wt. 5 lbs. . . \$59.95



Specifications: **Frequency Output:** 10 Hz to 100 kHz in four ranges. **Sine Wave Voltage:** 0 to 3 volts RMS. **Square Wave Voltage:** 0 to 3 volts peak. **Power:** Two 9-volt transistor batteries (not included) and/or IPA-5280-1 Power Supply. **Dimensions:** 11" H x 5¾" W x 7¾" D. **Weight:** 3½ lbs.



Battery Eliminator

SKILL LEVEL When you need a heavy duty power supply that provides a well regulated output voltage and a massive amount of

steady current, you need the Heathkit IP-2760 Battery Eliminator. It supplies a variable output from 8 to 15 VDC at 12 amps with excellent no load to full load regulation. This is the type of power supply that you need when servicing amateur and CB radio equipment and other projects requiring large current demands.

Kit IP-2760 Ship wt. 31 lbs. . \$179.95

Specifications: **Output:** Variable from 7.5 to 15 VDC. **Current:** 20 A intermittent, 12 A continuous. **Ripple:** <1%. **Regulation:** <2%. **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 5¼" H x 11" W x 11" D. **Weight:** 22½ lbs.



Compact Signal Tracer

SKILL LEVEL Keep your eyes on your work while your ears detect a good or bad signal. This way you can quickly trace signals in receiver and transmitter circuits in radios and TVs. Also use this compact instrument to detect faulty RF or IF stages, even isolate faulty components. The IT-5283 works equally well on audio circuits. This service-oriented tester

is a quick one-evening kit that lets you check voltages and resistances by simply listening to an audible tone. This is another inexpensive 5280-series test instrument with a storage compartment for test cables and accessories.

Kit IT-5283 Ship wt. 3 lbs. . . \$59.95

Specifications: **Speaker:** 3" permanent magnet, 16Ω. **Power:** Two 9-volt transistor batteries and/or IPA-5280-1 Power Supply. **Dimensions:** 5¾" H x 11" W x 7¾" D. **Weight:** 3 lbs.

5280-series DC supply

SKILL LEVEL This power supply simultaneously furnishes DC power to all the 5280-series instruments on these two pages. The unit can be wired to operate on 120 or 240 VAC. 6" H x 3¾" W x 3" D.

Kit IPA-5280-1 Ship wt. 3 lbs. \$39.95



Rack Mount for Spectrum Analyzer

SKILL 3 Install the AD-1308 Spectrum Analyzer (at right) into this rack mount accessory so you can keep it with your other rack mounted equipment. This accessory allows you to permanently mount the Analyzer for constant in-line monitoring of your stereo system. And when you need the Analyzer for checks elsewhere, it quickly snaps out for portable use. The rack mount accessory has an internal power supply for when the AD-1308 is permanently installed and a built-in recharger to keep the Analyzer's nickel-cadmium batteries fully charged.

Kit ADA-1308-1 Ship wt. 8 lbs. **\$99.95**

SAVER! Save 50% off the price of the Rack Mount by ordering it within 90 days of purchasing the combination ADS-1308-1 Noise Generator and Spectrum Analyzer.

Audio Spectrum Analyzer

SKILL 3 Use this microprocessor-controlled, 1/2 octave spectrum analyzer to check any audio system. Save money by seeing where improvements can be made in your sound system with the least investment. The portable Heathkit Spectrum Analyzer graphically shows which frequencies are underpowered on a bright fluorescent display. A professional tool for the hobbyist.

Kit AD-1308 Ship wt. 5 lbs. **\$299.95**

SAVER! For Christmas, get a FREE AD-1309 Noise Generator when you order an AD-1308 Spectrum Analyzer. Order today.

Kit ADS-1308-1 Ship wt. 8 lbs. **\$299.95**

Specifications: **SPL Range:** 23 - 126 dB. **SPL Accuracy:** ± 1 dB "A" weighted. **Input Sensitivity (90 dB SPL Range):** 0 dB = 350 mV RMS ± 10%. **Power:** 6 "C" batteries (not included). **Dimensions:** 4 1/2" H x 9 1/4" W x 4" D.



Noise Generator Kit

SKILL 3 To properly check out any stereo or sound system with a spectrum analyzer, you need a noise source with a nearly constant energy output. This one-evening Pink/White Noise Generator will do just that...and at a fraction of the cost of comparable noise generators.

Kit AD-1309 Ship wt. 2 lbs. . . **\$49.95**

Specifications: **Frequency Response:** Pink Noise, ± 1 dB from 20 Hz to 20 kHz. White Noise, ± 3 dB from 20 Hz to 20 kHz. **Output Levels:** >350 mV RMS, >1.5 V peak. **Power:** 9-volt battery (not included). **Dimensions:** 2 3/4" H x 4 1/4" W x 4 1/4" D. **Weight:** 11 ounces with battery.



Sine and Square Wave Generator

SKILL 3 Here is a 1 Hz to 100 kHz signal generator to use in almost all your test bench measurements. It supplies high quality sine waves with less than 0.1% distortion, ideal for testing audio amplifiers. And the sharp, clean square waves from this generator are just what you need to check frequency responses and to test digital instruments.

Kit IG-5218 Ship wt. 10 lbs. . **\$149.95**

Specifications: **SINE WAVE OUTPUT:** **Frequency Range:** 1 Hz to 100 kHz. **Internal Load:** Internal 600Ω load available on 0.003, 0.01, 0.03, 0.1, 0.3, and 1.0 volt ranges. **dB Ranges:** - 62 to + 22 dB (- 12 to + 2 dB on meter; - 50 to + 20 dB in eight 10 dB switch positions.) + 2 dB maximum

into 600Ω load. **Output Variation:** ± 1 dB from 10 Hz to 100 kHz. **Output Indication:** Two voltage scales and one dB scale on front panel meter. **Output Impedance:** 10 volt range: 0 - 1000Ω. 3 volt range: 800 - 1000Ω. 1 volt range and lower: 600Ω. **Meter Accuracy:** ± 10% of full scale with proper load termination. **Distortion:** Less than 0.1% from 10 Hz to 20 kHz. **SQUARE WAVE OUTPUT:** **Frequency Range:** 5 Hz to 100 kHz. **Output Impedance:** 52Ω on 0.1 V and 1.0 V ranges. Up to 220Ω on 10 V range. **Rise Time:** Less than 50 nanoseconds. **GENERAL:** **Frequency Selection:** First two significant figures on 0 - 100 and 0 - 10 switches each in ten steps. Third figure on continuously variable 0 - 1 control. Multiplier switch; X1, X10, X100, X1000. **Frequency Error:** Within ± 5% of first and second digit. **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 5 1/4" H x 13 1/4" W x 7" D. **Weight:** 7 lbs.



Rugged Vacuum Tube Voltmeter

 This Vacuum Tube Voltmeter has been and still is a favorite with service technicians as a versatile troubleshooting instrument. It's more tolerant of an overload than a digital multimeter and more accurate than a VOM.

On the wide 6" meter you can accurately measure \pm DC voltages from 1.5 volts to 1500 volts within \pm 3% of full scale accuracy. Measure AC voltages from 0 to 1500 volts RMS including a low 1.5 V range. The resistance range covers 0.1 to 1000 M Ω in seven ranges. A zero center and dB scale add versatility.

In less than three evenings you can put this 11 M Ω input meter together. Use the gimbal bracket to mount the meter almost anywhere. Requires one "C" size battery.

Kit IM-5228 Ship wt. 6 lbs. **\$89.95**

Specifications: **DC VOLTMETER: Ranges:** 0-1.5, 5, 15, 50, 150, 500, 1500 volts full scale. **Input Resistance:** 11 megohms on all ranges. **Accuracy:** \pm 3% of full scale. **AC VOLTMETER: Ranges:** 0-1.5, 5, 15, 50, 150, 500, 1500 RMS scales (0.353 of peak-to-peak). **Frequency Response (5 V range):** \pm 1 dB 25 Hz to 1 MHz (600 Ω source, referred to 60 cps). **Accuracy:** \pm 5% of full scale. **Input Impedance:** 1 megohm shunted by 40 μ F measured at input terminals (200 μ F at probe tip). **OHMMETER: Ranges:** Scale with 10 Ω center X1, X10, X100, X1000, X10K, X100K, X1 Meg. Measures 0.1 Ω to 1000 megohms with internal battery. **METER:** 6-inch, 200 μ A movement, polystyrene case. **PROBE:** Combined AC-OHMS-DC switching probe, single jack input for probe and ground connections. **POWER:** 120/240 VAC, 50/60 Hz. **DIMENSIONS:** 5" H x 12 $\frac{3}{4}$ " W x 4 $\frac{3}{4}$ " D. **WEIGHT:** 5 lbs.

A beginner's voltmeter a veteran can value

 It's compact, lightweight, battery-powered, easy to operate and can be put together in one evening. You'll find hundreds of uses for this solid-state general-purpose meter around the home and on your workbench. And the test leads are built right into the case so you'll never lose them.

While inexpensive, this meter is loaded with features. It maintains a very good accuracy due to a high input resistance on the DC and AC voltage ranges that places very little load on the circuit being tested. The meter has a wide frequency response on the AC voltage ranges that covers the full audio frequency range and beyond. And the ohmmeter ranges provide a 1 $\frac{1}{2}$ volt test voltage that's useful in checking semiconductors.

The simplicity of this valuable meter makes it an ideal construction project for the novice in electronics.

Kit IM-5217 Ship wt. 4 lbs. **\$49.95**

Specifications: **DC VOLTS: Ranges:** 0-1.5, 0-15, 0-500 volts full scale. **Input Resistance:** 10 megohms on all ranges. **Accuracy:** \pm 3% of full scale. **AC VOLTS: Ranges:** 0-1.7, 0-15, 0-150, 0-500 volts full scale. **Input Resistance:** 1 megohm on all ranges. **Accuracy:** \pm 5% of full scale. **OHMS: Ranges:** X1, X100, X10K, X1M; 10 Ω center scale. **GENERAL: Meter:** 4 $\frac{1}{2}$ inch, 100 μ A, 100 degree movement. **Power:** One 1.5 volt "C" battery and two 9 volt transistor batteries (not included). **Dimensions:** 5 $\frac{3}{8}$ " H x 9 $\frac{3}{8}$ " W x 9" D.



All-in-one 40 kV probe

 Here is a fast and easy way to check high voltages commonly found in televisions, computer terminals and oscilloscopes. Measure voltages up to 40,000 volts in any negative ground circuit with a full scale accuracy of \pm 3%.

Directly read all measurements on the built-in meter of this easy-to-build kit. In just one hour you can be making high voltage checks of your own equipment with this easy-to-assemble kit. 1 $\frac{1}{2}$ " H x 1 $\frac{1}{8}$ " W x 15" L.

Kit IM-5215 Ship wt. 2 lbs. **\$34.95**



Multifunction EPROM Programmer

Put your own adventure game, accounting package or home security program in an EPROM memory chip. Then plug it into your computer for easy access from the keyboard. But don't stop with programming EPROMs. With our Programmer you can also duplicate and verify EPROMs. In addition, using the simulate mode, you can substitute the Programmer for an EPROM to check your program and make any needed changes before burning in the memory device.

Heath's microprocessor-controlled EPROM Programmer can be used with popular 2500 and 2700 series EPROMs that use a single power supply. Other compatible memory devices up to 16K bytes can also be accommodated. Specific personality modules, wired by the user, are required for use in some modes for different EPROM configurations. Seven blank personality modules are supplied with the Programmer kit along with commonly used EPROM wiring diagrams. The assembled version of the EPROM Programmer comes with assembled personality modules configured for use with 2532, 2516/2716, 2732, 2732A, 2764, 2764A, 27128, and 27128A EPROMs.

The kit Programmer takes four evenings to assemble. Transfer software is included with kit programmer. The programmer is usable with terminals using terminal emulation software as well as computers.

Kit IDS-4801 Ship wt. 14 lbs. \$279.00

Assembled SD-4801 Ship wt. 10 lbs. \$525.00

Accessories: **SDA-4801-10** User-friendly software for use with all Heath/Zenith computers, IBM PC and compatibles. This software allows you to upload or download binary, text and Intel-Hex files to the EPROM Programmer. Does offset loading and relocation offset loading for EXE-type files. Uses the MS-DOS operating system. Ship wt. 1 lb. \$49.95

Specifications: **Programmed Devices:** 2500 and 2700 series and compatible devices that use a single supply voltage. **Features:** Keypad entry to RAM (stand-alone operation). EPROM to RAM download (address selectable). EPROM simulation using programmer RAM. Displays 16-bit check sum. EPROM test before programming start. Edit includes: insert byte, delete byte, search for byte and display address, and verify (EPROM to RAM comparison). **I/O:** RS-232C from 25-pin D connector provides read/write channel to computer. **I/O Formats:** Intel Hex. **Data Transfer Rate:** 9600 baud. **Processor:** Z-80 CPU. **Clock Speed:** 2 MHz. **Memory:** 4K ROM, 16K RAM. **Display:** Six 7-segment LEDs for address, data and prompt. Six LEDs for function indicators. **Keys:** 4 x 4 HEX keypad. Address, Increment, Decrement, Repeat, Function Select and Load Function keys. **Programming Time:** 50 ms per byte. **Power:** 120 VAC, 60 Hz. **Dimensions:** 4 3/4" H x 15 3/4" W x 10 3/4" D. **Weight:** 6 lbs.

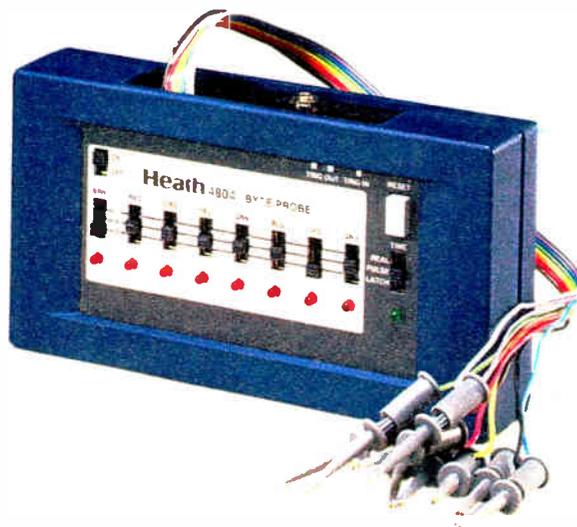
Save \$20 on a digital Byte Probe

The versatile Byte Probe is a unique device that tests the logic states, up to 10 MHz, of address lines, data lines and other general TTL or CMOS circuitry. All circuits under test must operate from a +5 VDC power supply.

With its trigger output, the Probe can be used to trigger a scope for in-depth real time waveform analysis. Observe actual data on a scope in real time, pulse stretch, or latched mode. Also connect multiple Probes together for testing of more than eight lines. A quick one-evening kit.

Kit ID-4804 Ship wt. 2 lbs. Was \$49.95, Now \$29.95

Specifications: **Pulse Repetition Rate:** 10 MHz typical, 8 MHz minimum. **Input to Trigger Output Delay:** 40 ns max. **Latching Pulse Width:** 25 ns min. **Display Modes:** Real time, Pulse time and Latch time. **Display:** Eight red LEDs for input and one green LED for coincidence. **Power:** One 9-volt battery (NEDA 1604) or optional PS-2350 120 VAC Battery Eliminator (page 39). **Dimensions:** 1 3/8" H x 6" W x 3 3/8" D. **Weight:** 10 ounces.



Use EPROMs over and over

A fast and easy one-evening kit that saves you money for other projects. The EPROM Eraser cuts memory device costs by letting you use the same EPROMs again and again. This inexpensive eraser is a money saver for all computer or electronics hobbyists interested in EPROM programming.

And the Eraser is easy to operate.

Just place the EPROMs into the locking tray and wait for them to be erased.

A safety interlock system prevents accidental exposure to ultraviolet rays when the tray is opened.

Kit ID-4803 Ship wt. 4 lbs. . . . \$59.95

Assembled SD-4803

Ship wt. 5 lbs. \$100.00

Specifications: **Erase Time:** 3 minutes per watt-second of erase energy specified by manufacturer. **Capacity:** Seven 24-pin, six 28-pin or four 40-pin IC's. **UV Source Wavelength:** 253.7 nanometers. **UV Lamp:** 12 inch, 8 watts. **Typical Tube Life:** 3000 hours. **Power:** 120 VAC, 60 Hz. **Dimensions:** 2 1/2" H x 3 1/4" W x 13 1/4" L. **Weight:** 3 1/2 lbs.



CRT Tester

 Satisfy your customers even more with an improved TV picture while increasing your profits. Do it by cleaning and rejuvenating virtually any TV CRT that comes into your shop with our CRT Tester and Rejuvenator.

Follow the easy operating instructions on the inside cover. They take you step by step through separate testing, cleaning and rejuvenating processes.

Each gun is individually controlled and monitored on its own grid current meter. Also check for shorts and gassy tubes. And a good indication of tube life expectancy. Four adapter sockets with instructions for assembling optional sockets are included.

Kit IT-5230 Ship wt. 9 lbs. \$149.95

Accessories: **Kit ITA-5230-1** CRT Socket Adapter allows you to test even more CRTs on the IT-5230. Uses universal clip leads to hookup and test CRTs with known basing configurations. Ship wt. 1 lb. \$29.95

Specifications: **Sockets (type supplied):** 14-pin for 90 color tubes. 13-pin for inline-gun color tubes. 8-pin for B&W tubes. 7-pin for B&W tubes. **Case:** Molded plastic. **Heater Supply Voltage:** Variable from 2 to 12 volts at 1 amp. **Power:** 120/240 VAC, 50/60 Hz. **Test Cable:** 4 foot, heavy duty.



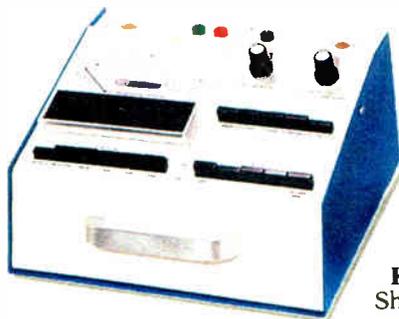
TTL/CMOS Logic Probe

 This handy, quick-checking Logic Probe detects and indicates high and low logic levels in 5 VDC TTL circuits up to 100 MHz and 15 VDC CMOS circuits up to 80 MHz. Two indicator lights are located at the tip of the probe to show a high or low logic level. This gives you a clear view of what is happening without having to remove your eyes from the circuit test point.

Power is provided to the logic probe from the circuit under test through 34" leads with built-in strain relief and color-coded mini-clips. Detachable ground clip included.

Kit IT-7410 Ship wt. 1 lb. \$39.95

Specifications: **AC THRESHOLD LEVELS: TTL Logic ZERO (V):** 0.8 ± 0.15 @ 5 VDC. **TTL Logic ONE (V):** 2.1 ± 0.25 @ 5 VDC. **CMOS Logic ZERO (%)**: 30 ± 10% of supply voltage. **CMOS Logic ONE (%)**: 70 ± 10% of supply voltage. **INPUT IMPEDANCE:** 400 kΩ in parallel with 10 pF. **RESPONSE LIMIT:** 10 ns for single pulse or train for TTL and CMOS. **Probe Input Protection:** ± 50 VDC, continuous. ± 175 VDC (124 VAC), 5 seconds. **Power:** 4.75 to 5.5 VDC @ 75 mA max. (TTL). 4.75 to 15 VDC @ 115 mA max. (CMOS). **Dimensions:** 9/4" L x 1" Diameter. **Weight:** 2 1/2 ounces.



Semiconductor checker

 Use this portable tester and see the actual operating characteristics of transistors, diodes, FETs, SCR's, triacs, and UJT's. Takes two quick evenings to assemble.

Kit IT-3120
Ship wt. 5 lbs. \$99.95

Specifications: **DC Beta Ranges:** 1 to 50, 5 to 250, 10 to 500, 50 to 2500 and 100 to 5000. **Collector Currents:** 1 mA, 5 mA, 10 mA, 50 mA, 100 mA, 500 mA and 1 A. **G_m:** 0 to 50,000 μmhos. **Leakage Current Ranges:** 0 to 100 μA, 0 to 1 mA, 0 to 10 mA, 0 to 100 mA and 0 to 1 A. **Out-of-Circuit Accuracy:** ± 2%, ± 2% arc for DC beta and leakage. **In-Circuit Accuracy:** Indicates good or bad. **Diode Test:** Tests for forward conduction and reverse leakage (out-of-circuit). **SCR and Triac Tests:** Test for proper conduction and blocking. **Unijunction Transistor Test:** Measures I_{b2}, I_{b1} and Emitter Current (out-of-circuit). **Power:** Two 1.5 volt D batteries (not included). **Dimensions:** 5 1/4" H x 9 3/8" W x 8 5/8" D.

Choose from 999,999 resistors

 The Heathkit Decade Resistance Kit is an accurate laboratory-type instrument that supplies a very wide range of resistance values for use in electrical measurements. Use it whenever you need an accurate variable multiplier or shunt, substitute resistor, or as an arm for DC and AC bridges. A one-evening kit that will supply any resistance value from 1 to 999,999Ω in 1Ω steps.

Kit IN-3117 Ship wt. 3 lbs. ... \$69.95

Specifications: **Range:** 1 Ω to 999,999 Ω in 1 Ω steps. **Resistors:** Precision, 1/2% accuracy, 1 watt. **Max Current:** X1 = 1000 mA, X10 = 300 mA, X100 = 100 mA, X1K = 30 mA, X10K = 10 mA, X100K = 3 mA. **Min. Resistance:** 0.025 Ω at terminals with all switches at zero. **Dimensions:** 5" H x 7 1/2" W x 6 5/8" D. **Weight:** 2 1/2 lbs.

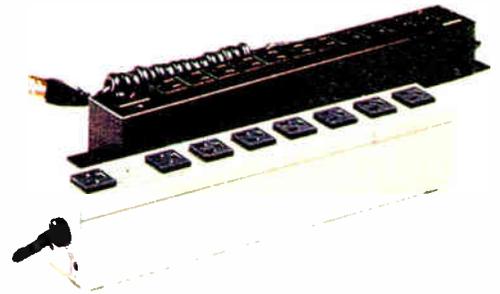




LUXO magnifier lamp

See better, clearer and easier with the famous LUXO magnifier lamp. No more hard-to-see soldering connections. A precision-ground 2 to 1 magnifier provides a wide distortion-free view of a circuit board through a polished 5" lens. An energy-conserving 22-watt circular fluorescent bulb provides bright, uniform and shadowless lighting directly on the work being inspected through the lens. The lamp moves at a touch and stays where you put it. Balanced arms have a 45" total reach. The lamp comes complete with clamp type mounting bracket for attaching to a level surface, edge of table or desk up to 1/2" thick. For 120 VAC use. UL approved. Color may vary.

Assembled GDP-200 Ship wt. 7 lbs. \$89.95



AC outlet box

No more dangerous extension cords. No more unplugging equipment to free up an AC outlet. In one and a half hours you can put together a strip of twelve 3-prong outlets. Single switch controls eleven outlets. One outlet is constant AC. 2 1/4" H x 15 7/8" L x 1 1/4" D.

Kit HD-1274 Ship wt. 4 lbs. . . . \$24.95

Smart Outlet Box

Simply plug in the AC line cord from the computer into the control outlet of this easy one-evening Smart Outlet kit. Plug the printer into one of the remaining six switched outlets. Power up the computer, the printer comes on automatically. Also surge protection. 2 1/4" H x 14 1/2" L x 2 3/4" D.

Kit GD-1495 Ship wt. 4 lbs. . . . \$59.95

Headband Magnifier

This comfortable fitting magnifier with adjustable headband frees both your hands for work. Shatter and scratch resistant lenses magnify 2 1/2 times. Works well with eyeglasses.

Assembled GDP-201 Ship wt. 1 lb. \$24.95



PanaVise circuit board holder

Position circuit boards at the best working angle. Spring-loaded arms hold boards that can be tilted 220° and rotated 360°. Use with standard or vacuum base.

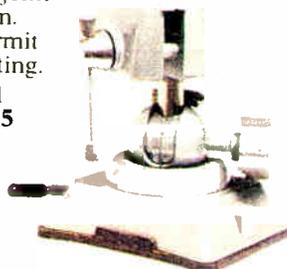
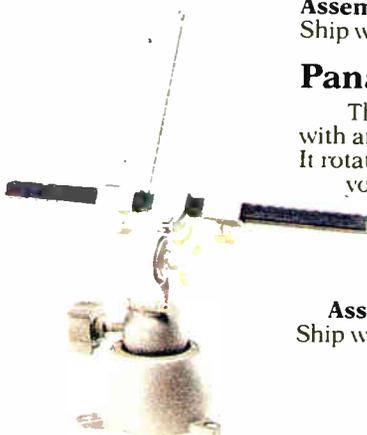
Assembled GDP-1254
Ship wt. 2 lbs. \$21.95

PanaVise base

This rugged base can be used with any workholder on this page. It rotates 360° and tilts 180° to fit your best working angle.

Adjustable ball joint locks in position. Three holes permit solid bench mounting.

Assembled GDP-1251
Ship wt. 2 lbs. \$16.95



PanaVise vertical holder

This vertical-opening vise is designed to position and hold large items.

Hold instruments, cameras, electronic equipment or entire chassis between these wide-opening 9" jaws. Replaceable jaw pads protect equipment from damage. Use this holder with either the standard bench-mount base or the vacuum base.

Assembled GDP-1255 Ship wt. 2 lbs. \$9.95



PanaVise standard vise head

Hold circuit boards and other projects steadily in place while you work on them. Nylon vise jaws open to a full 2 1/2". Use with standard bench-mount base or vacuum base.

Assembled GDP-1253 Ship wt. 2 lbs. . . . \$19.95

PanaVise vacuum base

Attaches instantly and securely to almost any smooth surface; glass, metal, formica, and more. Also uses multi-angle ball-joint positioner.

Assembled GDP-1252 Ship wt. 2 lbs. . . . \$21.95



Electronic tool kit

This is a perfect starter selection of tools for the beginning kit builder. Included are a Weller 25-watt soldering iron with two interchangeable tips, a soldering aid, a 4 ounce spool of solder, wire strippers, diagonal cutters, 4" needle nose pliers, 1/4" nut driver and a slotted and Phillips screwdriver. These tools are contained in a durable 3" H x 10 3/4" W x 10"D carrying case with a built-in carrying handle. All tools are stored in a molded storage tray.

Assembled GHP-1270

Ship wt. 2 bs. \$42.95

Weller temperature-controlled soldering station

Consistent 700°F temperature for steady and fast soldering. Comes with storage tray and removable sponge. Uses 120 VAC.

Assembled GDP-1108 Ship wt. 5 lbs. \$89.95

Accessories: Set of five assorted tips.

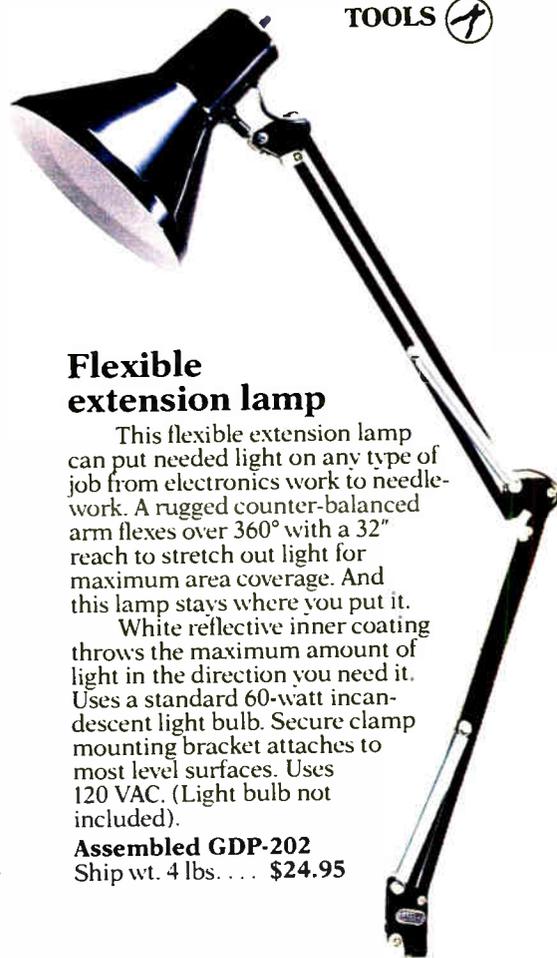
Assembled GDP-1109 Ship wt. 1 lb. \$17.95

Hobbyist soldering iron

A popular soldering iron for all your kit building needs. The 860°F 1/8" screwdriver tip of this pencil-type iron allows you to make those close soldering jobs easier and cleaner. Lightweight iron uses 120 VAC. (Color and manufacturer may vary.)

Assembled GDP-207

Ship wt. 1 lb. \$16.95



TOOLS

Flexible extension lamp

This flexible extension lamp can put needed light on any type of job from electronics work to needlework. A rugged counter-balanced arm flexes over 360° with a 32" reach to stretch out light for maximum area coverage. And this lamp stays where you put it.

White reflective inner coating throws the maximum amount of light in the direction you need it. Uses a standard 60-watt incandescent light bulb. Secure clamp mounting bracket attaches to most level surfaces. Uses 120 VAC. (Light bulb not included.)

Assembled GDP-202

Ship wt. 4 lbs. \$24.95

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Everything you need to start computing or to build up your computer system is here. You'll find computers, software, printers, modems, video monitors, furniture, external disk storage, plug-in accessory boards and computer supplies. And you'll get your order faster by calling TOLL-FREE 1-800-253-7057 between 8:00 A.M. and 4:30 P.M. Eastern Time on regular business days. Alaska and Michigan residents call 616-982-3411. Charge the order to your Visa or MasterCard credit card or put it on your personal Heath Revolving Charge.

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Choose from these two IBM PC-compatible computers. They are designed to fit your needs and your price range. Plus you get the bonus of a FREE Partnership Pack. It's worth up to \$500 and includes savings on hardware, software and more. See page 51 for details.

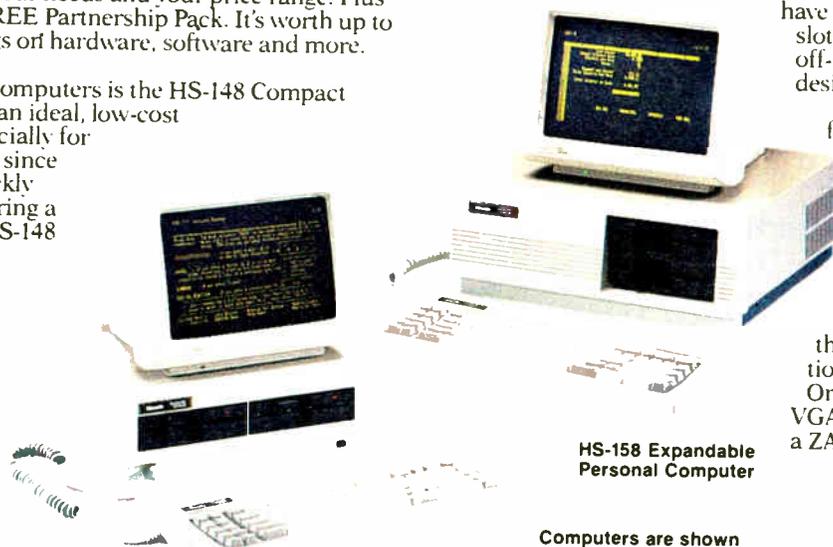
The first of the two computers is the HS-148 Compact Personal Computer. It is an ideal, low-cost start to computing...especially for the beginning kit builder since the computer can be quickly assembled without soldering a single connection. The HS-148 PC is also a perfect choice for business, educational and home users with everything needed to begin personal computing in a compact and space efficient cabinet. Or use it as

an inexpensive, intelligent workstation in a local area network. The second is the HS-158 Expandable Personal Computer. It offers all the features of the Compact PC in a kit that also requires no soldering. Plus you gain the ability to greatly expand the capabilities of the computer with numerous add-ons.

Both the Compact PC and the Expandable PC are designed around the 16-bit 8088 microprocessor, the same as used in the IBM-PC. This allows the Heathkit PCs to run 99% of all IBM-PC software. And you can run practically all of them right out of the box without any program alterations. In addition, you get switchable 8 MHz or 5 MHz operation for different running software programs.

Consult our charts at the bottom of these two pages. They'll show the standard features of the HS-148 PC and the HS-158 PC. They'll also show how to expand each one to meet your ever-changing needs. Meet your growing needs by expanding. Almost any IBM PC accessory board can be used with the HS-148 Compact PC. Just insert it into the optional ZA-148-2 Expansion Board that plugs into the computer's main board. With the HS-158 PC you have six open IBM-compatible slots that can accept most any off-the-shelf accessory boards designed for the IBM PC.

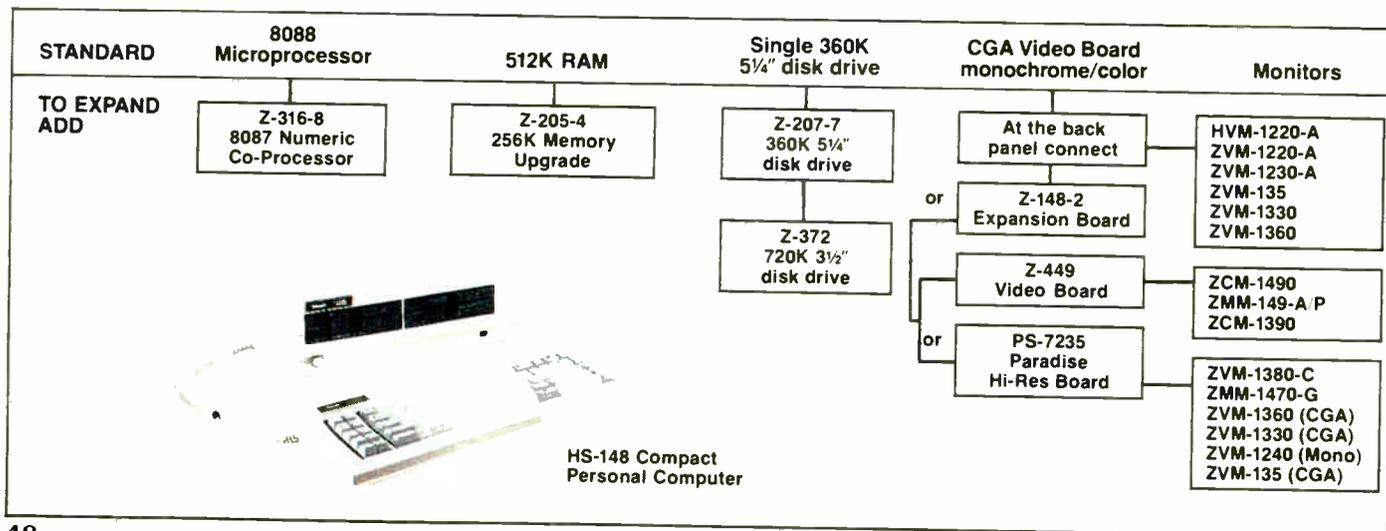
Enjoy interest-grabbing full color graphics or monochrome displays with either the Compact or Expandable PC. Both outputs are available on each computer for you to use. Or choose higher resolution graphics for the HS-158 with the addition of a Z-319 Video Card. Or, add an optional Z-449 VGA Video Card (HS-148 uses a ZA-148-2).



HS-148 Compact Personal Computer

HS-158 Expandable Personal Computer

Computers are shown with optional monitors and second disk drives





For communications flexibility, make use of an IBM compatible serial and a parallel port. Add a dot matrix or letter quality printer, plotter, modem or other peripheral to help you get your work done faster, easier and more effectively.

The MS-DOS operating system and a diagnostics disk are included FREE with both of these top-performing computers.

Uses 115/230 VAC, 50/60 Hz. Alternate AC line cord required for 230 VAC operation.

Configurations:

NEW! Kit HS-148-H* Compact Personal Computer with 512K RAM, one 5¼" disk drive with 360K total storage, MS-DOS and diagnostics. Ship wt. 51 lbs. **\$499.95**

NEW! Kit HS-158-H* Expandable PC with monochrome and color capability, 512K RAM, one 5¼" disk drive with 360K total storage, and MS-DOS. Ship wt. 66 lbs. **\$699.95**

Accessories:

Assembled Z-207-7 Optional 5¼" floppy disk drive with 360K storage. Ship wt. 5 lbs. **\$199.00**

NEW! Assembled ZD-372 Optional 3½" floppy disk drive with 720K storage. Ship wt. 3 lbs. **\$199.00**

Winchester Upgrade for installing an optional 20MB Winchester hard disk drive into only the HS-158 Expandable PC. **Kit HWD-20** Ship wt. 5 lbs. **\$499.95**

NEW! Assembled Z-316 8087 Numeric Co-Processor for Heath/Zenith Personal Computers operating at 4.77 MHz. Ship wt. 1 lb. **\$225.00**

Assembled Z-316-8 8087 Numeric Co-Processor that can be inserted into the empty socket on the CPU board of an 8 MHz Heath/Zenith Personal Computers operating at 4.77 MHz or 8 MHz. Ship wt. 1 lb. **\$285.00**

Assembled Z-205-4 256K Memory Chip Set.

Ship wt. 1 lb. **\$80.00**

NEW! Assembled Z-449 Color Video Card with automatic video switching between MDA, CGA, EGA, VGA and Hercules graphics on a 31 kHz video monitor.

Ship wt. 3 lbs. **\$599.00**

Assembled PS-7235 PARADISE Hi-Res Graphics Card for HS-148 (requires ZA-148-2) and HS-158 Computers.

Ship wt. 1 lb. *Was \$299.00 Now \$199.00*

Assembled ZA-148-2 Expansion Board for Heath/Zenith 148 Compact Personal Computers contains two PC compatible slots, one for a Winchester controller and the second for use with any IBM PC compatible card.

Ship wt. 3 lbs. **\$99.00**

Assembled Z-304 Optional Async Serial Port.

Ship wt. 2 lbs. **\$20.00**

Assembled Z-319 Bit-Mapped Video Graphics Card emulates video of the H/Z-100 Computer. Requires MS-DOS (OS-63-41) and the MS-DOS H/Z-100 Operating System for the Heath/Zenith-150 (OS-63-32) on page 56.

Ship wt. 1 lb. **\$424.00**

SAVER! Get both the Z-319 Video Card and the MS-DOS Enhancement (OS-63-32) in this combination package and save over separate costs. **Assembled ZSS-100-27.**

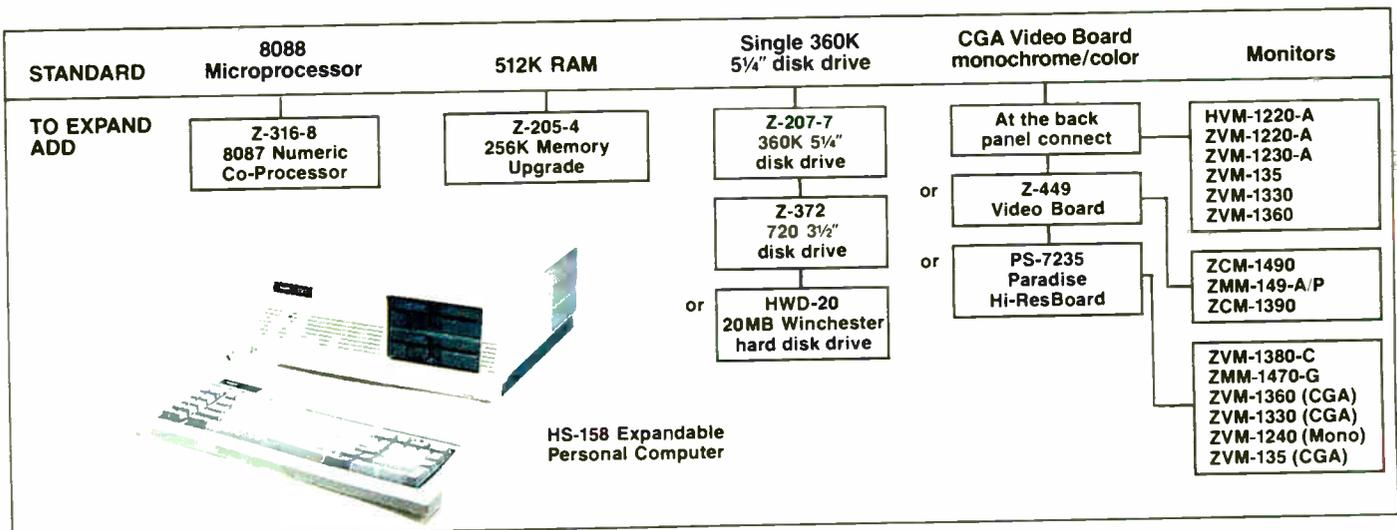
Ship wt. 12 lbs. **\$449.00**

TM-140 Technical Manual for the HS-148 and Z-138 Compact Personal Computers. Ship wt. 3 lbs. **\$49.00**

TM-158 Technical Manual for the HS-158 Expandable Personal Computer. Ship wt. 3 lbs. **\$25.00**

*Computers so marked include FREE menu-driven Integrated 7+ software containing a spreadsheet as easy as 1-2-3, a word processor, relational database manager, database merging, graphics, terminal emulation and PC-to-PC communications.

Protect your computers with surge suppressors -- see page 99.





HS-248 Advanced PC
with optional video monitor
and second disk drive

Economical power for computer users plus a FREE Partnership Pack

Stay ahead of the pressing demands made on your computer when it's the Heathkit Advanced Personal Computer. It's built for power with a blistering 8 MHz operating speed, extensive memory, huge data storage capacity, internal expandability and IBM PC AT compatibility. And it's an easy kit to assemble. All the circuit boards are preassembled, fully factory tested and test-run for complete reliability. Plus you get a FREE Partnership Pack with a value of \$500. See page 51 for details.

The Advanced PC is highly compatible with the IBM PC AT, so you can run

virtually all PC AT applications software as well as many programs written for the IBM PC and XT. The Advanced PC can act as a stand-alone tool or serve as the center of a powerful and expandable business system. Or this computer can efficiently serve as many as 16 PCs in a cost-effective local area network.

Based on the 80286 processor, the Advanced PC levels mountains of data to give you answers faster. It speeds through calculations using "zero wait state" technology and a lightning fast 8 MHz operating speed making it one-third faster than the PC AT. And by installing an optional Z-416-C Numeric Co-Processor, many number intensive programs are accelerated even more.

Memory in the Advanced PC comes fully loaded with 512K of RAM, enough memory to handle almost any program. And for those other memory hungry programs, you can install two optional Z-445 Memory Expansion Cards for up to 3MB of RAM.

The Advanced PC has an extensive storage capacity. A 1.2 MB floppy disk drive comes as standard equipment. To this you can add an optional 360K floppy drive to easily transfer PC software. Or you can add another 1.2MB floppy drive. Or install the optional Z-417 Winchester controller card and add an internal 20MB or 40MB Winchester hard disk drive. With the optional controller card installed your Advanced PC can now handle two floppy and two Winchester disk drives for a maximum in data storage efficiency.

The Advanced PC comes without a video board so you can select from text, graphics or high-resolution video options. Choose from among our video

cards that supply color or enhanced graphics displays. Also, virtually any PC video card works in the Advanced PC.

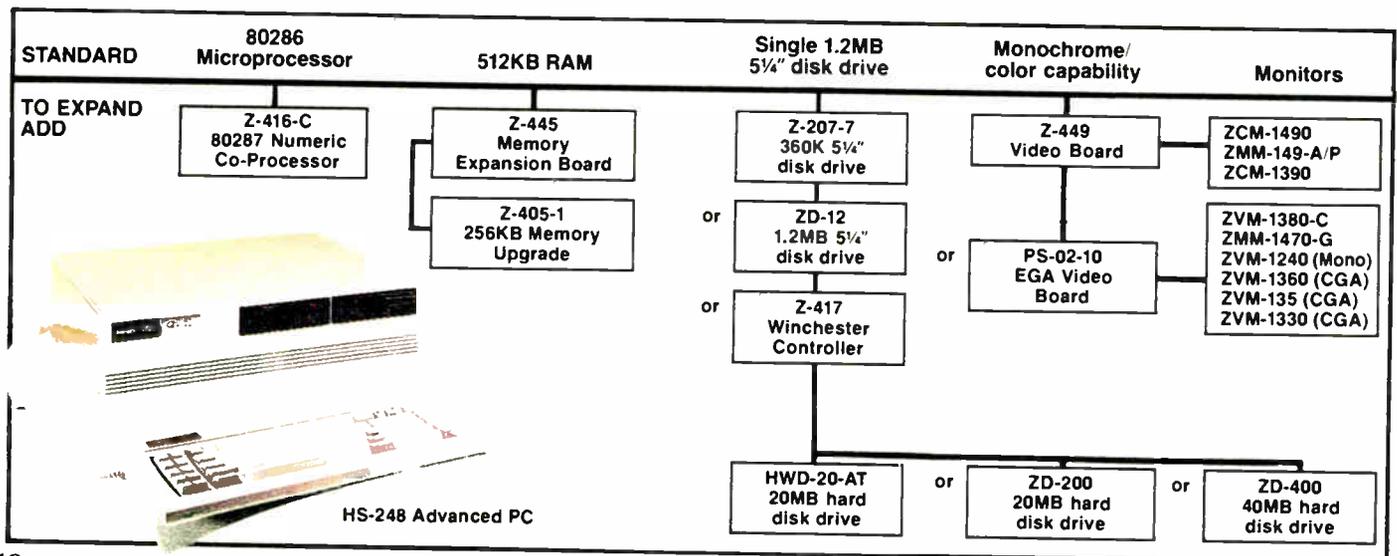
Seven open expansion slots inside the Advanced PC allow you to easily expand or upgrade this computer whenever you need. Install memory cards, modems, enhanced video display options, and multi-port serial cards to name but a few choices. Available inside are two 8-bit only slots, four 8-/16-bit slots and one Zenith video option slot.

One serial and one parallel port are also standard on this advanced expandable computer. You get a 9-pin RS-232-C male connector at the serial port and a Centronics-type 25-pin DB25 female connector at the parallel port. These two ports enable you to use a wide variety of peripheral devices, such as printers, modems, graphics pads and plotters.

The Advanced Personal Computer is powered by a 200 watt switching-type supply that provides plenty of reserve power. It can accommodate up to the maximum of ten circuit boards, two floppy disk drives and two Winchester drives. Uses 115/230 VAC, 50/60 Hz. Alternate AC line cord required for 230 VAC operation.

Configurations:

Kit HS-248-S Advanced PC equipped with a floppy-only controller and one 5¼" 1.2MB disk drive. Requires video board (and also includes diagnostics disk, MS-DOS and GW-BASIC). Ship wt. 65 lbs. . . . Was \$1999.00 Now **\$1599.95**



NEW! Kit HS-248-SX Advanced PC with all the features of the above HS-248-S plus the Z-417 Winchester Controller and a HWD-20-AT 20MB Winchester hard disk drive. Also includes FREE menu-driven Integrated 7+ software containing a spreadsheet as easy as 1-2-3, a word processor, relational database manager, database merging, graphics, terminal emulation and PC-to-PC communications. Ship wt. 73 lbs. **\$1999.95**

Accessories:

Assembled Z-445 Memory Expansion Card for Heath/Zenith 200-series computers operating at 8 MHz with zero wait states. Comes with 512K RAM. The first 128K is used to expand base memory to 640K. This card can also be used to increase extended memory up to 1.0M byte using two sets of Z-405-1 256K RAM chip set. Ship wt. 2 lbs. **\$349.00**

Assembled Z-405-1 256K Memory Chip Set for use with the Z-445 Memory Expansion Card. Ship wt. 1 lb. **\$240.00**

NEW! Assembled Z-449 Color Video Card with automatic video switching between MDA, CGA, EGA, VGA and Hercules graphics on a 31 kHz video monitor. Ship wt. 3 lbs. **\$599.00**

Assembled PS-02-10 Enhanced Graphics Card is compatible with virtually all major PC graphics standards including IBM CGA,

Plantronics Extended CGA Color Mode, IBM EGA, IBM MDA and Hercules Monochrome Graphics. This card also offers automatic transparent switching between video modes without special software or manual hardware switching, 256K video memory, flicker free scrolling and an IBM compatible parallel printer port. Ship wt. 2 lbs.
 Was \$499.00 Now **\$399.00**

Assembled Z-416-C 80287 Numeric Co-Processor that can be inserted into an empty socket on the CPU board of Heathkit/Zenith 200-series computers operating at 6 or 8 MHz. Ship wt. 1 lb. **\$375.00**

Assembled Z-207-7 Optional 5¼" high density floppy disk drive capable of storing 360K bytes of information on a single floppy disk. Ship wt. 5 lbs. **\$199.00**

Assembled ZD-12 Optional 5¼" 1.2MB floppy disk drive with 1.2MB data storage. Ship wt. 5 lbs. **\$250.00**

Assembled Z-417 Winchester Controller Card. Ship wt. 1 lb. **\$349.00**

Assembled HWD-20-AT Winchester Upgrade Kit for installing an optional 20MB 65 ms hard disk drive, cables included. Requires Z-417 Controller Card. Ship wt. 4 lbs. **\$429.95**

Assembled ZD-200 Optional 20 MB 40 ms Winchester disk drive. Requires Z-417-1 cable (and separate Z-417 Controller Card for floppy-only models). Ship wt. 9 lbs. **\$1199.00**

Assembled ZD-400 Optional 40MB 30 ms Winchester disk drive. Requires Z-417-1 cable (and separate Z-417 Controller Card for floppy-only models). Ship wt. 9 lbs. **\$1699.00**

Assembled Z-417-1 Winchester Cable required for the installation of the first 20MB or 40MB Winchester drive into Heath/Zenith 200-series computers. Ship wt. 1 lb. **\$20.00**

Assembled HCA-200-PC Serial RS-232-C Cable features a female 9-pin "D" connector to a male 25-pin "D" connector. This 6-foot cable converts the serial output connector from the Heath/Zenith 200-series computer and the IBM PC AT to the serial output connector standard of Heath/Zenith PCs and the IBM PC. Ship wt. 1 lb. **\$35.00**

More accessory circuit boards can be found on page 89.

Protect your computer investment with surge suppressors – see page 99.

FREE Partnership Pack with every Heathkit Personal Computer

Save up to \$500, and even more, with the discounts you'll find inside a Heath/Zenith Partnership Pack. And it's yours FREE with every Heathkit Personal Computer purchase. The Pack is loaded with valuable certificates designed to help get you up and running on your new computer. And the Pack will supply you with support through your very important first year of ownership.

The Partnership Pack includes a free diagnostic check-up and discounts on Winchester or floppy disk drive upgrades. Inside the Pack you'll also find certificates good for discounts on software, a free software offer and free computer training software. With the options provided by these certificates your savings could total even more than \$500.

Get your own personalized Partnership Pack and become a partner with those who are dedicated to bringing you quality products, service and support. Like the name on the pack implies, you become more than a customer. You become our partner when you choose to purchase our products. We stand beside you – always.

Discover the fun of computer kitbuilding at your Heath/Zenith Computers & Electronics Center.



Shop by computer

Enjoy the ease and convenience of shopping by using your computer with the Heathkit Online Catalog through COMPUSERVE. Just type in GO HTH at any "!" or "OK" prompt and get instant electronic access to bargains, specials and new products.

Browse through over 400 products by following a series of menus. You can even place your order online using your Visa, MasterCard or Heath Revolving Charge.



Career Opportunities

The following exciting and challenging job opportunities currently exist at Heath Company.

- Educational Media Designers
- Financial Analysts
- Programmer Analyst
- Technical Writers
- Systems Engineers
- Hardware/Software Design Engineers
- Manufacturing Engineers
- Documentation Writers
- Programmers
- Collectors
- Retail Management/ Outside Sales
- Circuit Board Designers
- Continuing Engineer
- Production Supervisors
- Computer Technicians
- QA Engineers
- Test Engineers
- Buyers
- Project Managers

To find out more, call or send your resume and salary requirements to Mr. Wayne Petzke, Heath Company, Dept. HC87, Hilltop Rd., St. Joseph, MI 49085, (616) 982-3484.

An Equal Opportunity Employer M.F/H/V
Part of the Zenith Computer Group

Need assistance or information? Just give us a call.

Product Orders (TOLL-FREE except Alaska and Michigan) (8:00 A.M.-5:00 P.M., Eastern Time)	1-800-253-0570
Product Orders for Alaska and Michigan (24-hour number - sorry, toll-free service not available)	616-982-3411
Replacement Parts Orders: (please have Heath part number available when you call)	616-982-3571
Order information, delayed shipments, etc	616-982-3275
Overseas Orders: International Division	616-982-3512
Computer Sales Information	616-982-3285
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• Educational Products	616-982-3296
• Amateur Radio	616-982-3315
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• Television	616-982-3496
• Home Products, Stereo, Security, Telephone, Marine, Automotive	616-982-3496
• Computers	616-982-3309
• Hardware	616-982-3309

ORDERING IS EASY!



BY PHONE: 1-800-253-0570
CALL TOLL FREE!

TO ORDER TOLL-FREE, call 1-800-253-0570, using your Heath Revolving Charge or Visa or MasterCard credit cards (min. purchase \$10). Call toll-free between 8:00 A.M. and 5:00 P.M. Eastern Time Monday through Friday; Alaska and Michigan orders, or after 5:00 P.M. and weekends, call 616-982-3411. If you want the quickest handling and service possible, just fill out our order form between pages 52 and 53 before you call.



BY MAIL: Please follow these simple steps so we can handle your order quickly:

- Use the handy order form between pages 52 and 53.
- Write your name the same, 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 53.
- Please use separate sheet to order parts, manuals or for any correspondence.

TERMS: • Open new accounts with purchases as small as \$100 with 10% down. Write to Heath Company for your Heath Revolving Charge application. No minimum required for "add-ons" to your account (except parts orders - see credit card plans below). Be sure to sign the charge agreement. Use credit cards for parts orders.



- MasterCard and Visa credit plans. Use your credit cards to charge Heathkit products. Just fill in your credit card number in the space provided on the order form. Include your card expiration date and sign the order form. NOTE: We accept credit card orders for replacement parts.
 - Commercial Accounts: If you're a company with rated credit, you can have net 30-day terms.
 - Educational Accounts: Net 30-day terms to Patterson-listed educational institutions. Authorized purchase order is required.
- Note: All credit orders subject to Heath Credit Department approval.

COMMERCIAL, INDUSTRIAL & EDUCATIONAL SALES:

Heath Company can fill out quantity orders for any of its quality-engineered electronic kit or assembled products. We can provide what you want...special modifications to products... custom packaging...private labeling, this includes our famous educational manuals...special quantity sales...OEM sales...blanket orders. Just give us a call and find out what we can do for you.

Heath Company makes many different and often unique electronic kit and assembled products. These products extend from exciting and innovative consumer items to reliable and accurate test instruments...across many price ranges. And in purchases of 250 or more these can be customized to reflect your company's image and market. We can also tailor our highly acclaimed electronic education materials to suit your target market and with your company logo.

To find out how to put our quality products into your package or information about quantity sales or specific modifications to products, write or call Contract Sales Department, 616-982-3519.

For quantities less than 250, contact Marketing Services Department, 616-982-3454.

Note: Quantity discounts apply to single models only; not combination orders, special orders or systems.

MONEY-BACK HEATHKIT MANUAL PREVIEW

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 or the SK-100 Educational Manual.

Send orders for manuals on a separate sheet of paper to Heath Co., Parts Department, Benton Harbor, MI 49022.

To get a free copy of the warranty for any customer product in this catalog costing more than \$15, simply write the Manager of Marketing Services, Heath Company, Benton Harbor, MI 49022.

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

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.

b. 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.

Zip Code Prefixes	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	659-679	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	769	6	922-928	7
154-160	4	330-334	6	437-457	3	540	4	770-778	5	930-934	8
161	3	335-338	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
				354	5	467-469	2	567	5	800-803	5
						470-472	3	570-572	4	804-805	6
200-232	4	355-359	4			573	5	573-588	5	806-807	5
233-237	5	360-361	5	473	5					808-816	6
238-259	4	362	4	474-475	3	590-597	6			808-816	6

RATE CHART

Heath Shipping and Handling Charges, available items only. See special shipping and handling information for Motor Freight items

Your shipping and handling charges are indicated in the zone column across from the shipping weight

NOTE: UPS 2nd Day Air Service covers continental U.S. Zone 0 Covers HI (Honolulu).

IMPORTANT: Shipping weights listed for model numbers shipped in more than one carton, or of excessive length, have been adjusted to provide correct postage

For weights over 50 lbs. and up to 70 lbs.

Shpg. wt.	Zone 1 & 2		Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	UPS 2nd DAY AIR SERVICE		
	\$1	\$2	\$1	\$1	\$1	\$1	\$1	\$1	Zone A	Zone D	
1	\$1	\$23	\$1	\$2	\$1	\$4	\$1	\$2	\$1	\$7	\$4
2	1	24	1	34	1	63	1	73	1	87	2
3	1	32	1	48	1	80	1	95	2	15	5
4	1	40	1	56	1	91	1	107	2	20	6
5	1	49	1	66	1	103	1	120	2	26	7
6	1	57	1	75	1	110	1	128	2	32	8
7	1	65	1	82	1	118	1	136	2	38	9
8	1	73	1	90	1	126	1	144	2	44	10
9	1	82	1	97	1	134	1	152	2	50	11
10	1	90	1	104	1	142	1	160	2	56	12
11	1	98	1	111	1	150	1	168	2	62	13
12	2	06	2	119	2	158	2	176	3	68	14
13	2	15	2	127	2	166	2	184	3	74	15
14	2	23	2	135	2	174	2	192	3	80	16
15	2	31	2	143	2	182	2	200	3	86	17
16	2	39	2	151	2	190	2	208	3	92	18
17	2	48	2	159	2	198	2	216	3	98	19
18	2	56	2	167	2	206	2	224	3	104	20
19	2	64	2	175	2	214	2	232	3	110	21
20	2	72	2	183	2	222	2	240	3	116	22
21	2	81	2	191	2	230	2	248	3	122	23
22	2	89	2	199	2	238	2	256	3	128	24
23	2	97	2	207	2	246	2	264	3	134	25
24	2	105	2	215	2	254	2	272	3	140	26
25	2	114	2	223	2	262	2	280	3	146	27
26	3	22	3	31	3	41	3	51	4	20	34
27	3	30	3	40	3	50	3	60	4	26	35
28	3	38	3	48	3	58	3	68	4	32	36
29	3	47	3	56	3	66	3	76	4	38	37
30	3	55	3	64	3	74	3	84	4	44	38
31	3	63	3	72	3	82	3	92	4	50	39
32	3	71	3	80	3	90	3	100	4	56	40
33	3	80	3	88	3	98	3	108	4	62	41
34	3	88	3	96	3	106	3	116	4	68	42
35	3	96	3	104	3	114	3	124	4	74	43
36	4	04	4	112	4	122	4	132	5	80	44
37	4	13	4	120	4	130	4	140	5	86	45
38	4	21	4	128	4	138	4	148	5	92	46
39	4	29	4	136	4	146	4	156	5	98	47
40	4	37	4	144	4	154	4	164	5	104	48
41	4	46	4	152	4	162	4	172	5	110	49
42	4	54	4	160	4	170	4	180	5	116	50
43	4	62	4	168	4	178	4	188	5	122	51
44	4	70	4	176	4	186	4	196	5	128	52
45	4	79	4	184	4	194	4	204	5	134	53
46	4	87	4	192	4	202	4	212	5	140	54
47	4	95	4	200	4	210	4	220	5	146	55
48	4	103	4	208	4	218	4	228	5	152	56
49	4	111	4	216	4	226	4	236	5	158	57
50	4	120	4	224	4	234	4	244	5	164	58
Add'l	08	12	16	21	27	34	41	50	61	1	18
lbs	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb

SPECIAL SHIPPING AND HANDLING:

- **MOTOR FREIGHT ITEMS**—Items indicated Motor Freight exceed weight or size limitations of UPS or Parcel Post. 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.
- **APO/FPO Shipments**—Use the following Zones to estimate costs: West Coast—Zone 8; East—Zone 5; Miami—Zone 6. PAL (Airlift Military) transports packages by air for \$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.



HS-386 Desktop Computer with optional video display and second disk drive

H-386 Desktop Computer – the most powerful computer kit ever



SKILL LEVEL 3 In less than two evenings you can build a powerful 80386-based microcomputer with superb high-resolution graphics priced in the range of IBM's XT and AT. Included with your computer are bonuses like MS-DOS, diagnostics and a Partnership Pack (see page 53). In addition, Integrated 7+ software (see right) is bundled-in making this computer a terrific bargain. And when your kit is finished you'll have a high quality, highly reliable computer. Every INTEL 80386 microprocessor used in our HS-386s are 100% tested for

ALL functions whether checked by MS-DOS or not.

The HS-386 is built for today's major computer applications like windowing operations, software development, CAD/CAM, desktop publishing, very large spreadsheets and networking. You can run most all PC and AT compatible software. And at a 16 MHz operating speed they'll run two to three times faster than on 8 MHz AT computers.

Plus, you get a 31 KHz video card that automatically emulates EGA, CGA, MDA and Hercules depending on what your software requires. And this high-resolution card uses the new Zenith flat tension screen color monitor among others. You also get "zero wait" state technology, 1MB of RAM that can be expanded up to 16MB, serial and parallel communications ports, a hard disk and floppy controller, and ROM-based diagnostics.

Uses 115/230 VAC, 50/60 Hz. Alternate AC line cord required for 230 VAC operation. 6.5" H x 21" W x 16.5" D.

Kit HS-386-A Desktop Computer equipped with 1MB RAM, video card and one 1.2MB 5¼" disk drive. Includes MS-DOS, diagnostics and Integrated 7+ software. Ship wt. 65 lbs. ... **\$3349.95**
Accessories:

Assembled ZD-12 Optional 5¼" 1.2MB disk drive. Ship wt. 5 lbs. **\$250.00**

Includes Integrated 7+. This is a menu-driven applications package containing a spreadsheet as easy as 1-2-3, a word processor, relational database manager, database merging, graphics, terminal emulation and PC-to-PC communications. A super value!

Assembled Z-207-7 Optional 5¼" 360K disk drive. Ship wt. 5 lbs. **\$199.00**

Assembled HWD-20-AT Winchester Upgrade Kit for installing an optional 20MB 65 ms hard disk drive, cables included. Ship wt. 4 lbs. **\$429.95**

Assembled ZD-400 Optional 40MB 30 ms Winchester disk drive. Requires Z-417-1 Cable when installing in floppy-only models. Ship wt. 9 lbs. . . **\$1699.00**

Assembled ZD-800 Optional 80MB Winchester hard disk drive. Requires Z-417-1 Cable when installing in floppy-only models. Ship wt. 9 lbs. . . **\$1999.00**

NEW! Assembled Z-505 Fully populated 1MB Memory Expansion Board with enable/disable EMS memory. Ship wt. 3 lbs. **\$699.00**

NEW! Assembled Z-515 Fully populated 4MB Memory Expansion Board with enable/disable EMS memory. Ship wt. 3 lbs. **\$2199.00**

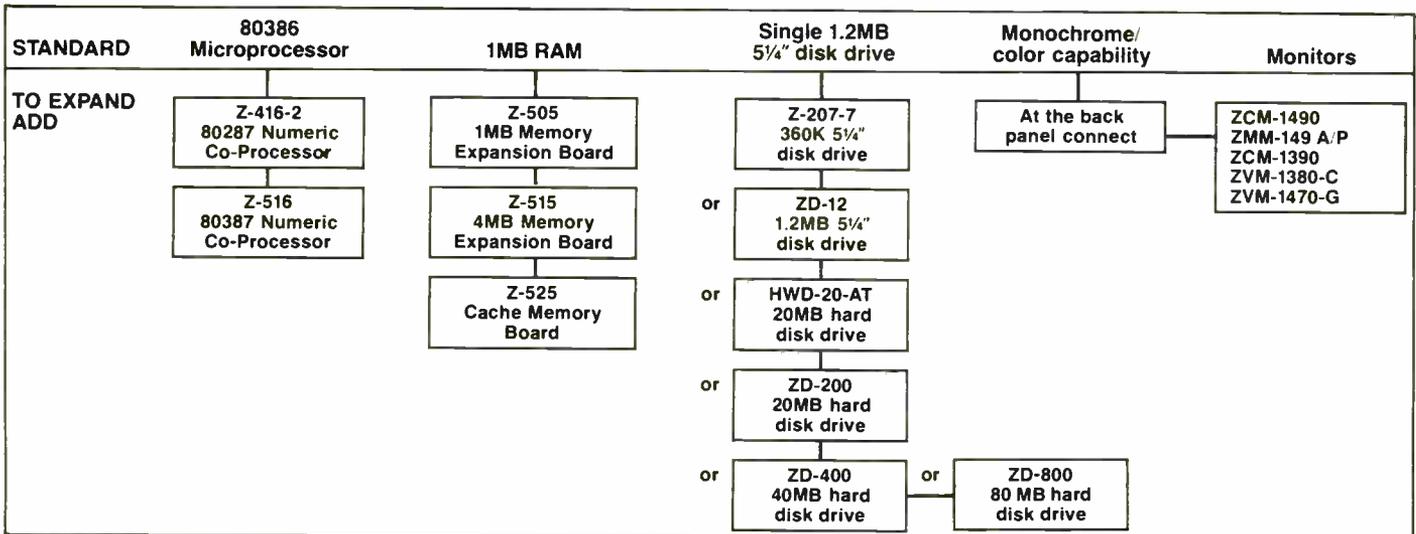
NEW! Assembled Z-525 High-Speed Cache Memory Card with 64KB of RAM. Ship wt. 2 lbs. **\$599.00**

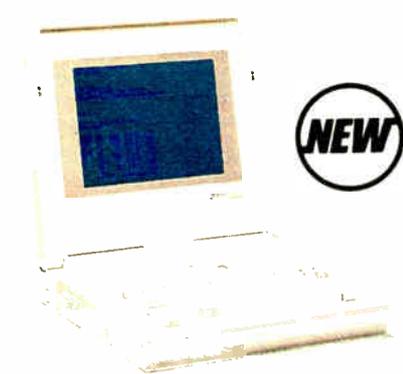
NEW! Assembled Z-416-2 80287 Numeric Co-Processor operating at 10 MHz. Ship wt. 1 lb. **\$525.00**

NEW! Assembled Z-516 80387 Numeric Co-Processor. Ship wt. 1 lb. **\$1199.00**

NEW! Assembled Z-449 Color Video Card with automatic video switching between MDA, CGA, EGA, VGA and Hercules graphics on a 31 kHz video monitor. Ship wt. 3 lbs. **\$599.00**

Assembled Z-417-1 Winchester Cable required for the installation of the first Winchester hard disk drive. Ship wt. 1 lb. **\$20.00**





Winchester drive in Zenith full-featured portable computer

Zenith Data Systems now adds Winchester data storage capability to its popular Portable Personal Computer. With an internal 3½" hard disk drive, the Z-183 puts 10 megabytes of on-line data storage at your disposal in addition to its other desktop-like functions. More than ever, the Z-183 is capable of satisfying your portable computer needs.

This IBM compatible laptop offers a full 640KB RAM, switchable 4.77 and 8 MHz operation, large capacity 720KB pop-up 3½" disk drive, serial and parallel port, and a user-friendly full-function keyboard. Plus the Z-183 boasts a large 25 line by 80 character screen that's perhaps the most advanced screen available in a portable. Display images are crisp, bold and bright. 3½" H x 14" W x 13⅝" D.

Assembled ZWL-183-92

Ship wt. 18 lbs. \$3499.00

Accessories: **Assembled ZA-180-40**

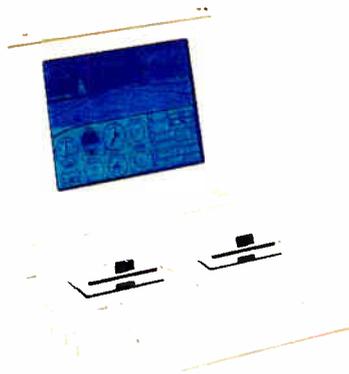
Optional 4 amp/hr "D" cell battery.

Ship wt. 1 lb. \$129.00

Assembled ZA-180-45 Optional

2.5 amp/hr "D" cell battery.

Ship wt. 3 lbs. \$119.00



Improved Z-181 Portable Personal Computer

To the advanced Z-181 Portable PC, Zenith Data Systems is adding a switchable 4.77 and 8 MHz system clock and an external bus connection for an optional 3½" 20 MB Winchester hard disk drive. These new enhancements plus the full desktop features of the Z-181 make it a truly superior laptop.

Other outstanding features include a standard 640K memory, IBM PC/XT compatibility, two 3½" pop-up disk drives with 720K storage per diskette, a serial and a parallel port, and a professional keyboard. Weighs less than 12 pounds. Plus it has a built-in backlit display that earned the Z-181 an Award for Technical Excellence from *PC Magazine*. 3⅝" H x 13½" W x 11⅝" D.

Assembled ZFL-181-93

Ship wt. 18 lbs. \$2399.00

Accessories: **ZA-180-20** External 20MB Winchester hard disk drive in separate case with 120/240 VAC power supply (requires HCA-78 cable). Ship wt. 12 lbs. \$1299.00. **ZA-180-21** Optional 12.5 volt 2 amp/hr battery. Ship wt. 2 lbs. \$99.00. **ZA-181-4** 240 VAC Adapter. Ship wt. 1 lb. \$69.00. **HCA-78** Winchester to Z-181 interconnecting data cable (4 ft.). Ship wt. 1 lb. \$99.00.



\$600 in savings plus six great built-in Microsoft programs

With the Zenith Data Systems ZP-150 Laptop Computer you save three ways. You get \$300 off the computer's regular price and you get \$100.00 worth of accessories FREE, one RAM Module and the Printer cable are included. Plus you also get a certificate good for \$200 off any future purchase. That's a total savings of \$600 on a powerful laptop computer that can go anywhere and do sales forecasts, school work, budgeting, pricing and more.

Access six built-in programs from Microsoft's WORKS ROM. On the LCD screen create documents, do spreadsheets, write BASIC programs, record appointments, work with data bases or use it as a terminal. (HAMS... the ZP-150 makes a great and inexpensive remote terminal for your shack.) And you can call up an alarm, a calculator and a telephone dialer from within any of these six programs. A Systems Manager (much easier to use than a DOS) allows you to run the six programs, exchange information between programs and manage files.

The ZP-150 comes equipped with an easily readable LCD display that can be tilted and the intensity adjusted for optimum viewing. The Laptop weighs less than eight pounds and is small enough to fit in most standard size briefcases. The ZP-150 uses ten "AA" batteries (not included) when not using AC.

And the File Transfer software (below) is included FREE. When ordering your Laptop, remember your FREE accessories and include ZP-150-2 and ZP-150-4 on the order form and write "No Charge" in the price column. **Assembled ZP-150** Ship wt. 22 lbs. Regularly \$999.00 Now \$699.00

Accessories: **ZP-150-2** 32K RAM module. Ship wt. 1 lb. \$79.00. **ZP-150-4** Parallel to Centronics printer adapter cable. Ship wt. 1 lb. \$19.00. **CB-5063-27** Software for transferring files from the ZP-150 to other MS-DOS computers. Ship wt. 3 lbs. \$49.00.

More accessories for both Z-181 and Z-183 Computers

ZA-180-35 External battery recharger. Ship wt. 1 lb. \$29.00

ZA-181-18 1200 baud internal modem. Ship wt. 2 lbs. \$399.00

ZA-181-7 Auto cigarette lighter power adapter. Ship wt. 1 lb. \$19.00

ZA-181-8 External 5¼" disk drive (requires HCA-77 cable; previous ZFL-181-92 requires HCA-76). Ship wt. 12 lbs. \$399.00

ZA-181-9 Monochrome video cable. Ship wt. 1 lb. \$19.00

ZA-181-17 Universal padded laptop carrying case. Ship wt. 3 lbs. \$59.00

HCA-77 External floppy disk drive data cable (4 ft.). Ship wt. 1 lb. \$49.00

HCA-76 Cable only for ZFL-181-92 external disk drives. Ship wt. 1 lb. \$19.00



*New products

	Heath/Zenith Personal Computers and Portable PCs			H/Z-100 Advanced Desktop Computer		
	Model Number	Ship Wt (lbs.)	Price (\$)	Model Number	Ship Wt (lbs.)	Price (\$)
OPERATING SYSTEMS						
MS-DOS H-100 Op. Sys. for H-150 (5,12,18)	OS-63-32	1	150.00	OS-63-30	5	150.00
MS-DOS Vers. 3 (2,5)	OS-64-61	4	149.00	CB-3163-30	5	225.00
MS-DOS Vers. 3.2 (2,5)	CB-3163-30	5	225.00	MS-3063-30	3	99.00
MS-DOS Vers. 3 Programmer's Package (2,6,7)	MS-5063-30	3	99.00			
Microsoft Windows* (3,6,7)	PT-5063-1	3	49.00			
PolyWindows Desk Plus (1,6,7)	OS-63-70	5	429.00			
XENIX*	OS-63-80	3	429.00			
*XENIX Systems 5 Time Share System	OS-63-81	3	499.00			
*XENIX Systems 5 Development System (24)	OS-63-82	3	149.00			
*XENIX Systems 5 Text Processor						
OPERATING SYSTEM INTERFACES						
*MS-DOS Manager	MS-4164-50	3	49.00			
WORD PROCESSING						
Multimate* (3,6,7)	SS-5063-1	3	495.00	RS-463-75	3	295.00
PeachText 5000* (1,6,7)	RS-463-75	3	295.00	MP-463-17	4	399.00
WordStar Professional* (2,5,7)						
SPREADSHEETS						
LOTUS 1-2-3 Release 2 (2,6,7,16)	LS-5063-2	5	495.00	SC-463-1	4	195.00
SuperCalc* (5,7)	SC-5063-4	3	395.00			
SuperCalc 3 (1,6,7)						
DATA BASE MANAGEMENT SYSTEMS						
R:BASE 5000 (3,5,7)	MR-5063-1	6	695.00	CD-5063-3	5	650.00
R:BASE 5000 Interface (3,5,7)	MR-5063-2	3	395.00	AT-5065-2	3	495.00
Condor rDBMS* (1,5,7)	CD-5063-3	5	650.00			
dBASE II* (1,5,7)	AT-5065-2	3	495.00			
dBASE III Plus(3,6,7)	AT-5063-5	11	695.00			

Minimum Computer Hardware and Software Requirements:

- | | |
|---|--|
| (1) 128K RAM | (17) Z-304 Synchronous Serial Port |
| (2) 192K RAM | (18) For H-100 mode operation |
| (3) 256K RAM | (19) H/Z-200 Computers only. |
| (5) One 5 1/4" disk drive | (22) 1.2 MB floppy and 20 MB Winchester Drive. |
| (6) Two 5 1/4" disk drives | (23) 512K RAM |
| (7) MS-DOS Operating System | (24) XENIX Operating System |
| (11) Z-204 Multipoint I/O Card | (25) MS-DOS for the Z-181 |
| (12) Z-319 Video Graphics Card | |
| (16) Not available by mail order. Visit your nearest Heath/Zenith Computers & Electronics Center. | |

*CP/M and CP/M-86 are registered trademarks of Digital Research Inc. WordStar is a registered trademark of MicroPro International Corporation. PeachText 5000 is a registered trademark of MSA, Inc. SuperCalc is a registered Trademark of Computer Associates International Inc. Condor is a registered trademark of Condor Computer Corporation. WordStar Professional is a trademark of MicroPro International Corporation. SuperCalc3 is a trademark of Computer Associates International Inc. Condor rDBMS is a trademark of Condor Computer Corporation. XENIX and Windows are trademarks of Microsoft Corporation. dBASE II is a registered trademark of Ashton-Tate. dBASE III is a trademark of Ashton-Tate.



	Heath/Zenith Personal Computers and Portable PCs			H/Z-100 Advanced Desktop Computer		
	Model Number	Ship Wt (lbs.)	Price (\$)	Model Number	Ship Wt (lbs.)	Price (\$)
DATA BASE MANAGEMENT SYSTEMS R:BASE 5000 (3,5,7) R:BASE 5000 Interface (3,5,7) Condor rDBMS* (1,5,7) dBASE II* (1,5,7) dBASE III Plus (3,6,7)	MR-5063-1 MR-5063-2 CD-5063-3 AT-5065-2 AT-5063-5	6 3 5 3 11	695.00 395.00 650.00 495.00 695.00	CD-5063-3 AT-5065-2	5 3	650.00 495.00
COMMUNICATIONS AND TERMINAL EMULATION HYPERACCESS (See page 59) 3278/79 Standard Coax Connector (1,5,7) MBridge Emulator (1,5,7,17) 3270 Emulator (2,6,7,17) 3780 Emulator (2,6,7,17) ZSTEM-VT100 Emulator (1,5,7) Z-181 Interface software to PCs (25) Z-181 Interface plus 9 pin/25 pin null modem cable (25) Z-181 Interface + 25 pin/25 pin null modem cable (25)	PM-160 CX-5063-1 MB-5065-1 PO-5063-1 PO-5063-2 KE-5063-2 CB-5063-37 CBG-5063-1 CBG-5063-2	3 3 1 2 3 2 1 2 2	149.00 895.00 295.00 499.00 499.00 149.00 79.00 99.00 99.00	PM-162	3	149.95
COMPUTER AIDED INSTRUCTION Z-Tap Typing Tutor (3,5,7) Teach-N-Tutor (3,5,7)	CB-5063-32 CB-5063-33	3 3	79.00 199.00			
DIAGNOSTICS Disk-Based Computer Tests (1,5) Personal Computer Diagnostics (1,5) ★ Z-150 PC Diagnostics Z-200 PC Diagnostics (3,5) ★ H-300 PC Diagnostics	CB-4164-28 CB-4164-29 CB-4164-40 CB-4164-41	3 3 3 3	79.00 79.00 79.00 79.00	CB-463-13	4	79.00
DIRECTORIES XENIX Applications Software (3rd Party)	CB-7063-1	1	14.95			



★New products

	Heath/Zenith Personal Computers and Portable PCs			H/Z-100 Advanced Desktop Computer		
	Model Number	Ship Wt (lbs.)	Price (\$)	Model Number	Ship Wt (lbs.)	Price (\$)
GRAPHICS						
Microsoft Write/Paint (3,6,7,26)	MS-5163-30	2	49.00			
GrafTalk (1,6,7)	RG-5063-2	3	499.00			
4-Point Graphics (4,6,7)	IM-5063-1	3	195.00			
PROGRAMMING LANGUAGES						
★EGA GW* BASIC Interpreter Vers. 3 (2,5,7)	MS-4164-11	4	99.00			
★EGA GW BASIC Compiler Vers. 3 (2,5,7)	MS-4164-14	3	250.00			
COBOL (1,6,7)	MS-5063-3	3	395.00	MS-5063-3	3	395.00
C86 C Language Compiler (2,6,7)	CI-5063-2	2	395.00			
FORTRAN (2,6,7)	MS-5063-2	3	195.00	MS-5063-2	3	195.00
GW-BASIC 2 (5,7)	MS-5163-13 (12,13,18)	3	100.00	MS-5163-13	3	100.00
MS BASIC-86				MS-463-1	5	175.00
Pascal (2,6,7)	MS-5063-5	3	295.00	MS-5063-5	3	295.00
Z-BASIC Compiler (5,7)				MS-463-4	3	250.00
STATISTICAL ANALYSIS						
Microstat (1,6,7)	ES-5063-1	3	249.00	ES-5063-1	3	249.00

Minimum Computer Hardware and Software Requirements:

- | | | | |
|------------------------|-----------------------------------|--|---------------------------|
| (1) 128K RAM | (6) Two 5¼" disk drives | (13) MS-DOS Enhancement Op. Sys. | (20) Accesses 64K of RAM |
| (2) 192K RAM | (7) MS-DOS Operating System | (15) Version 2.5 Monitor ROM and a Z-205 Memory Card | (25) MS-DOS for the Z-181 |
| (3) 256K RAM | (9) GW-BASIC Programming Language | (17) Z-304 Synchronous Serial Port | (26) Microsoft Windows |
| (4) 320K RAM | (11) Z-204 Multiport I/O Card | (18) For H-100 Mode Operation | (27) Microsoft Mouse |
| (5) One 5¼" disk drive | (12) Z-319 Video Graphics Card | | |

*GW is a registered trademark of Microsoft Corporation.

AUTOSKETCH and AutoCAD

AutoSketch runs on Heath/Zenith and IBM PCs equipped with a minimum of 512K RAM, two 5¼" floppy disk drives, and CGA or Hercules video capability.

EC-1310-PC AutoSketch for Heath/Zenith Personal Computers. Ship wt. 1 lb. **\$79.95**

And for those requiring the power of a large-scale CAD program we have AutoCAD with optional 3D modeling.

Configurations:

EC-1305 Basic AutoCAD for the H/Z-100 Computer. Ship wt. 3 lbs. **\$300.00**

EC-1305-PC Basic AutoCAD for Heath/Zenith PCs. Ship wt. 3 lbs. **\$300.00**

EC-1311-PC AutoCAD Version 2.6 for Winchester equipped H/Z Personal Computers. Ship wt. 1 lb. **\$2850.00**

Accessories: **Assembled DMP-29** Graphics Plotter from Houston Instruments. Ship wt. 32 lbs. **\$2295.00**. **Assembled DMP-29-2** Pen set for acetates. Ship wt. 1 lb. **\$59.00**.



Your own private tutor for AutoCAD

An easy-to-use package on how to take maximum advantage of the important features of AutoCAD, a full-sized industrial CAD system. An ideal learning tool, this tutorial introduces and guides you in the use of high performance computer-aided drafting. Covered are commands necessary to produce drawings accurately and quickly including: points, lines, arcs, circles, text, panning, zooming, layering, blocks and arrays.

Plotters and digitizers are discussed to familiarize you with the wide range of input and output devices used with this drafting system. Even the advanced features of AutoCAD are examined for a fuller knowledge of a broad subject. Includes a floppy disk containing hands-on experiments with CAD.

Computers used with either of the following listed programs require a minimum of 256K RAM, two 5¼" disk drives, color CGA or Hercules video capability and MS-DOS. A digitizer and plotter are optional. For use with AutoCAD Version 1.4 and earlier.

EBS-609 AutoCAD Tutorial for use with Heath/Zenith 100-series Computers. Ship wt. 3 lbs. **\$59.95**

EBS-609-PC AutoCAD Tutorial for use with Heath/Zenith Personal Computers. Ship wt. 3 lbs. **\$59.95**

Super-value 2400 baud modem

Now get a full-featured 2400 baud modem at a 1200 baud modem price. Upload files faster and save you costly phone time. Plus this modem uses a specially designed signal processor that provides a better overall bit rate performance over varying telephone line conditions.

Completely compatible with the Hayes AT command set. And it meets CCITT and Bell phone system requirements. Also stores a telephone number in memory automatically. Connects to the phone line using an included RJ11C phone cable. Requires data cable.

Assembled PD-2424

Ship wt. 4 lbs. **\$299.95**



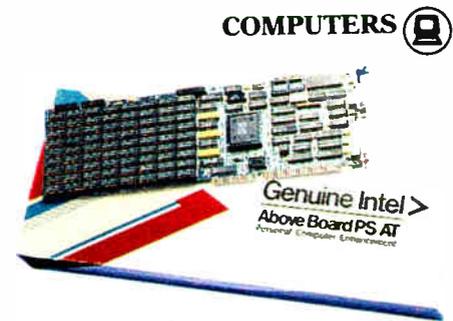
2400 baud modem from ZDS

From Zenith Data Systems comes an external 2400 baud modem that can be fully configured from the keyboard of your computer or terminal. The ZM-2401's default parameters can be changed and saved in nonvolatile memory (RAM). In addition, a most-used phone number can also be stored.

Other features: FCC approved, auto-answer, touch-tone/pulse dialing, Bell and CCITT systems compatible, self-test and diagnostics, responds to the Hayes AT command set, a 2-inch speaker with a programmable volume control. Includes an RJ11C phone cable and requires an HCA-51 cable on page 65. Uses 120 VAC, 60 Hz. 1 1/2" H x 5 1/2" W x 10" D.

Assembled ZM-2401

Ship wt. 5 lbs. **\$399.00**



New Intel Above Board 286

The Above Board 286 is a new second-generation multifunction board that can give you up to 2MB of expanded memory based on the Lotus/Intel/Microsoft standard plus a parallel and a serial port. Above Board fits in 8088 and 80286-based Heath/Zenith Personal Computers and IBM PC ATs running up to 12.5 MHz and PCs running up to 8 MHz.

Besides adding extra memory now for those memory-intensive applications you're all set for all those OS/2 programs yet to come.

The Above Board 286 comes with switchless installation, 512KB RAM expandable to 2MB and an outstanding five-year warranty.

PC-4120 Ship wt. 3 lbs. **\$599.00**

SAVER! Purchase extra 256K RAM Chip Sets within 90 days of buying an Intel Above Board from the Heathkit Catalog or a Heath/Zenith Computers & Electronics Center and save 50%.

Z-205-4 Ship wt. 1 lb. *Regularly* \$80.00 *With Saver* **\$40.00**

NEW! Computer Voice

Give your computer a distinctive voice or voices with the kit HV-2000 plug-in card. Instead of slowly reading data off your monitor, have your computer quickly read back text files, including WordStar document files. Or have your computer announce batch files. You can even add voice to sent and received RTTY messages using the HK-232 TNC on page 24. Included software supplies pronunciation rules to turn ASCII data into intelligible conversation. The HV-2000 can also be interfaced to a high level language for voice-enhanced programs. You can even vary pitch or inflection.

The HV-2000 works on any Heath/Zenith PC, IBM PC AT or XT, or compatible. Includes speaker with enclosure.

Kit HV-2000 Ship wt. 2 lbs. ... **\$89.95**

Powerful HYPER- ACCESS

Communications power from Hilgraeve Inc. is so easy to use that everything can be done by following the on-screen menus. Completely

automate any of the program's procedures or create custom menus. Use with most modems up to 19.2K baud.

HYPERACCESS lets you emulate the most popular terminals and lets your computer act as a host, so it can be operated from any remote computer or terminal. Also use DOS commands.

PM-160 For Heath/Zenith Personal Computers, the IBM PC and compatibles. Ship wt. 3 lbs. **\$149.00**

PM-162 For Heath/Zenith-100 Computers. Ship wt. 3 lbs. ... *Last Call* **\$149.95**

Smart Watch

Add accurate time keeping capability with the Smart Watch 10-year clock/calendar - without using an expansion slot. Includes software for displaying time and date and setting DOS time. A built-in battery provides permanent back-up time keeping. Use with floppy or Winchester drive computers. For use on all Heath/Zenith Personal Computers except the H-300, H/Z-200, Z-170 and Z-180 series.

CB-5063-50 Ship wt. 3 lbs. ... **\$59.00**

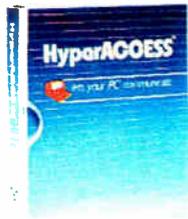
Advanced ZOOM 1200 and 2400 baud modems

The latest integrated modern technology and advanced computerized assembly methods are used to put the most power and flexibility possible into two plug-in boards for Heath/Zenith and IBM PCs along with their compatibles. Both the 1200 and the 2400 baud modems feature almost total automatic operation.

More features: 100% Hayes SMART-MODEM compatible, "Demon dialing," password protection, 8K RAM expandable to 32K, system clock with backup battery, an audio input jack, extra serial port, A-A1 light control for use with IA2 type office key systems. Modems come with software, phone cord, bracket and card guide. FCC approved.

Assembled PC-132 ZOOM/MODEM PC 1200XL. Ship wt. 3 lbs. ... **\$249.95**

Assembled PC-136 ZOOM/MODEM PC 2400XL. Ship wt. 3 lbs. ... **\$399.95**



EPSON and Heath – joining together to answer all your computer system needs

Look to Heath for a solution to any printing problem. We will solve it with an Epson printer, the #1 choice among businesses and computer enthusiasts.

Epson makes any size printing job easier and more efficient with printers that cover a wide range of tasks. There are printers that offer high-speed dot matrix versatility to tackle numerous printing jobs. For proposals, presentations and business letters, there's sophisticated letter quality printing. And there are printers that handle wide ledger paper for financial report spreadsheets. Epson printers can draw some very convincing pictures too, including true circles.

These printers are loaded with features. You can plug an Epson into virtually any microcomputer made and be printing right away. All Epson printers have bidirectional printing using their famous disposable logic seeking printhead. All have a parallel interface for connecting to a personal computer and most have a 2K print buffer. And all Epson printers feature a Quiet Mode for less noise in your home or office.

Epson printers are well known for their versatility, reliability, performance and value...plus you get a one year warranty.

For the latest prices call TOLL-FREE 1-800-253-7057 from 8:00 A.M. to 4:30 P.M. E.T. Monday through Friday. Alaska and Michigan residents call: 616-982-3411.

Dot matrix printing of letters or spreadsheets

This 136-column printer is ideal for printing spreadsheets and financial reports.

It features fast, efficient printing at 180 cps in the draft mode and 60 cps in the letter quality mode.

This printer also can turn out sharp, finely defined graphics. Has built-in serial and parallel interfaces making it easy to use with virtually all business and personal computer systems. A 7K internal buffer stores up to four pages of data at a time and allows you to use your computer while printing continues. 3 $\frac{7}{8}$ " H x 23 $\frac{1}{2}$ " W x 13 $\frac{1}{4}$ " D.

Assembled PP-243 Epson LQ-1000. Ship wt. 24 lbs. *Last Call*

Accessories: **PPA-243-1** Replacement ribbon. Ship wt. 1 lb.

PPA-243-2 Tractor feed. Ship wt. 4 lbs.

An ideal office addition

In this FX-86-E printer you'll find many features normally found exclusively on costly 24-pin printers. Do fast draft printing at 240 characters per second in draft elite or 200 cps in draft pica. Then switch to Near Letter Quality Roman or Sans Serif fonts for letter perfect documents at 40 cps.

Has graphics capability and a parallel interface. Accepts single-sheet paper up to 8 $\frac{1}{2}$ " wide and continuous feed paper up to 10" 5 $\frac{7}{8}$ " H x 16 $\frac{1}{2}$ " W x 13" D.

Assembled PP-86-E Epson FX-86-E. Ship wt. 23 lbs.

Accessories: **PPA-225-1** Replacement Ribbon. Ship wt. 1 lb.

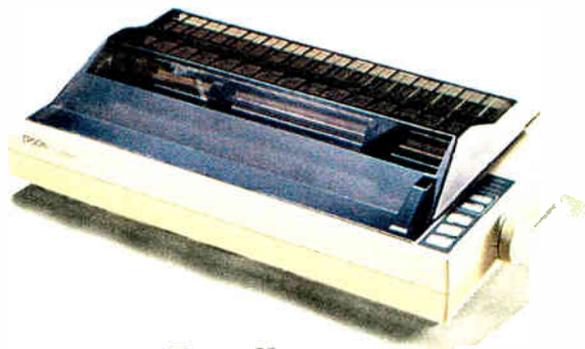


Outstanding word processing dot matrix printer

For efficient letter printing and superb print quality, the LQ-800 printer delivers. A 24-pin printhead with a smaller wire diameter allows a higher resolution character which means elegant printing for you. This 80-column printer prints bidirectionally at 180 characters per second in the draft mode and 60 cps in letter quality. Also has a graphics mode, built-in serial and parallel interface, 7K buffer and built-in fonts. Has dimensions of 3 $\frac{7}{8}$ " H x 16 $\frac{1}{2}$ " W x 13 $\frac{1}{4}$ " D.

Assembled PP-246 Epson LQ-800. Ship wt. 16 lbs. *Last Call*

Accessories: **PPA-246-1** Replacement ribbon. Ship wt. 1 lb.
PPA-246-2 Tractor feed. Ship wt. 3 lbs.



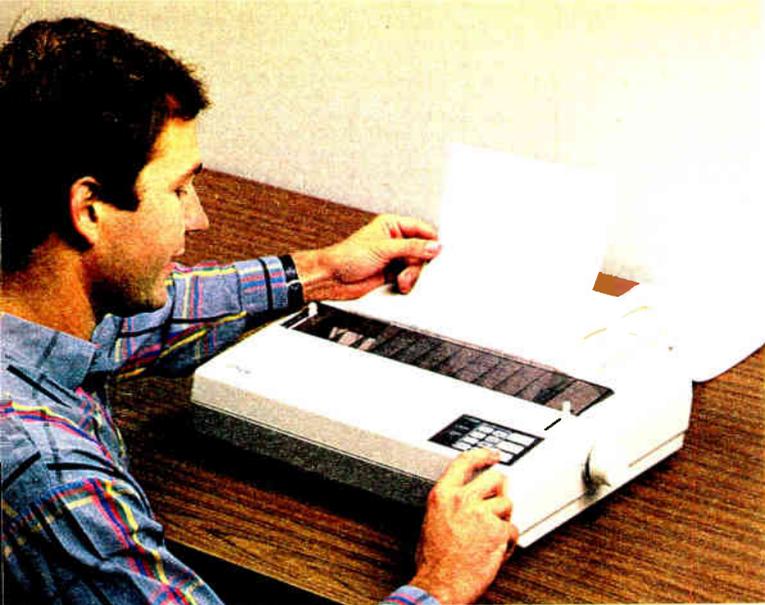
For all your office jobs

The FX-286-E Printer will take care of all your printing needs. Get your drafts out quicker with 240 character per second printing in draft elite or 200 cps in draft pica. Then, for those letter perfect documents, switch to Near Letter Quality Roman or Sans Serif fonts to print out at 40 cps. And for spreadsheets, use the wide carriage that handles single-sheet or continuous feed paper up to 16" wide. The FX-286-E also features printing of startling graphics. This printer comes equipped with a parallel interface. 5 $\frac{7}{8}$ " H x 21 $\frac{3}{8}$ " W x 13 $\frac{1}{2}$ " D.

Assembled PP-286-E Epson FX-286-E. Ship wt. 31 lbs.

Accessories: **PPA-230-1** Replacement Ribbon. Ship wt. 2 lbs.





Epson's top-of-the-line dot matrix printer

Super high-speed printing and versatility mark this 136-column wide business printer. Get a very fast 324 or ultra-fast 405 character per second draft mode printing, 108 cps in the letter quality mode, and an IBM-style graphics character set. Built-in are five fonts that can be selected at the press of a button. A 20-character LCD display shows print modes and settings while four memory cells store different printing selections. Has built-in 8K buffer and serial and parallel interfaces. 5 $\frac{5}{8}$ " H x 23 $\frac{1}{4}$ " W x 14 $\frac{3}{4}$ " D.

Assembled PP-262 Epson LQ-2500. Ship wt. 32 lbs.

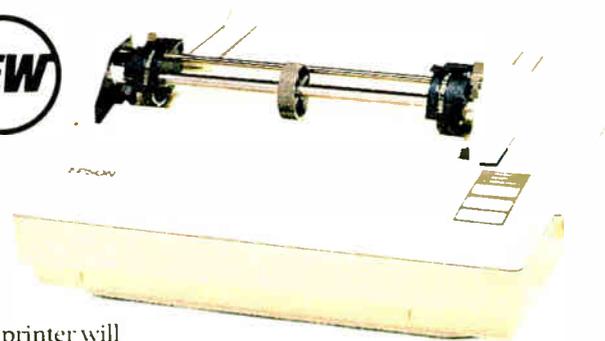
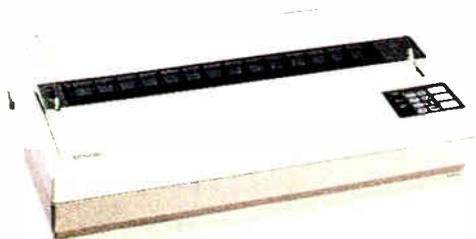
Accessories: **PR-120** Replacement ribbon. Ship wt. 1 lb.

For your word processing needs

This high-speed printer will help you master those sizable document printing jobs with flair. Choose 300 character per second draft mode printing or 60 cps near letter quality printing. Plus, you get superb graphics with excellent resolution. And customize your documents on this 80-column wide printer using eight different typestyles. Also features an 8K buffer, serial and parallel interfaces, and a built-in Push-Feed Tractor that helps save paper. 4 $\frac{7}{8}$ " H x 17 $\frac{5}{8}$ " W x 14 $\frac{7}{8}$ " D.

Assembled PP-256 Epson EX-800. Ship wt. 26 lbs.

Accessories: **PR-100** Replacement ribbon. Ship wt. 1 lb.



High-speed printer

A top choice with fast 300 character per second draft and 60 cps near letter quality printing. It has a 136-column carriage for handling fan-fold and ledger paper up to 16 inches wide. Even create customized documents using IBM graphics characters and eight different typestyles. Other features include an 8K buffer, standard serial and parallel interfaces, and an automatic sheet load function with a built-in bidirectional push feed tractor. Has dimensions of 4 $\frac{7}{8}$ " H x 23 $\frac{3}{8}$ " W x 15 $\frac{3}{8}$ " D.

Assembled PP-253 Epson EX-1000. Ship wt. 34 lbs.

Accessories: **PR-100** Replacement ribbon. Ship wt. 1 lb.

New addition to fine Epson printer line

The LX-800 dot matrix printer will help you keep pace with today's hectic business world. The LX-800 adds increased printing speed of 150 characters per second in the draft mode and 25 cps Near Letter Quality printing. Plus this printer has a built-in tractor feed. The LX-800 features a built-in graphics mode, a 1K buffer, several typestyles at the press of a button and a built-in parallel interface.

Assembled LX-800 Epson LX-800. Ship wt. 15 lbs.

Accessories: **PPA-225-1** Replacement ribbon. Ship wt. 1 lb.

Whatever your computer – your printer should be an Epson

Epson printers are the world's most popular printer and virtually all computer manufacturer's and software publishers design their products to be compatible with Epson printers. Even a large number of printer makers make

their's compatible with Epson. This means that, with very few exceptions, no matter what computer you're using, a simple plug connection is all you need to start printing on the world's number one printer.



HP LaserJet II – a new generation

The LaserJet II from Hewlett Packard leads the way with a lower price, excellent print quality and expandability. Now you can print better documents at eight pages per minute on different paper sizes and types. The LaserJet II prints in a high-



ScanJet

Hewlett-Packard now provides an economical way to include scanned images in documents. The ScanJet desktop scanner has a flatbed design that allows you to scan a wide variety of documents from wallet-sized photographs to pages in books and magazines up to 8½ x 11 inches. The scanner has a scanning speed of approximately 20 seconds at any resolution from 38 dots per inch to 300 dpi. Built-in image enlargement and reduction allows images to be reduced to as little as 13% or enlarged up to 200% of their original size.

Included with the scanner is Scanning Gallery software. It's a unique program that allows images to be scanned and stored in a variety of industry standard file formats. These include TIFF, PC Paintbrush and MS-Paint. Both MS-DOS and MS-Windows are supported. Easily imports images for PageMaker. 120/240 VAC, 50/60 Hz. 19.8" H x 14.5" W x 2.9" D.

Assembled PP-9190 ScanJet II. Ship wt. 31 lbs. . . . **\$1499.00**

Assembled PP-8290 ScanJet Interface Kit includes interface board for IBM PC/XT/AT and compatibles, Scanner manual, Scanning Gallery user's manual and Scanner interface cable. Ship wt. 4 lbs. **\$499.00**

Assembled PP-8390 ScanJet Interface Kit for Macintosh computers. Ship wt. 4 lbs. **\$599.00**

resolution 300 x 300 dots per inch dot-matrix pattern. And the blacks produced are so much blacker than previously achieved, that they are comparable to the black produced on a Linotronic300 typesetter.

The LaserJet II comes with a standard 512K RAM that can be easily expanded using optional 1 and 2 Mbyte memory boards. They allow you to do full page graphics as well as to download more fonts and forms. The LaserJet II has resident Courier, Courier Bold and Compressed Line Printer fonts and will accept two additional font cartridges.

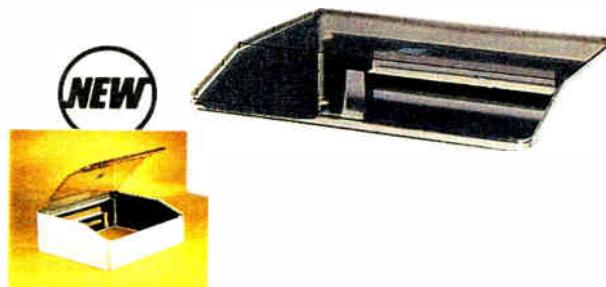
Other features include a serial and parallel interface, easy control panel configuration, up to 16 fonts per page, macro capability and advanced graphics capability. Measures 8½" H x 18" W x 19" D. Uses 120/240 VAC, 50/60 Hz. Includes toner.

Assembled PPS-3400 LaserJet II. Ship wt. 59 lbs. **\$2495.00**

Assembled PP-3443 Optional 1MB Memory Board.
Ship wt. 1 lb. **\$499.95**

Assembled PP-3444 Optional 2MB Memory Board.
Ship wt. 1 lb. **\$999.95**

PR-2295 Toner. Ship wt. 4 lbs. **\$115.00**



Mufflers cut printer noise by 80%

Stop a noisy printer from putting your nerves on edge with a Print Muffler. Two models provide extraordinary quiet, one muffles most standard 80 column printers and the other silences most standard 132 column printers.

Assembled PM-2250 Print Muffler for 80 column printers.
Ship wt. 8 lbs. **\$59.99**

Assembled PM-2252 Print Muffler for 132 column printers.
Ship wt. 10 lbs. **\$79.99**

Quality computer printer paper

Premium 8½" x 11" blank paper is an ideal letter-quality word processing paper. The one-part fan-folded paper comes boxed in a continuous 2700 sheets.

HCS-1 Ship wt. 28 lbs. **\$32.00**

Standard 8½" x 11" paper is perfect for letter writing and general usage. This one-part fan-folded paper comes in a continuous 3200 sheets to the box.

HCS-2 Ship wt. 31 lbs. **\$32.00**

Standard 14¾" x 11" extra wide paper. This one-part fan-fold paper comes in a continuous 3200 sheets.

HCS-3 Ship wt. 47 lbs. **\$42.00**

Bond form-feed 8½" x 11" blank paper. Comes in a continuous 1000 sheets of one-part fan-fold paper.

HCS-4 Ship wt. 13 lbs. **\$25.00**



Printer buffer prevents wasted computer time

The Heathkit Printer Buffer lets you use your computer instead of waiting around until a document is finished printing. No more wasted computer time while large spreadsheets or long word-processing documents are being printed. The Printer Buffer can accept data as fast as your computer can send it with serial baud rates up to 38.4K and parallel rates to 100,000 CPS. The Buffer then stores the data in 64K of memory, that's equal to 21 typewritten pages. And memory can be expanded to 512K or 170 typewritten pages. After your files are stored they are sent to the printer while you're back at the computer getting other work done.

The Printer Buffer has *both* serial *and* parallel inputs *and* outputs which allow you to connect more than one computer and printer. This amazing accessory lets you accept files from both computers and then send them to separate printers at the same time. Or files can be sent to either printer. A priority print function permits you to interrupt printing, print out a priority document and then reprint the interrupted document. To add to its versatility, you can even print up to 99 copies of a file.

The Printer Buffer even checks its own memory through a self-diagnostic program every time you turn it on. And to make sure you don't overload memory, a front panel display shows the remaining amount of free memory.

Once you use the Printer Buffer you'll wonder how you ever did without it. And it only takes two evenings to assemble. The Buffer has dimensions of 1½" H x 9¼" W x 7½" D. Operates on 108-132 VAC, 60 Hz.

Kit SK-203 Ship wt. 5 lbs. **\$199.95**

Accessories: **HCA-85** A 9-pin to 9-pin serial I/O cable for use with AT-compatible computers. Ship wt. 1 lb. **\$20.00**

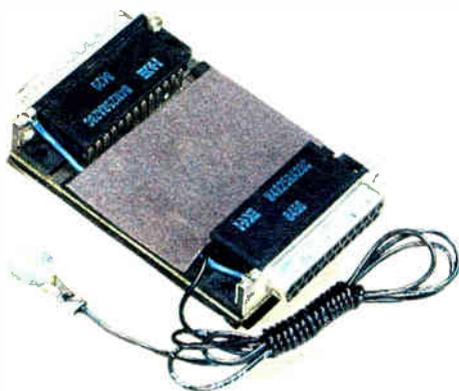


Instantly measure baud rates with compact analyzer

Here is an ideal test instrument for anyone involved in installing, testing or repairing computer systems. The unique Baud Rate Analyzer goes between a computer and any RS-232C serial device and measures the data transmission rate. Once it's connected in-line you can verify baud rates and switch settings.

The Analyzer has a direct-reading display ranging from 300 baud to 38.4K baud and connects in-line with a combination 25-pin male/female connector. Has selectable pin 2 or pin 3 test configuration. Requires a 9V transistor battery (not included). 1⅝" H x 6" W x 3⅝" D.

Kit SK-205 Ship wt. 3 lbs. **\$49.95**



Data Line Protector

An easy beginner kit with computer applications. Connect it in-line between your computer and peripherals to prevent damage from voltage spikes, transient voltages and static charge buildups. Take just one evening to build a RS-232C project that protects interconnecting peripheral lines 2 through 8 and 20 from static charges up to 15,000 volts with a power dissipation of 500 mW. Includes two DB-25 connectors, one male and one female, and has no effect on line signals. ¾" H x 3½" L x 2⅝" D.

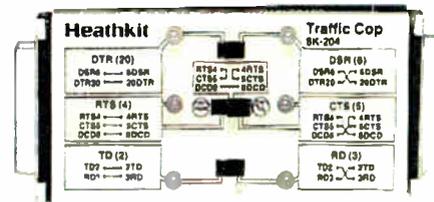
Kit SK-202 Ship wt. 1 lb. **\$14.95**



Surge Protector

Stop worrying about damage to modems or other telephone equipment caused by voltage spikes, transient surges or static charge buildups. This one-evening kit uses MOVs to protect *both* the green/red and yellow/black telephone wire pairs from voltage transients up to 15,000 volts and current peaks up to 10,000 amps. It uses an RJ-11 connector so it may be used on all standard telephone lines. 1⅝" H x 2⅞" W x 4" D.

Kit SK-201 Ship wt. 1 lb. **\$14.95**



Use this traffic cop to direct your data

The Heathkit Traffic Cop helps you guide data to its proper destination. Connect it between a computer and a peripheral to help identify the correct cable wiring. Three slide switches provide twelve different switching combinations. Six LED indicators quickly show when proper interfacing is achieved between computer and peripheral. After determining the right wiring configuration replace the Traffic Cop with an exact cable.

Uses two 25-pin RS-232 connectors, one male and one female, for easy installation. It monitors data lines 2, 3, 4, 5, 6 and 20. All power is derived from the lines. ⅞" H x 4¾" L x 2⅝" D.

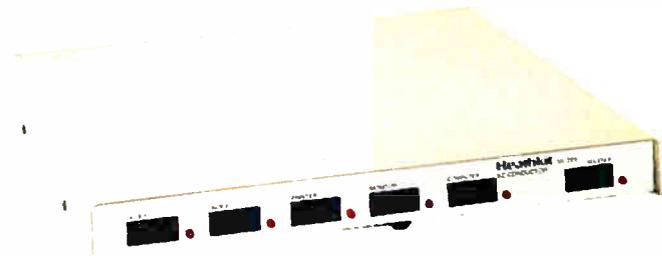
Kit SK-204 Ship wt. 2 lbs. **\$39.95**

Monitor shows what your AC line is doing

1. Keep track of an important part of any system – the AC power line. When you have voltage sensitive equipment like computers, communications gear, medical apparatus and others, you must be alerted to anything that could influence their operation. And the Heathkit AC Monitor will do it for you inexpensively. Eight LED indicators show the AC line voltage from 95 to 130 VAC in 5 volt steps. A separate fault LED lights if the AC voltage falls below 90 VAC and a separate spike LED lights if a voltage transient occurs.



Kit SK-211 Ship wt. 1 lb. \$39.95



Control your computer and peripherals from one convenient power director

1. Add convenience and protection to your computer system with the Heathkit AC Conductor. Simply plug the AC line cords of your computer equipment into the Conductor and control the AC power to each from the Conductor's front panel. This handy addition means no more groping for power switches hidden behind widely spaced computer system components.

And more importantly, the AC Conductor filters the AC line voltage and shields your equipment against power line spikes with a protective MOV device. The Conductor also protects against excessive loads with a 15-amp fused line.

The AC Conductor controls up to five individual devices: computer, monitor, printer and two auxiliary peripherals. Or it can control any other five devices. A flip of the master switch and all five components turn on. Or each one can be turned on individually. Separate LEDs show you what's on and what's not.

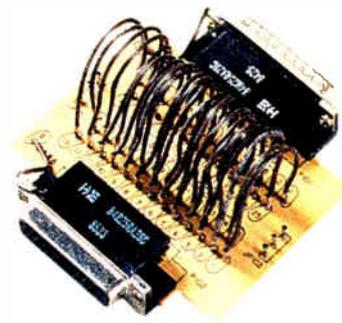
A unique feature of the AC Conductor is its turntable base. Place your monitor on the Conductor and then rotate for easier monitor viewing. And, by tucking the Conductor between your computer and monitor, you gain convenience and protection without losing precious desk space.

The AC Conductor easily assembles in one evening. It has dimensions of 1 3/4" H x 13 1/2" W x 14" D. Order today and get convenience plus protection for your computer system.

Kit SK-209 Ship wt. 11 lbs. \$49.95

Patch Board for RS-232 lines

1. Link up a new printer to your computer system, or mate any standard RS-232 hardware without being thwarted by the annoying problem of differently wired cables. Just plug your mismatched equipment into this Patch Board test instrument to determine the correct wiring configuration for inter-connecting the two devices. After establishing the proper wiring a permanent cable can be made.



The Patch Board allows access to all 25 lines of the interfacing circuitry. The board consists of one male and one female 25-pin "D" plug connector. Separate 2- and 3-pin common pads allow you to tie several lines together.

Kit SK-210 Ship wt. 1 lb. \$14.95

RS-232 Switch Box

1. Eliminate the bothersome unplugging and replugging in of peripherals. Also save on the cost of expensive expansion ports. Just add this Switch Box kit to your computer system and with the press of a button you can instantly alternate between two RS-232 devices without touching a cable.

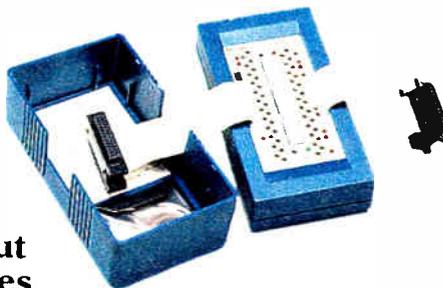


In less than one evening you can put together an inexpensive solution to major hardware expense problems. Features three EIA RS-232C compatible DB-25 female connectors. Cabinet has dimensions of 1 1/4" H x 6 7/8" W x 5 3/8" D. Eliminate expensive duplicate equipment with this low-cost way to interconnect peripherals and computers.

Kit PMK-121 Ship wt. 3 lbs. \$49.95

Breakout Box saves you time

1. In one evening build a valuable timesaver... the Heathkit Breakout Box. It provides access to all 25 lines of RS-232C cables linking computer system devices. Twelve LEDs monitor key signal lines while 23 lines can be switch disabled and then cross-connected. Five jumper wires are included. Built-in dual DTE and DCE gender connectors eliminate the need for adapter cables and connectors. Two "AA" batteries power the line monitoring LEDs but they are not needed for the Breakout Box to operate. 1 3/8" H x 2 1/8" W x 6" D.



Kit PMK-130 Ship wt. 2 lbs. \$79.95

One-stop computer system shopping

While you're choosing a quality computer or deciding about adding a peripheral to your computer system, check out our high quality kit and assembled accessories and support products on pages 62 through 67.



New diskette files

From AMARAY, starting from the bottom and going clockwise are:

MediaPack 4 consists of a set of four 5¼" interlocking modules. Each is detachable and holds 10 diskettes.

MP-4 Ship wt. 1 lb. \$11.99

MediaMate 5 stores up to 50 5¼" floppy disks. Stackable unit has a built-in, self-latching handle and five adjustable dividers. Also non-skid feet.

MM-5 Ship wt. 1 lb. \$12.99

MediaMate 3 holds up to 30 3½" micro diskettes. Features stackable cabinet, five adjustable dividers, built-in handle and non-skid feet.

MM-3 Ship wt. 1 lb. \$11.99

MediaMate 5XL+ (below) stores up to one hundred 5¼" floppy disks in a stackable case with a built-in, self-locking handle. Also has ten adjustable dividers and sturdy lock with key.

MM-5-XL Ship wt. 1 lb. \$24.99



FREE camera or video tape offer with NASHUA diskettes

NASHUA, the leading name in coating technologies since 1949, makes high quality diskettes. And to show you how exceptional these diskettes are, NASHUA is offering two special packages to make it really worth your time to give them a try. All NASHUA diskettes carry a manufacturer's lifetime replacement warranty.

Five-pack camera special – buy 50 double-sided double-density 5¼" diskettes at a special price and receive a FREE KEYSTONE Pocket EVERFLASH camera...a \$25.95 retail value.

Three-pack special – buy 30 double-sided, double-density 5¼" diskettes at a special price and receive a FREE TDK VHS T-120-HS high standard video tape...a \$7.95 retail value.

Find out for yourself what makes these diskettes the best and take advantage of these valuable specials.

PM-8705 5-pack camera special. Ship wt. 4 lbs. \$69.95

PM-8703 3-pack video tape special. Ship wt. 3 lbs. \$39.99

PM-9125 Box of ten 5¼" DSDD diskettes. Ship wt. 1 lb. \$24.99

PM-8725 Box of ten 5¼" DSDD diskettes. Ship wt. 1 lb. \$13.99

PM-8326 Box of ten 3½" diskettes. Ship wt. 1 lb. \$24.99



Gender converters

All 25 pins are directly wired back-to-back on these male/male and female/female RS-232 connectors.

PM-125 Male. Ship wt. 1 lb. \$11.99

PM-126 Female. Ship wt. 1 lb. ... \$11.99

Dependable floppy disks

Soft-sectored, double-sided, quad-density 5¼" floppy disks for use only in the Heath/Zenith Advanced PC, the IBM PC AT and other AT compatibles. Stores up to 1.2MB of data on a single disk. Package of ten.

HCS-60 Ship wt. 1 lb. \$59.00

Soft-sectored, double-sided, double-density 5¼" floppy disks for use in all Heath/Zenith Personal Computers (except Z-181 and Z-183 Laptops) for up to 360KB of data storage. Package of ten.

HCS-71 Ship wt. 1 lb. \$50.00

Soft-sectored, 96 TPI, double-sided, double-density 5¼" floppy disks for use with H-17-5 drives and the Z-89-37 Controller Board. Stores up to 640KB of data on a single disk. Package of ten.

HCS-68 Ship wt. 1 lb. \$55.00

Pre-wired, 10 foot RS-232 cables (connects pins 1-8, 20)

HCA-10 Male/Male. Ship wt. 1 lb. \$20.00

HCA-11 Male/Female. Ship wt. 1 lb. \$20.00

HCA-12 Female/Female. Ship wt. 1 lb. \$20.00

Pre-wired Heath/Zenith PC and IBM PC cables (shielded)

HCA-51 Male/Female Cable (6 ft.). Ship wt. 1 lb. \$30.00

HCA-52 Female/Female Cable (6 ft.). Ship wt. 1 lb. \$30.00

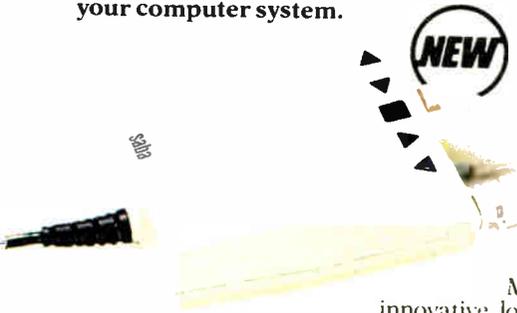
HCA-53 Centronics Parallel Cable (10 ft.). Ship wt. 2 lbs. \$30.00

HCA-84 Male/Male 25-pin straight through RS-232/parallel 6-foot cable with "D" connectors and ferrite beads at each end. Ship wt. 1 lb. \$30.00

HCA-100-PC PC Serial Conversion Cable (1 ft.). Ship wt. 1 lb. \$16.00

Computer peripherals, accessories and supplies

Providing you with high quality kit and assembled products is important to us. That's why we carefully select every peripheral, accessory and support product we stock. So choose with confidence what you need for your computer system.



Speed up data entry with the SABA Mouse Scanner

The SABA Mouse Scanner is an innovative, low-cost device that dramatically increases data re-entry. If you've ever retyped printed information into a data base, spreadsheet or word processing program, you know the wasted time involved and even the errors that can result from such a process. But now there's the Mouse Scanner from SABA Technologies. It allows a user to directly enter typed or printed data into a computer without retyping. The Mouse Scanner is faster and more accurate than retyping plus it is easy to use and very adaptable to your unique data entry requirements.

The SABA Mouse Scanner works with a wide range of software applications from spreadsheets like Lotus 1-2-3, to databases such as dBase III or RBASE 5000. The Scanner also works with a variety of word processing programs including WordStar, Word Perfect and Multimate.

The SABA Mouse Scanner is designed so new users can learn to operate it with success in minutes. A simple one button operation is all it takes. A unique gliding feature ensures accurately read documents by automatically compensating for variations in speed or motion caused by the operator.

The Mouse Scanner comes in a complete package that contains an interface card, scanner, user's manual and all supporting software that is menu-installed and memory resident. The Scanner works with the Heath/Zenith Personal Computer and its compatibles equipped with 512KB RAM (minimum). Although the Scanner can be operated with a dual-floppy computer, a hard disk drive is recommended.

Assembled PI-2000 Ship wt. 3 lbs. **\$699.00**

Kensington Slideaway

Finally, a solution to the problem of a keyboard that just doesn't have enough room. The Keyboard Slideaway fits easily under your PC to let you store that space-wasting keyboard. Then it extends your workspace forward by 8 inches to give you plenty of keyboard room. When you're finished, you easily and conveniently slide the keyboard back under the PC where it's out of the way and protected from dust and spills. The Slideaway accommodates any PC and keyboard with a depth of 8 inches or less.

Assembled PM-2212 Keyboard Slideaway: Ship wt. 5 lbs. **\$49.99**



Standby power system

The 450AT+ UPS from American Power keeps your computer going when it's hit by totally unexpected AC power disruptions. With your computer connected to the 450AT+ you'll have a secure feeling knowing that your data is safe from all forms of power line trash including surges, spikes, noise interference and - most importantly - voltage sags, brownouts and blackouts.

The 450AT+ trips in 4 ms (typically) at 103 VAC to supply 300 watts (450 VA) to advanced desktop computers and engineering workstations for 10 to 15 minutes. These include fully loaded Heath/Zenith, IBM and other computers. Has four AC outlets. Uses 120 VAC, 60 Hz. 6.6" H x 4.7" W x 14.2" D.

Assembled PM-450 Ship wt. 26 lbs. **\$699.00**



Two powerhouse UPS systems

In addition to the 450AT+ described above, American Power has two more uninterruptible power sources. The 1200VX (1200 VA, 1000 W) and the 800RT (800 VA, 600 W) advanced UPS systems are designed to protect all types of micro, supermicro and small minicomputers from power problems which can result in loss of data or even damage to your computer. Either system will relieve you of worry by preventing power interruptions. Besides safeguarding your computer system against blackouts, brownouts and voltage sags, both the 1200VX and 800RT protect against surges, spikes, noise, interference and even overvoltage.

Both the 1200VX and the 800RT feature an exclusive fault indicator that diagnoses a poor ground or reversed AC polarity. Both systems have six AC outlets, EMI/RFI filtering, low 103 VAC and high 130 VAC transfer voltages, and a typical 2 ms transfer time. The 1200VA and 800VA UPS systems operate from 120 VAC, 60 Hz power. 11.5" H x 7.7" W x 14.5" D.

Assembled PM-1200 1200VA UPS. Ship wt. 79 lbs. **\$1399.00**

Assembled PM-800 800VA UPS. Ship wt. 58 lbs. . **\$1099.00**



Credit card orders call TOLL-FREE:

1-800-253-0570

Alaska and Michigan residents call: 616-982-3411.

HELP in building your kit: see page 52



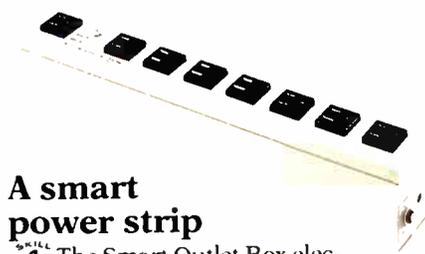


Organize, direct and protect with MasterPiece

The Kensington MasterPiece solves four problems at once. Five switched outlets organize your AC line cords for convenient on/off control from a single location. Surge protection stops surges, spikes and line noise. A static guard nameplate grounds body-accumulated static at a touch. And a swivel base adjusts your monitor with fingertip ease. UL approved. 1 3/8" H x 13 1/2" W x 13 1/4" D.

Assembled PM-2100 Ship wt. 10 lbs. \$149.99

COMPUTERS 



A smart power strip

The Smart Outlet Box electronically transfers the ON/OFF switch of many peripherals to a single device. Plus this multiple-outlet AC power strip protects your equipment with damage-preventing surge suppressors.

Just plug the AC line cord of the device you wish to use as the master controller, such as a video monitor, into the control outlet of our highest quality outlet strip. Then plug in the remaining line cords of the computer system into the other six outlets. When you turn on the monitor, the Smart Outlet applies AC to the six outlets.

A separate socket is unswitched with constant AC always available. This allows you to connect a clock or other device that you do not wish to turn on and off with the other outlets.

In addition, your computer system is protected by the best circuitry we've ever devised - from up to 70 joules of spike energy. We use a popular MOV device plus a new laser-cut spark gap surge absorber. This new design assures you that your Smart Box will perform reliably for many years.

A two-evening kit that's circuit-breaker protected up to 10 amps. 2 1/4" H x 2 3/4" W x 14 1/4" L.

Kit GD-1495 Ship wt. 5 lbs. . . \$59.95

Kraft Joysticks

Mouse or joystick operation with three cursor speeds. Has limited 1-year warranty. Use with Macintosh computers.



Assembled PI-330
Ship wt. 1 lb. Was \$69.95 Now \$59.99

Assembled PI-47 Standard joystick (only) for Apple, IBM and compatibles (not pictured). Ship wt. 1 lb. . . \$29.99

Freely express all your ideas on this graphics tablet

From Summagraphics Corporation comes a graphics tablet designed for the IBM PC and compatibles. With it you can make a computer understand things not possible using a keyboard. Use the tablet's 11 3/4" x 11 3/4" active area to: trace pictures, drawings, and maps; draw freehand; steer a cursor on a computer screen; or pick selections from a menu. The list becomes endless the more you use the tablet.

The SummaSketch graphics tablet is a sophisticated device that uses electromagnetic technology, which makes it very accurate and reliable. The tablet has a typical accuracy of $\pm 0.025"$ with a repeatability of $\pm 0.010"$ or better.

All your computer needs is an RS-232C DTE configured port to accept the tablet's 9-pin female "D" connector. It has overall dimensions of 16" x 16 1/4" x 3/4" and uses 120 VAC.

Assembled SI-1201
Ship wt. 10 lbs. \$479.00

Gravis MK VI

This comfortable joystick has a pistol-grip stick with integrated fire button, two program-

mable fire buttons and an extra-long 72" cable.

Assembled PP-402 For Heath/Zenith, IBM PC and compatibles.

Ship wt. 2 lbs. \$39.95

Assembled PP-450 For Apple IIe and IIc. Ship wt. 2 lbs. \$39.95



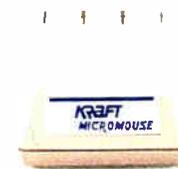
Save \$10 on this analog game port

For Heath/Zenith PCs, the IBM PC and compatibles. With it, you can add on analog devices like joysticks. The board includes a clock/calendar with a backup battery and software. Supported by GW-BASIC.

Assembled PCS-110
Ship wt. 1 lb. Was \$89.95 Now \$79.95

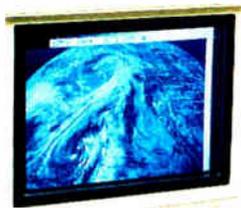
Kraft Micromouse

The opto-mechanical Micromouse uses precise and reliable tech-



nology with a high 200 pulses-per-inch resolution. It has three function buttons and five programmable button options. The Kraft mouse comes with pop-up menu software and requires a serial interface. A 120 VAC power supply is included.

Assembled PI-23
Ship wt. 1 lb. Was \$99.95 Now \$79.99



14"-diagonal CRT flat technology monitor



It's the perfect monitor...with the perfectly flat screen and VGA compatibility. It's the

ZCM-1490 Color Monitor from Zenith Data

Systems which represents a giant leap forward in video display technology. The ZCM-1490 uses a new flat tension mask screen that produces a much more brilliant image than a conventional CRT. This 14" monitor displays a "truer" color at much higher intensities which results in a dramatically improved contrast for jet blacks and more pronounced highlights and softer colors. In addition, the ZCM-1490's perfectly flat tube virtually eliminates glare for less eye strain. High quality photographs can be taken off the screen as well. Capable of resolutions up to 640 x 480 and a 31 kHz scan rate.

The ZCM-1490 is designed to work with the video from the Z-449 Video Card or the output from the IBM Personal System 2 computer and other VGA compatible video cards. The monitor can display software written for popular standards including CGA, MDA/Hercules, EGA and Advanced EGA. Dimensions are 12½" H x 14¾" W x 15½" D. FCC Class B, UL and CSA approved. Uses 115/230 VAC, 50/60 Hz.

Assembled ZCM-1490 Ship wt. 43 lbs. \$999.00

New monochrome monitors

Also from Zenith Data Systems comes two new VGA compatible monochrome monitors that use 14" CRTs. Choose from a non-glare amber or page white phosphor CRT for reduced eye strain commonly experienced with prolonged hours in front of a video monitor. The ZMM-149 series monitors are designed for use with the Z-449 Video Card and IBM PC and Personal System 2 computers and other VGA compatible video cards. 115 VAC, 60 Hz. 10" H x 12¾" W x 13" D. Has an attached 15-pin D connector cable.



Assembled ZMM-149-A

Amber CRT. Ship wt. 21 lbs. \$299.00

Assembled ZMM-149-P

Page white CRT. Ship wt. 21 lbs. \$299.00

Swivel Base for ZCM-1490

Add this tilt and swivel base to the ZCM-1490 monitor (at left) for more comfortable viewing while using your computer and video display. Adjust the base for a better viewing angle and reduce eye strain and fatigue. The base just snaps into place underneath for an easy, one-step installation.

Assembled ZCM-1400-1 Ship wt. 3 lbs. \$25.00

All the monitors on these two pages that operate on 230 VAC require an alternate AC line cord.

EGA-class 14" diagonal CRT monochrome monitor

This Zenith Data Systems monitor features automatic selection of either CGA or EGA scanning frequency; non-glare green-phosphor CRT, graphics resolution of up to 640 x 350 pixels in EGA mode, built-in tilt and swivel stand, and easily accessible operator controls. Accepts RGB, RGBI or RGBrgb signals through an attached 40" cable with a 9-pin D connector. Uses 115/230 VAC, 50/60 Hz and has dimensions of 10" H x 11" W x 12½" D.

Assembled ZMM-1470-G Ship wt. 24 lbs. \$299.00



Save \$30 on our easy-to-build kit monochrome monitor



Build your own 12" diagonal CRT video monitor and get performance comparable to models costing much more. With this video display kit you get an improved flat-looking screen that provides excellent character definition and clarity for comfortable and enjoyable viewing. Features an easy-on-the-eyes non-glare amber screen, a sharp 25 lines by 80 characters (640 x 200 pixels) display, typical 15 MHz bandwidth and a fast 21 ns rise time and brightness and contrast controls. All circuit boards are pre-assembled for a fast two-evening assembly. For use with PCs having NTSC composite video outputs. Includes RCA to RCA cable. Uses 115 VAC. 12" H x 12¾" W x 12" D.

Kit HVM-1220-A

Ship wt. 19 lbs. Was \$89.95 Now \$59.95

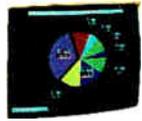


Dazzling 13" diagonal CRT color monitor

Also from Zenith Data Systems is another quality monitor specially designed to display the detailed video generated by the Enhanced Graphics Adapter card. The ZVM-1380-C has a high-resolution, non-glare color CRT that displays up to 64 brilliant colors from computers

using RGB, RGBI or RGBrgb outputs. The monitor's dual horizontal frequency operation provides you with three exceptional resolutions of 640 x 200, 640 x 225 and 640 x 350. Has conveniently located user controls, selectable 115/230 VAC and an attached 40" video cable with a 9-pin D connector. An affordably priced color EGA monitor.

Assembled ZVM-1380-C Ship wt. 36 lbs. \$799.00



13"-diagonal color monitor

Zenith Data Systems introduces a new VGA compatible color monitor. The large non-glare 13" CRT allows high resolution up to 640 x 480 for high quality graphics displays.

The 31 kHz ZCM-1390 RGB accepts video signals from computers equipped with the Z-449 Video Board and IBM PC and Personal System 2 computers or other VGA compatible video cards. FCC Class B, CSA and UL approved. Uses 115/230 VAC, 50/60 Hz and has dimensions of 13" H x 14 1/4" W x 15" D. Has an attached 15-pin D connector cable.

Assembled ZCM-1390
Ship wt. 34 lbs. **\$699.00**



Tilt and swivel base

Position HVM-1220-A, ZVM-1220-A, ZVM-1230-A, ZVM-1240 and ZMM-149-A/P monitors to a better working angle for your viewing comfort.

Assembled ZVM-1200-1
Ship wt. 2 lbs. **\$25.00**



A medium-resolution color monitor with a 13" diagonal CRT

Get vivid reds, bright blues and true green on the ZVM-1330 RGBI-only video monitor. It is designed to work with CGA compatible video cards and supports up to 16 colors including brown. The monitor displays 25

lines of 80 characters and up to 640 x 240 pixels on a non-glare screen.

Accessible controls include Power On/Off, brightness, contrast, focus and horizontal and vertical controls. The monitor comes with an attached 40-inch 9-pin video cable. Uses 115 VAC/60 Hz and has dimensions of 12 7/8" H x 14 3/8" W x 15" D.

Assembled ZVM-1330 Ship wt. 34 lbs. **\$649.00**
Accessories: **ZVM-1300-1** Tilt/Swivel Base. Ship wt. 4 lbs. **\$30.00**

Color monitor with sound

This Zenith Data Systems monitor delivers a crisp, clear, high-resolution display plus excellent sound reproduction. The 13" diagonal CRT, with its 25 lines of 80 characters, can exhibit intensely clear text and impressive 640 x 240 pixel graphics. A unique "green only" switch enables easier reading of monochrome text on a black background.

The ZVM-135 is also compatible with both composite video or RGB direct drive outputs. Uses 115 VAC. 13 3/4" H x 15 1/4" W x 15 1/4" D.
Assembled ZVM-135 39 lbs. **\$599.00**

Accessories: **ZVM-135-2** H/Z and IBM PC Cable. Ship wt. 1 lb. . . **\$25.00**



Save up to \$80 on video monitors

Zenith Data Systems has three first class monochrome monitors. The ZVM-1220-A is an NTSC composite input monitor with non-glare amber screen. The ZVM-1230-A is the same except with a green screen. The ZVM-1240 is a TTL-compatible monitor with amber CRT and 9-pin D-type video output connector. All use 115 VAC. 10" H x 11 3/4" W x 12 5/8" D.

Assembled ZVM-1220-A Ship wt. 16 lbs. *Regularly* \$199.00 *Limited Quantities At* **\$119.95**

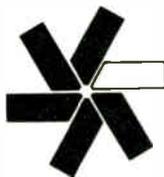
Assembled ZVM-1230-A Ship wt. 16 lbs. *Regularly* \$199.00 *Limited Quantities At* **\$119.95**

Assembled ZVM-1240 Ship wt. 17 lbs. *Regularly* \$229.00 *Limited Quantities At* **\$169.95**

Accessories: **ZVM-121-1** RCA to RCA cable. Ship wt. 1 lb. **\$5.00**



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Join thousands of other Heath/Zenith computer users and keep up with the latest happenings and the newest Heath/Zenith computer products. Become a member and receive the highly informative and interesting REMark monthly magazine for a year. It will keep you in touch with others as you share hardware modifica-

tions, software improvements and ideas through the magazine's open forum. And as a member you'll gain access to over 700 low-cost programs from HUG's software library. You can even purchase Heath/Zenith computer products at a discount using the HUG ID card. So get the latest on Heath/Zenith computer developments and HUG activities...join today.

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For orders outside the United States, including APO/FPO, the rates are \$37.95 for new members and \$32.95 for renewal. Send your name and postal address to Heath Company, P.O. Box 1288, Benton Harbor, MI 49022. Payment must be in U.S. funds only.

Learn the latest electronics technology with our effective, economical self-study and classroom courses

Our Heathkit/Zenith education courses are designed to meet your needs – for self-study, classroom or special industrial training. Each course offers a complete learning program, including clearly written and illustrated textbooks; easy-to-follow workbooks which include real-world, hands-on experiments and labs; complete parts packs with all the electronic components needed to complete the experiments; and detailed instructor's guide with examinations, quizzes and more. Educational trainers, combined with course experiments, give you hands-on experience that increases your skill unlike any other learning method. And now, the new ET-3600 Trainer and ET-3700 Trainer are available, in addition to the familiar ETW-3100-B and ET-3200-B Trainers. Video courses on selected subjects are available, too (see page 85).

You'll receive a handsome certificate from Heathkit/Zenith when you pass the optional final exam for each course with a score of 70% or higher. Plus you can earn Continuing Education Units for non-credit adult education. What's more, our programs are approved by nationally recognized organizations (see page 85). We've put together the information you need in a clear and comprehensive format, and we stand behind each course with a money-back guarantee. If you're not completely satisfied with any self-study course, simply return all course material (excluding trainer) and your receipt for a full refund.

Attention U.S. NAVY personnel: Heathkit/Zenith courses are now eligible for reimbursement under the Navy's Tuition Assistance Program. See your Education Services Officer or your Navy Campus representative. Ask to see the Dantes Guide to National Home Study Council Courses. DOD 1322.8C (Supplement 1).



Increase learning success with the new analog trainer

SKILL LEVEL 2 The new ET-3600 Analog Trainer is a versatile experimental tool for successful hands-on learning. It's used in experiments contained in the DC, AC, Semiconductor Devices, Electronic Circuits, Electronic Communications, Concepts of Electronics and Test Equipment courses. The Analog Trainer is completely equipped to help you build, analyze, test, modify and gain experience in practical electronic circuit design. In addition, the ET-3600 Trainer is designed to accept the new ET-3567 Backpack Accessory (right). The Backpack extends the versatility of your Analog Trainer for even more simple and reliable bench testing and allows you to experiment with the optional ETB-3300 experiment module (p. 71).

The Analog Trainer is amply equipped for all your experiments. It has variable, regulated positive and negative 15 VDC power supplies, plus 15 and 30 volt AC voltage sources and a 200 Hz to 20 kHz frequency generator, with sine wave and square wave outputs. The trainer has solderless breadboard sockets for circuit building and also includes built-in 1 kilohm and 100 kilohm potentiometers. A built-in connector accommodates the ET-3567 Backpack.

Operates at 120 VAC, 60 Hz and has dimensions of 4 1/4" H x 12" W x 11 3/8" D.

Kit ET-3600 Ship wt. 6 lbs. **\$119.95**

Assembled ETW-3600 Ship wt. 6 lbs. **\$199.95**

70



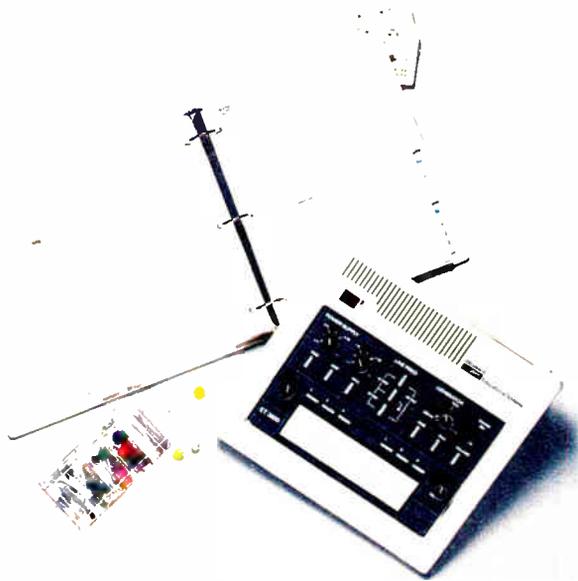
Add more capability with the backpack

SKILL LEVEL 2 The ET-3567 Accessory Backpack mounts directly to the new ET-3600 and ET-3700 (page 74) Trainers to extend the trainer's versatility and reliability. The Backpack includes programmable, positive and negative 1.2 to 15 volt DC power supplies to power analog, linear and CMOS circuits and a 5 volt DC power supply. In addition, a digital voltmeter is included to allow AC and DC voltage measurements up to 500 volts, DC current measurements up to 200 mA and resistance measurements up to 2 megohms, without the need for additional test equipment. The Backpack also features a fused, high-impedance voltmeter input for maximum circuit protection and minimum circuit loading. The meter has an easy-to-read LCD display with automatic polarity sensing.

The Accessory Backpack is designed for long and reliable performance for experimenting with your electronic trainer and Heathkit/Zenith Educational courses. AC power is coupled through the power switch of the associated trainer to assure that power for experimental circuits and the DVM is always applied only when the trainer is on. The Backpack also includes connectors for accepting experiment modules from Heathkit/Zenith Educational Systems courses. (See ETB-3300 Breadboard Experiment Module and ETB-6201 Digital Circuits Experiment Module on pages 71 and 74.) Add the Backpack for even more experimenting and designing of electronic circuits.

Kit ET-3567 Ship wt. 6 lbs. **\$119.95**

Assembled ETW-3567 Ship wt. 6 lbs. **\$199.95**



You'll get a broad foundation in electronics with our entry-level electronics courses

Start discovering the world of electronics with these fundamental courses. Learn the basics of DC and AC electronics as you actually build and analyze circuits. Progress to a comprehensive understanding of semiconductor devices where you'll learn about their construction, operating characteristics and schematic symbols. Explore electronic circuits from theory to practice; learn about the application and operation of test instruments; and gain a working knowledge of electronic communications. It's all here for you in our fundamental series. When you take these courses, you'll use the new ET-3600 Analog Trainer or your ETW-3100-B Trainer and instruments such as multimeters and oscilloscopes.



Credit card orders call TOLL-FREE:

1-800-253-0570

Alaska and Michigan residents call: 616-982-3411.

HELP in building your kit: see page 52



Expand breadboard capabilities

The new ETB-3300 Breadboard Experiment Module slides into the ETW-3567 Accessory Backpack (p. 70) to add more breadboarding capabilities to your ET-3600 or ET-3700 electronic trainer. The solderless sockets in the three large breadboards accept solid wire up to #20 and the leads of most common electronic components. The ETB-3300 gives you access to +5 volt DC power supply, variable positive and negative 1.2 to 12 volt DC power supplies and the internal trainer speaker.

You can avoid tangle and confusion with the ETB-3300's three additional 640-hole breadboards. It's ideal for designing and experimenting with prototype circuits extending beyond the physical capacities of the ET-3600 and ET-3700 circuit design trainers.

ETB-3300 Ship wt. 2 lbs. **\$99.95**



Learn the essentials of DC electronics

With this course you'll learn all about necessary principles like current, voltage, resistance, Ohm's Law, magnetism, electrical measurements, DC circuits, inductance and capacitance. You'll even build and experiment with DC circuits of your own design. Plus you'll learn how to draw a schematic from a wiring diagram and how to use a multimeter.

With the optional audio/visual package you'll get two audio tapes and a 123-page illustration booklet with over 230 illustrations that will enrich your learning experience.

The experiments in this course require you to also use a multimeter, like the IM-2260 (page 36). And when you pass the final exam, you'll earn 2.0 CEUs.

EE-3101-A Ship wt. 6 lbs. **\$49.95**

Accessories: **EEA-3101-A** Optional Audio-Visual Package. Ship wt. 2 lbs. **\$19.95**



Useful AC electronics principles

This course gives you a firm foundation in alternating current and its special applications in electronics circuits. You'll learn how various components react in AC circuits and see the application and use of AC components. You'll find the text interesting reading as it discusses AC theory, measurement and circuit behavior in a simple, no-nonsense style that makes learning enjoyable.

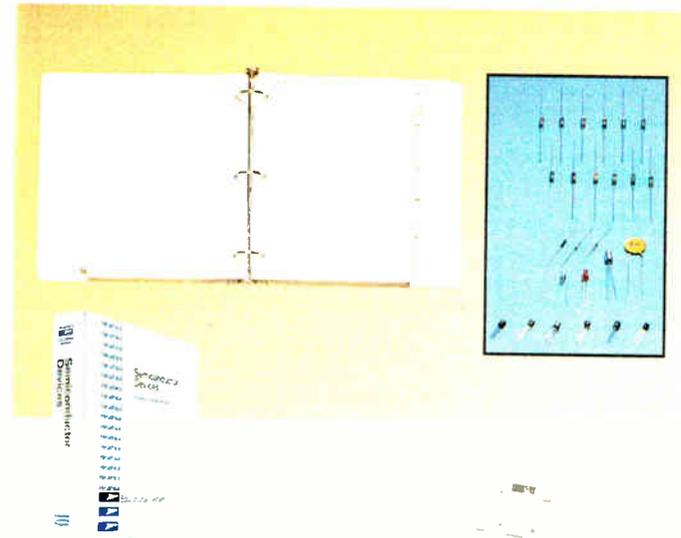
Plus you'll really benefit from the exciting experiments in RC Circuits, RL Circuits, Transformer Characteristics,

LC Filters and more.

We recommend that you use a multimeter and an oscilloscope for this course. You'll earn 1.5 Continuing Education Units when you successfully pass the final exam.

EE-3102-A Ship wt. 7 lbs. **\$59.95**

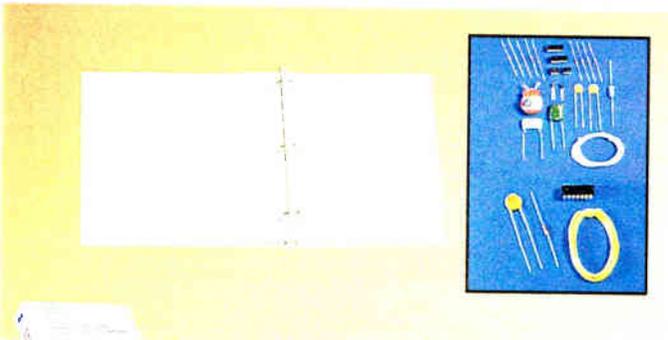
Accessories: **EEA-3102-A** Optional Audio-Visual Package. Ship wt. 2 lbs. **\$19.95**



Semiconductor Devices Course covers solid-state

Expand your electronics background with this in-depth study of semiconductors, their properties and uses. Step by step you'll learn about the backbone of modern electronics as you examine solid-state devices like diodes, transistors and integrated circuits. You'll also learn about zeners, bipolar transistors, FETs, thyristors and UJTs. Through text and experiments you'll find out how to properly use the semiconductor components essential to today's fascinating electronic world. And you'll discover how semiconductors can be damaged by operating them beyond the component's rating or through improper handling.

For a better understanding of semiconductors, you'll see how they are made and how they operate in the micro-sized



Learn Electronic Test Equipment theory and applications

Discover the exciting operation and theory behind electronic test equipment in this course. Become proficient with bench and field test equipment as you learn how to make measurements using digital and analog meters, how the meters operate and what they measure. You'll gain practical knowl-

world of solid-state electronics. You'll also learn the electrical characteristics of semiconductor materials. And you'll see how to correctly test various devices to determine if they are operating as they should.

Each concept is presented in clearly written text and instantly reinforced with a programmed review. Included experiments illustrate and enhance your understanding of important concepts with hands-on training. To perform the experiments in this course you'll need the ET-3600 Trainer located on page 70. A multimeter is also recommended.

Pass the optional final exam and earn 3.0 Continuing Education Units.

EE-3103-A Ship wt. 6 lbs. **\$59.95**

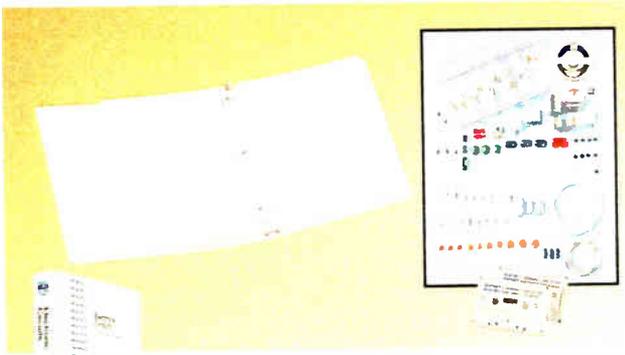
Accessories: **EEA-3103-A** Audio-Visual Package.
Ship wt. 2 lbs. **\$19.95**

edge in the operation and use of the oscilloscope in electronic testing and equipment servicing by following our proven instruction methods of reading and then doing. From this instruction method, you'll also learn to use frequency generators and frequency counters. Included in the course is a unit on special measuring instruments for bridge circuits, transistor testers, curve tracers, spectrum analyzers and logic probes. The optional Audio-Visual Accessory Package enhances your learning process by reinforcing each lesson with audio cassettes and a supplemental manual. Fifteen interactive experiments give you the chance to use many different types of test equipment.

To get the most out of this course, there are a few things you'll need. You should have access to the following equipment to obtain the full benefit from the experiments: a digital multimeter, an analog meter, oscilloscope, frequency generator and frequency counter. This course also uses the ET-3600 Trainer found on page 70. Plus you must have a previous knowledge of material in the EE-3101-A thru EE-3104-A and EE-3201-A courses. It's well worth the 6.0 CEUs earned when you pass the final exam.

EE-3105-A Ship wt. 9 lbs. **\$69.95**

Accessories: **EEA-3105-A** Audio-Visual Package.
Ship wt. 2 lbs. **\$19.95**



Follow Electronic Circuits from theory to board

The Electronic Circuits Course contains seven carefully designed units that cover circuits you find in everyday electronic products. In this course you'll learn how to identify power supply rectifiers, filters and regulation circuits. You'll also develop an understanding of radio circuits by studying amplitude and

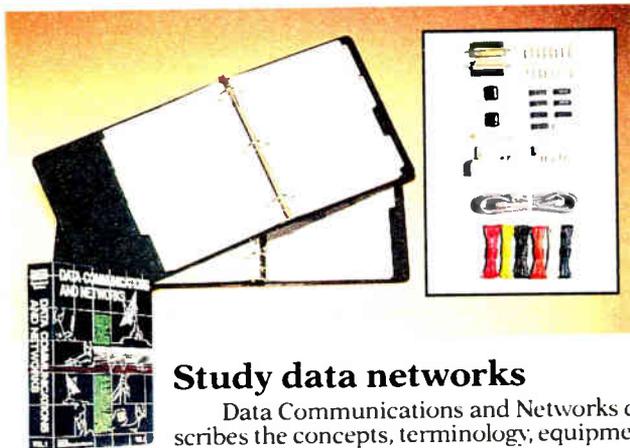
frequency modulation circuits along with the heterodyne principle of modulation and detection circuits. You'll even be able to construct transistor and integrated circuit amplifiers, oscillators, active filters and pulse-shaping circuits with the knowledge gained from your work in this course.

The course continues with explanations of power supplies and power supply regulation circuits, as well as a basic modulation and demodulation system. Also includes over 100 electronic components for use with the 18 fun experiments contained in the text.

You should complete the DC and AC Electronics and Semiconductor Devices courses (EE-3101-A thru EE-3103-A) or have an equivalent knowledge. We also suggest a dual-trace oscilloscope, a VOM and the ET-3600 Trainer (page 70) to complete the experiments in this course. You'll receive 4.0 Continuing Education Units (CEUs) upon successfully passing the optional final exam.

EE-3104-A Ship wt. 7 lbs. **\$69.95**

Accessories: **EEA-3104-A** Audio-Visual Package.
Ship wt. 2 lbs. **\$19.95**



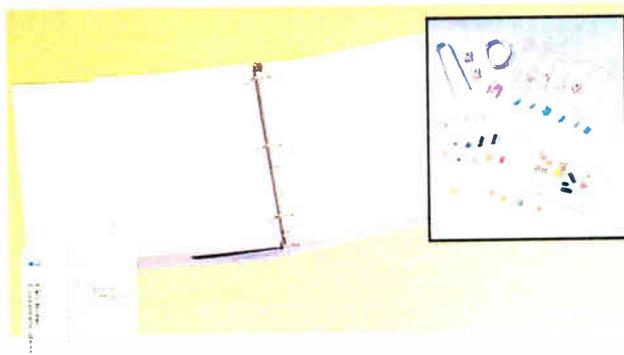
Study data networks

Data Communications and Networks describes the concepts, terminology, equipment

and techniques that make up today's data communications systems. Centered on computer communications, this course highlights signaling techniques, terminals and codes, modulation and multiplexing, transmission media and errors, telephone network, security and also provides an overview of current digital data networks.

To better understand this course you should have already completed course EE-3201-A Digital Techniques and course EE-3102-A AC Electronics or have an equivalent knowledge. To perform the experiments in the course you'll need the ET-1000 Circuit Design Trainer on page 89, a multimeter and a dual-trace oscilloscope. Pass the optional final exam and earn 7.0 Continuing Education Units.

EE-8090 Ship wt. 11 lbs. **\$99.95**



Discover the world of broadcast communications

With the Electronics Communications Course you can develop a full understanding of broadcast and data communications fundamentals. Working at your own pace from the detailed text you'll cover amplitude, frequency, phase and angle modulation. And then you'll study transmitters, antennas and communications receivers, including many specific circuits.

In this course you'll find out how to analyze the composition of complex waveforms. You'll see how to construct basic communications circuits. And you'll examine transmission lines with their characteristics and different uses. Also analyzed are FM stereo and television broadcasting systems along with data communications systems.

With the included hands-on experiments you'll build an AM transmitter, balanced modulator, AM detector, FM transmitter and an FM receiver. You'll also build such advanced systems as a pulse modulator, time division multiplex transmitter and a data communications modem with the included components. For these experiments you'll need the ET-3600 Trainer (page 70), a multimeter and an oscilloscope.

We suggest that you follow up the EE-3101-A thru EE-3104-A with this specialized course in communications. And by passing the optional final exam you receive 2.0 Continuing Education Units.

EE-3106-A Ship wt. 7 lbs. **\$64.95**

Accessories: **EEA-3106-A** Audio-Visual Package.
Ship wt. 2 lbs. **\$19.95**

Take this exciting step into the field of digital technology

You get a comprehensive and in-depth understanding of digital circuitry with the Digital Techniques course. You'll explore digital technologies from fundamental concepts to the most advanced applications. Even learn to design your own digital circuits. Gain hands-on experience with the new ET-3700 Digital Trainer or the ET-3200-B Trainer for a successful learning experience.

Beginning on page 75 you'll find exciting courses on microprocessor technology. Gain a working knowledge of microprocessors and machine level programming and interfacing. Even get on speaking terms with your computer with the Voice Synthesis Course.

As with all the basic electronics courses, trainers are an important part of learning. All Microprocessor courses require either the ET-3400 or ET-3400-A Trainer.

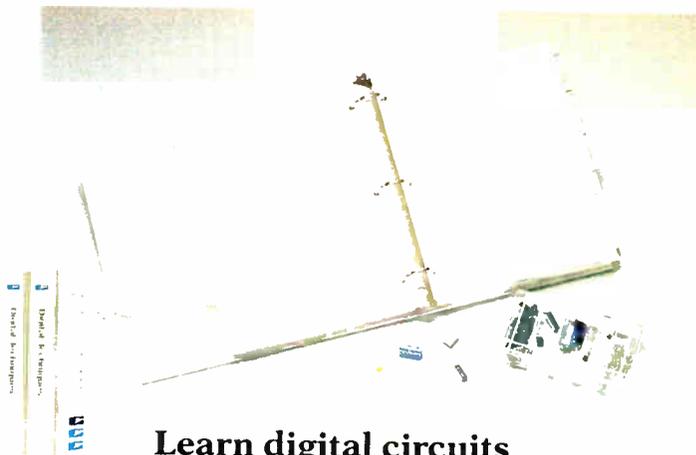


A trainer for digital circuit design

The new ET-3700 Digital Trainer allows you to quickly and efficiently design and experiment with digital electronic circuits. It lets you apply course material in a practical way, through experiments and by building and testing prototypes. It also lets you confirm circuit operation and test digital ICs. Also, use it to experiment with the EE-3201-A Digital Techniques Course. Plus, the ET-3700 Trainer is designed to accept the new ET-3567 Backpack Accessory (p. 70). The Backpack extends the capabilities of your Digital Trainer and allows you to experiment with optional experiment modules (p. 71 and right).

Three built-in, regulated power supplies furnish positive and negative 12-volt DC and positive 5-volt DC voltages to power both digital and linear circuits. The ET-3700 Trainer not only supplies common DC voltages used in digital electronics, but it also supplies a line-frequency square wave (60 or 50 Hz); complementary clock signals of 1 Hz, 1 kHz, and 100 kHz; logic and data switches to control input levels; and four LED logic-state indicators to visually monitor logic states and transitions. Connector blocks allow solderless breadboard connections between parts and wires and a built-in connector accommodates the ET-3567 Backpack. 4 1/4" H x 12" W x 1 1/4" D.

Kit ET-3700 Ship wt. 6 lbs. \$119.95
Assembled ETW-3700 Ship wt. 6 lbs. \$199.95



Learn digital circuits

You'll feel like an expert on digital circuitry once you've finished this course. You'll start off with fundamentals and theory of digital logic, including number systems. You'll then learn how to design and apply modern digital circuitry. You'll also become familiar with Boolean algebra, flip-flops and registers, sequential logic circuits, combinational logic circuitry and digital design. Plus you'll gain skills in designing digital circuitry for virtually any modern application.

This course comes with electronic components for performing all of the 24 experiments. Two optional audio cassettes help you integrate everything you've studied.

To complete this course successfully, you must have a basic electronics background, which you can get from the DC, AC, Semiconductors and Electronics Circuits courses on the preceding pages. We also suggest that you use a multimeter and dual-trace oscilloscope for your course experiments.

This is a comprehensive course that you can take in your spare time, at your own speed. And you get it at a fraction of college or technical school costs.

EE-3201-A Ship wt. 7 lbs. \$99.95

Accessories: **EAA-3201-A** Optional Learning Cassettes. Two text descriptive audio cassette tapes plus a vinyl holder to keep them in and an illustrated booklet. Ship wt. 2 lbs. \$19.95

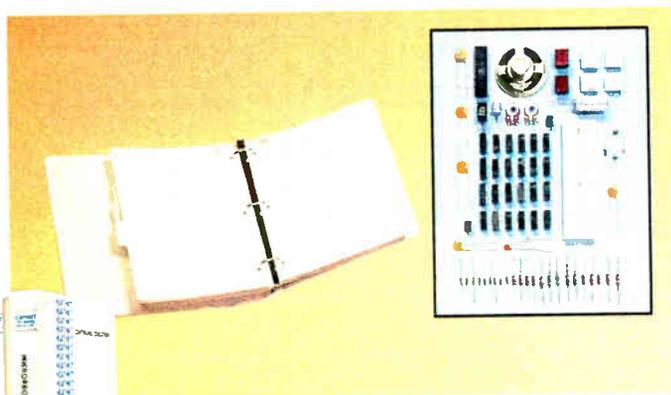
Master the concepts of digital circuitry

These new applications manuals and supplemental experiment module are designed for use with the new ET-3700 Trainer and ET-3567 Accessory Backpack. Both the Administrator's Guide and the Laboratory Manual are used in conjunction with the ETB-6201 Experiment Module. The ETB-6201 slides into the Backpack (p. 70) that's mounted to the ET-3700 Trainer. It provides visual demonstrations of concepts and theories of digital electronics that are applied to real-life circuits. Students develop hands-on knowledge of digital circuitry as they use the ETB-6201 to perform the 40 prewired experiments detailed in the student lab manual. And the Administrator's guide provides even more circuit descriptions, experiment information and classroom demonstrations to help explain the material.



ETB-6201 Experiment Module. 2 lbs. \$149.95
EB-6201-52 Administrator's Guide. 1 lb. \$9.95
EB-6201-71 Student Laboratory Manual. 1 lb. \$12.95

Enter the fascinating world of microprocessing



Get a thorough education in microprocessors

This course won an International Award from the Society for Technical Communication. It provides a well-organized, economical, self-paced home study program covering all the basics of 8-bit microprocessors, microcomputers and machine level programming. Concepts are carefully integrated into 8 learning units for thorough training. A ninth unit reviews MPU programming techniques through 10 topic-related experiments. A tenth unit provides hands-on hardware experiments in the areas of memory interfacing, display control and I/O interfacing for a total learning experience.

Your study starts with a review of the basics of computer number systems and codes: decimal, binary, octal and hexa-

decimal numbering systems. Unit 2 covers terms and conventions, an introduction to several programming instructions, plus how programs are written and executed. In unit 3 you'll learn about binary addition, subtraction, multiplication and division, and two's complement arithmetic. You'll also learn how to use Boolean logic operators like NOT, AND, OR, Exclusive OR and INVERT. Unit 4 gives you a thorough introduction to programming. You'll study branching, conditional branching, algorithms and programming instructions. In units 5 & 6, you'll learn about 6800/6808 microprocessors and pick up valuable details on architecture, instruction sets, addressing modes, stack operations, subroutines, input/output operations and interrupts.

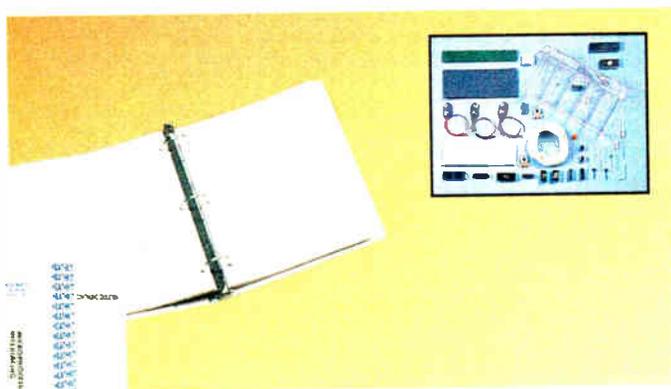
Units 7 & 8 cover 6800/6808 microprocessor architecture and interfacing. You'll also find information on interfacing with both static and dynamic random access memory, read only memory, displays, switches and the Peripheral Interface Adapter (PIA).

In unit 9 you'll increase your skills through programming experiments and writing programs. Plus, you can use your trainer to drill yourself and provide practice in the numbering systems. In later experiments, you'll use all instructions and addressing modes including subroutines, stack operations and more. You'll continue to benefit from 19 hardware experiments in microprocessor theory and microprocessor applications found in unit 10.

But what makes this course even more incredible is that, for most of it, you don't need any prior knowledge about electronics. Only units 7, 8 & 10 require knowledge equivalent to the EE-3201-A Digital Techniques Course (page 74).

To make this course even more effective, we request that you use either the ET-3400 or the ET-3400-A Microprocessor Trainer. You'll really be proud of the 8.0 CEUs that you'll earn upon passing the final exam.

EE-3401-A Ship wt. 10 lbs. **\$99.95**



Microprocessor interfacing course

The EE-3402 Microprocessor Interfacing Course is a natural second step after completing the EE-3401-A Microprocessor Course. This course will introduce you to the powerful 6809 and 68000 processors. The eleven units of Microprocessor Interfacing explore topics such as the advanced Peripheral Interface Adapter (PIA), analog conversion and serial data

communications. You'll also study peripheral devices, memory devices and programmable timers.

Ten hands-on experiments focus your attention on concepts presented in the text. You'll experiment with display multiplexing, I/O control and handshaking using the PIA, analog-to-digital conversion and ADC interfacing. Other experiments cover parallel-to-serial conversion using the 6850 ACIA, serial standard conversion, 2708 EPROM programming, ROM/EPROM interfacing, 6840 PTM input and output and 6809 software operation. All components required for the experiments are included, and are performed on the ET-3400 or ET-3400-A Microprocessor Trainer (p. 76).

Before attempting this comprehensive course, we recommend that you complete the EE-3401-A Microprocessor Course (above) or have the equivalent knowledge. The in-depth scope of this course means you can qualify for 7.0 CEUs upon completion.

EE-3402 Ship wt. 11 lbs. **\$99.95**



Learn about microprocessors with an 8-bit computer trainer

This versatile, low-cost trainer is designed to teach and illustrate microprocessor operation, programming and applications. It even includes microprocessor-based software and a special interface development system. So, you can use your Trainer as a miniature digital computer for experiments in microprocessor related courses EE-3401-A through EE-3405.

This special trainer features the popular 6808 microprocessor as a CPU and built-in 512 bytes of RAM, plus a built-in 1K ROM monitor program controlling the unit's operation. A 17-key hexadecimal keyboard lets you enter machine language program code, access memory locations and examine their contents through a six-digit hexadecimal 7-segment LED display; modify the contents of memory; examine or change any of the microprocessor's internal registers; set break points for program debugging; or reset the CPU. And thanks to the flexible instruction set of the 6808, you'll even be able to use 5 addressing modes, 2 accumulators, an index register and a stack pointer.

Added to all this is a microprocessor breadboard that features solderless sockets for rapid assembly of IC circuitry. All microprocessor address, control and data busses are buffered and terminated on the front panel for easy connection to experimental memory and interface circuits. You'll also get a 40-pin external connector for expanding memory and the Trainer's I/O capacity.

And there's even more. Your experiments will really fly with the 8 individual and independently buffered LEDs for monitoring logic states; the 8 SPST binary data switches for logic level switching; the built-in +5 and ± 12 VDC power supply connections; and the 1 Hz and 60 Hz clock outputs.

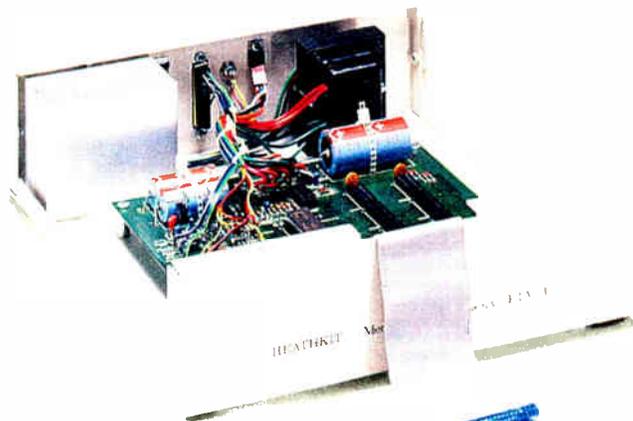
For increased personal microcomputer power, just team up your Trainer with the ETA-3400 Microprocessor Trainer Accessory (below). Requires 120 VAC at 50/60 Hz, 30 watts.

Kit ET-3400-A Ship wt. 7 lbs. **\$259.95**

Assembled ETW-3400-A Ship wt. 6 lbs. **\$359.95**

SAVER! ETS-3400-B Includes ET-3400-A, ETA-3400 Trainer Accessory and ETA-3400-1 Chip Set. Ship wt. 16 lbs.

Separately \$444.85 Our System Price **\$399.95**



Now save \$50 on the ETA-3400 Trainer Accessory



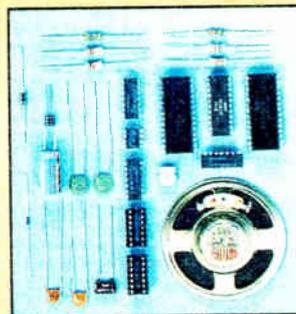
Expand your ET-3400-A Trainer

The ETA-3400 Microprocessor Trainer Accessory turns your ET-3400-A Trainer into an 8-bit cassette-based microcomputer system with an optional 3K bytes of RAM. A serial interface with EIA and 20 mA loop formats enables hook-up to a smart video terminal or a 20 mA ASCII teletypewriter machine. A cassette interface permits you to store programs on standard cassette tapes. Also includes a ROM monitor/debugging program to implement the standard trainer monitor functions through an external terminal. Memory locations can be examined or changed, break points initiated and program debugging can be accomplished with a single-step feature. A tiny BASIC Interpreter stored in ROM lets you program in the BASIC language. Use the Trainer to run machine code routines learned in the EE-3401-A Microprocessor Course from BASIC. All parts required to modify the Trainer and connect the Accessory are included. Modifying the ET-3400 trainer changes the clock frequency, so we recommend you complete experiments in EE-3401-A thru EE-3405 before adding the Accessory. An RS-232 compatible video terminal is required to use BASIC and monitor features of the ETA-3400.

Kit ETA-3400 Ship wt. 8 lbs.
Was \$179.95 Now Only **\$129.95**

Accessory: **ETA-3400-1** 3K Chip Set.
Ship wt. 1 lb. **\$54.95**

Voice Synthesis Course uses an easy-to-follow format with experiments



Two popular voice synthesis methods are covered

Includes two complete chip sets and components for experiments

Listen to your experiments with Voice Synthesis

Be on speaking terms with your ET-3400 or ET-3400-A Microprocessor Trainer by taking the EE-3403-A Voice Synthesis Course. Included in the 5

units of the course are linear and logarithmic coding, delta modulation, speech synthesis by linear predictive coding, the phoneme speech synthesizer (PSS) and advanced programming for the phoneme speech synthesizer.

All components are included for the hands-on experiments you'll perform as you learn about the basic hardware and

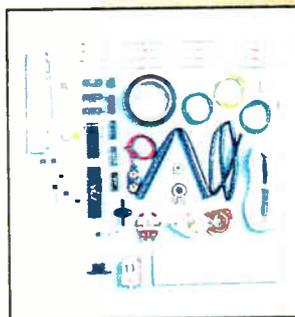
software necessary for breadboarding computer synthesized speech circuits on the ET-3400 or ET-3400-A Trainer. Other experiments instruct you in the programming and interfacing needed for both digitized and phoneme voice synthesis. In addition, this course prepares you to write machine code programs tailored for the ET-3400 and ET-3400-A Microprocessor Trainer.

Included with the course are complete chip sets for digitized and phoneme voice synthesis. The digitized set contains both a ROM chip and a synthesizer chip, featuring a vocabulary totaling more than 200 words. The phoneme synthesizer is self-contained in a single integrated circuit which can produce an unlimited vocabulary.

To better prepare yourself for the material in the Voice Synthesis Course, the EE-3401-A Microprocessor Course (p. 75) or equivalent knowledge is needed. You'll earn 3.0 Continuing Education Units with this course.

EE-3403-A Ship wt. 4 lbs. . . . \$69.95

Microprocessor Applications Course relates the real analog world to the microprocessor



Understand how a microprocessor can sense and control events in an analog world

Experiments show how microprocessor control is applied

Practical microprocessor applications

Learn how to put your previous microprocessor knowledge to work with the Microprocessor Applications Course. A complete discussion of analog

circuits starts you on your way to an understanding of how a microprocessor can sense and control events in an analog world. This includes digital-to-analog conversion techniques along with analog signal conditioning.

A microprocessor must first sense or receive information before it can carry out an assigned task. To acquaint

you with this side of a microprocessor, the EE-3405 Course covers, in depth, sensors and transducers and how they interface to a microprocessor to sense real-world events. Complete coverage is given to temperature, light, position, motion, force, pressure, flow and level sensors, and transducers of various types and styles. Further coverage is given to microprocessor control of devices and circuits such as transistor arrays, SCRs, TRIACs, relays, DC motors and stepper motors. Phase-locked loops, which are being used more frequently in microprocessor applications, are presented along with information for interfacing and controlling them with a microprocessor. You'll see examples of microprocessor uses in consumer, industrial and business applications and take a look at future microprocessor applications.

To perform the 13 experiments in this course, you'll need the ET-3400 or ET-3400-A Microprocessor (p. 76), a VOM and an oscilloscope. You should also complete the EE-3401-A Microprocessor Course (p.75) and the EE-3402 Microprocessor Interfacing Course (p. 75). Pass the optional final exam of this challenging course and earn 8.0 CEUs.

EE-3405 Ship wt. 10 lbs. . . . \$99.95

The easy way to learn computer servicing and advanced microprocessing

Our fascinating series in computer servicing gives you a thorough introduction to the computer, microprocessor, and peripherals. You'll also learn how to maintain, troubleshoot and repair computers with the help of a step-by-step method that gradually builds on

your knowledge. Our Advanced Microprocessor course is the culmination of the microprocessor series, instructing you in 16-bit computer technology and the 8088 microprocessor used in the Heath/Zenith PC, IBM PC and other compatibles.



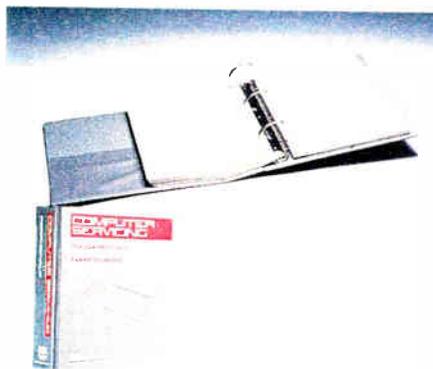
Get to know the modern computer

This is an eight-unit Computer Fundamentals Course with an emphasis on microcomputers. In it you'll find an effective step-by-step presentation of computer basics, applications and systems. You'll learn about power supply sources, 8- and 16-bit micros, bussing and interfacing CPUs, semiconductor memories and much more. You'll also be introduced to programming using high- and low-level languages, assemblers, editor, compilers and interpreters. Plus you'll learn many popular computer terms.

It will help to have a background in basic electronics and digital theory. You can get such a background by taking the EE-3101-A DC Electronics, EE-3102-A AC Electronics, EE-3103-A Semiconductor Devices, EE-3104-A Electronic Circuits and EE-3201-A Digital Techniques courses.

To perform the hardware and software experiments, in addition to the ET-100 Trainer, you'll need a cassette recorder, video monitor (or TV receiver and RF modulator), a single-trace oscilloscope, a multimeter and a dot matrix printer. Earn 2.0 Continuing Education Units upon passing the final exam.

EC-2001 Ship wt. 6 lbs. \$79.95



Complete peripherals course

We've designed this course to build on the knowledge you acquired in the Fundamentals Course. You'll learn about each category of peripheral device, including printers, displays, disk drives and modems. You'll study the purpose, capabilities and fundamentals of each, plus how each is interfaced to a mini- or microcomputer. The course also includes a discussion of control and data flow of electronic and electro-mechanical devices.

Methodically-presented segments let you go at your own pace. This step-by-step course covers serial, EIA and parallel data communications, communication standards and non-standard interfaces. You'll also learn the ins and outs of input devices, visual displays, printers, plotters and memory peripherals and so much more.

To perform the fascinating experiments that bring this topic to life, you'll need the ET-100 Micro Trainer and EWA-100-B Upgrade Accessory (page 79), a cassette recorder and a video display. You'll also need a volt-ohm meter and an oscilloscope. All other components are included. We also recommend that you complete the EC-2001 Computer Fundamentals Course before taking this course. Worth 2.0 CEUs.

EC-2002 Ship wt. 10 lbs. \$99.95



Learn to service computers

You can learn to troubleshoot and maintain both digital and microprocessor systems with our Computer Maintenance Course. You'll start with a review of TTL and MOS devices and move on to study and gain practical experience in standard digital troubleshooting techniques like: determining electrical characteristics of integrated circuit input and output pins, and using logic and logic pulser probes.

We then extend your learning experience to a typical microprocessor based system. You'll learn how all system hardware sections interact with each other and how to troubleshoot them. You'll develop valuable skills in finding the defective block of a system and applying classical troubleshooting techniques like logic state analysis and signature analysis. We also present new troubleshooting techniques such as static stimulus testing and the use of the mobile I/O port. Plus, you'll learn to write system diagnostics for a particular system.

To perform the experiments, you'll need the ET-100 Trainer and EWA-100-B Accessory, an oscilloscope and a multimeter. We also recommend that you complete the DC Electronics, AC Electronics, Digital Techniques, and Computer Servicing - Fundamentals and Peripherals courses before taking Computer Maintenance. Worth 3.0 CEUs.

EC-2003 Ship wt. 9 lbs. \$69.95



You'll get a lot out of this in-depth study of microprocessors

Our comprehensive and thorough Advanced Microprocessor Course is designed to make you well-versed in 16-bit computer technology and the 8088 microprocessor. It includes more than 300 pages of software programming and interfacing experiments along with 1200 pages of text divided into ten units. You'll start with an examination of microcomputers and be introduced to the 8088 microprocessor with instruction addressing modes. From there, you'll become familiar with

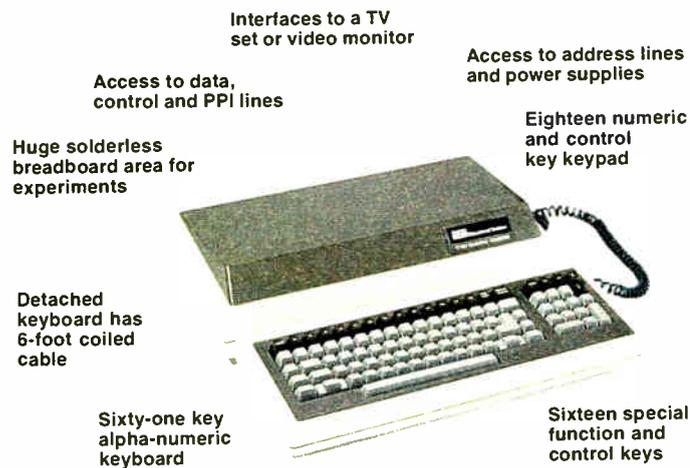
machine and assembly language programming, conditional/unconditional loops and loop addressing plus sub-routines. To this we add informative discussions of the 8088 instruction set addressing modes and memory segmentation. Also examine I/O operations, internal/external interrupts and string operations. Later you learn about the various MPU bus and control lines, typical address and data bus networks, and data handling techniques. We also examine the memory system in detail and go into various forms of input/output interfacing.

You should have previous digital electronics background such as the Digital Techniques Course (EE-3201-A, page 74). You should also be familiar with binary and hexadecimal numbering systems, and computer math. Worth 8 CEUs.

EE-8088 Ship wt. 10 lbs. \$99.95

SAVER! Get both EE-8088 and the ET-100 Computer Trainer and save \$50 over buying each separately.

EES-8088 Ship wt. 49 lbs. \$849.90



Train on this 16-bit computer

Whether you're an experimenter or a technician, you'll enjoy using the ET-100 as an advanced trainer. With it, you'll be able to easily modify circuits, build interfaces or simply experiment with the 8088. The ET-100 is ideal for breadboarding computer circuits that interface to the 8088 microprocessor. All access lines are buffered to protect the microprocessor from damage. And you'll be able to power your projects using the four power supply voltages available on the breadboard.

As a 16-bit computer the ET-100 features 16K of RAM expandable to 64K and a sophisticated 8088 microprocessor found in many popular PCs. The ET-100 includes a powerful editor, assembler and debugger permanently stored in 32K of ROM. And you'll find the cassette port, RS-232 Input/Output port and detached 95-key keyboard extremely useful. Also, a video output can be displayed on a monitor, like the HVM-1220-A (page 68).

Kit ET-100 Ship wt. 33 lbs. \$799.95

Assembled ETW-100 Ship wt. 33 lbs. \$1095.00

Give your ET-100 more power

With this accessory, you can modify your trainer/computer to help with applications like data processing, telecommunications, and financial analysis. Once modified, your computer will have 128K bytes of RAM expandable to 192K with the addition of accessory Z-205-1. This package consists of 2 circuit boards, a boot ROM, an external disk drive unit and a dust cover. Two full RS-232C serial ports let you communicate with printers, modems and voice synthesizers. And you also get a programmable timer that's independent of the system clock.

Configurations:

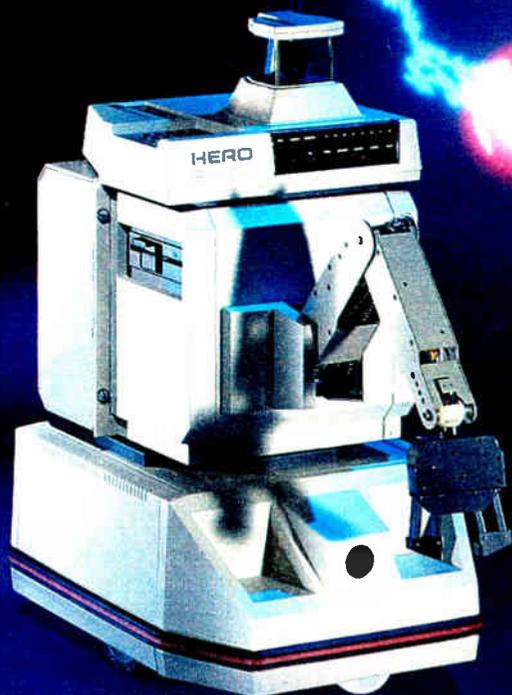
Assembled EWA-100-B Ship wt. 70 lbs. \$1650.00

Assembled EWS-100-B Includes ETW-100 and EWA-100-B. Ship wt. 96 lbs. \$2750.00

Accessories:

ETA-100-1 Extra Removable Breadboard. 1 lb. \$29.95

Z-205-1 64K RAM Upgrade. Ship wt. 1 lb. \$40.00



Credit card orders call TOLL-FREE:

1-800-253-0570

Alaska and Michigan residents call: 616-982-3411.

HELP in building your kit: see page 52



HERO 2000 leads you into the future

HERO 2000 will help you explore the related technologies of robot automation programming, electronics for automation, intelligent machines and robotics.

This incredible robot features a 16-bit 8088 master microprocessor that runs user programs and eleven 8-bit peripheral microprocessors, plus HERO 2000 BASIC stored in the 64K ROM. Other built-in programs are for demonstrations, diagnostics and sensor adjustment routines. The 24K of RAM is expandable up to 576K by using three optional memory boards. Each memory board contains 64K of RAM and will accept two additional 64K RAM chip sets.

The new disk drive accessory expands HERO's capabilities by allowing you to store and retrieve programs and data on a 5¼" floppy disk. It includes the MS-DOS software package and requires the ETW-19-15 Extension Board with a minimum of 128K RAM installed for use with your HERO 2000.

Other expansion features include 12 circuit card slots, an optional Experimenter Board for conducting experiments and testing your own circuits, two RS-232 DCE ports configured for a terminal and printer, and a cassette port for storing your programs on standard cassette tapes. Over a dozen programs are available on the optional demonstration ROM to show you the versatility of the electronically synthesized voice and built-in sensors. The optional robot arm is multi-jointed with a gripper that has a sense of touch. An optional auto-docking accessory enables HERO 2000 to automatically dock with its charger when a low battery voltage is detected.

Access ROM routines and perform movements from the top-mounted hexadecimal keypad or the optional wireless remote control (included with an assembled HERO 2000). HERO 2000 requires the Remote Console or a computer terminal for programming and checkout routines. Sixteen head-mounted LED status indicators (eight are user definable) show you what function HERO is performing. And with three power modes, HERO 2000 is able to operate up to six days on its single 24 amp-hour battery (included). A 120 VAC charger is also included.

Configurations:

Kit ET-19 HERO 2000 Robot without Arm.
Ship wt. 108 lbs. **\$1999.95**

Kit ETS-19 HERO 2000 Robot with Arm.
Ship wt. 129 lbs. **\$2499.95**

Assembled ETW-19-A HERO 2000 Robot, Arm and 75.43 MHz Remote Control. No assembly required - can be operated directly out of shipping crate. Ship wt. 147 lbs.,
Mtr. Frt. **\$4499.95**

SAVER! Kit ETS-19-A Save \$400 on ETS-19 HERO 2000 Robot with Arm, Remote Control, ET-19-14 and ET-19-51 Accessories and Robotics courses EE-1900 and EE-1901.
Ship wt. 162 lbs. **Our System Price \$2999.95**

Accessories:

Kit ETS-19-1 HERO 2000 Arm with Controller Card.
Ship wt. 22 lbs. **\$699.95**

Kit ETS-19-35 75.43 MHz Remote Control. 10 lbs. . **\$499.95**

Kit ETS-19-36 75.67 MHz Remote Control. 10 lbs. . **\$499.95**

Kit ET-19-5 Auto-Docking Accessory. Ship wt. 3 lbs. **\$149.95**

ET-19-14 Experimenter Board. Ship wt. 2 lbs. **\$99.95**

ET-19-51 Demonstration ROM. Ship wt. 1 lb. **\$29.95**

ETW-19-15 192K Static RAM Expansion Board with 64K RAM installed. Ship wt. 2 lbs. **\$99.95**

ETA-19-15 64K RAM Chip Set. Ship wt. 1 lb. **\$49.95**

ETW-19-6 360K Disk Drive. Ship wt. 7 lbs. **\$399.95**



HERO 2000 Trainer courses

With the EE-1900 Intelligent Machines course you'll study input and output devices, sensors and transducers, basic signal conditioning, digital/analog conversion, and look at CAD/CAM operations. Requires HERO 2000 with arm for experiments. Earn 3.0 CEUs.

EE-1900 Ship wt. 8 lbs. \$99.95

Course EE-1901, Electronics for Automation, looks at the electronics used at the component level in automated systems. Study industrial controllers, active and passive sensory devices and circuits, analog sampling and analog-

digital conversion circuits. All experiments use HERO 2000. 6.0 CEUs.

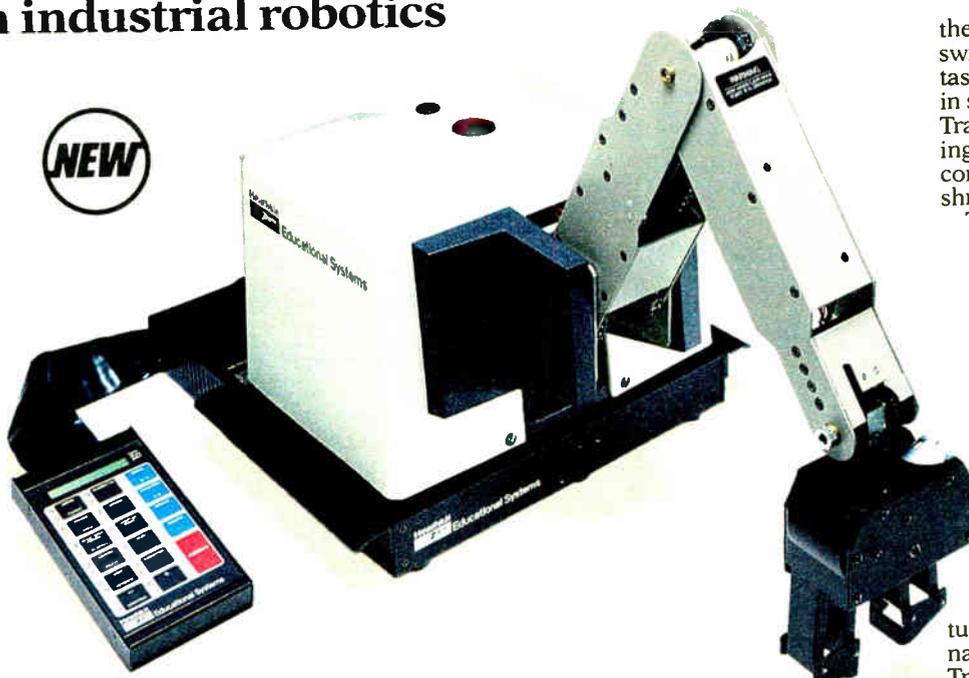
EE-1901 Ship wt. 11 lbs. \$99.95

The EB-1950 Programming and Interfacing course covers both hardware and software aspects of the automation trainer along with detailed technical discussions of the various robotic subsystems. Familiarity with BASIC is recommended. Experiments are performed on a HERO 2000 equipped with arm and remote control. Course not shown.

EB-1950 Ship wt. 5 lbs. \$59.95

Robot Arm Trainer provides complete instruction in industrial robotics

NEW



SKILL 3 The Robot Arm Trainer is designed to simulate the operation of full-scale industrial robots. In the classroom and the lab, it's the most effective and complete learning aid available. And it's simple to understand and operate, so you can spend your time learning by doing.

The Trainer features five axes of motion and a patented sense-of-touch gripper that is programmable to exert specific amounts of force. An on-board 8-bit CPU and six slave microprocessors control simultaneous operation of all the Trainer's functions. No external computer is required for operation.

Six closed-loop DC servomotors provide smooth motion and accurately move the Arm through all its axes. The closed-loop system monitors both speed

and position of each servomotor and reports to the controlling microprocessor.

In addition, the Trainer has menu-driven software that's programmed to provide you with command options. It leads you through the Trainer's operations and eliminates the need for constant reference to manuals. You can also program the Trainer to do tasks consisting of up to 50 steps and even link tasks to create larger application programs. It's easy to simulate real industrial applications with the Trainer's exact repeatability and accuracy.

The Robot Arm Trainer also has protective features that make it safe for beginners or trainees. The top-mounted Emergency Stop Switch interrupts the Trainer instantly without aborting

the task in progress. Release the switch and the Trainer resumes the task at the point of interruption. Built-in software limits ensure that the Trainer won't be damaged by exceeding its physical limitations, even if commanded to do so. Protective shrouds keep you away from the Trainer's moving parts.

Also included in this practical and comprehensive trainer package is an industrial-type teaching pendant with a 17-key membrane pad and 16-character LCD readout, and a built-in RS-232 port to interface with a terminal or an external computer, allowing you to create, edit and store programmed tasks at a computer terminal. An optional cassette interface accessory (listed below) permits you to store programs on standard cassette tapes. In addition, an 8-channel status port can send and receive data signals, permitting the Robot Arm Trainer to communicate with external sensors and other robotic devices. An internal set of diagnostic routines aid in alignment procedures and provide system checks.

Now you can learn the fundamentals of robotics in industry and turn your understanding of robotics theory into hands-on experience with the Robot Arm Trainer. Trainer includes arm and base.

Kit ETS-19-32
Ship wt. 49 lbs. \$1795.00

Assembled EWS-19-32
Ship wt. 55 lbs. \$2795.00

Accessories: **ETW-19-31** Cassette Interface. Ship wt. 1 lb. \$69.95

Learn high-tech robotics with the HERO[®] 1 Robot and its complete training system

demonstration of HERO's sensors, voice and movements as soon as you get your robot by purchasing our special HERO 1 Demo Cassette.

On-board HERO 1 is an 8-bit 6808 microprocessor that can guide the robot through complex maneuvers, activate and monitor sensors, and modify actions as a result of sensor or real-time clock inputs. HERO 1 also has 8K of ROM as well as 4K of RAM which can be increased up to 56K with the addition of an optional memory expansion board.

Commanding HERO 1 is easy with three different methods available to you. A top-mounted 17-key hexadecimal keyboard lets you easily enter, verify and modify programs, and select any of seven separate operating modes. You can also access any of the microprocessor's registers through the keypad. An attachable Teaching Pendant lets you manually control all motor and arm movements, or store them for later duplication. Or you can control HERO 1 with a remote, radio frequency-controlled transmitter available in two models, each operating at a different frequency. The Remote controls all keyboard and Teaching Pendant operations from up to 100 feet away. You can also guide HERO 1 by directly linking a host computer with the help of the Memory Expansion Board and an optional RS-232 Interface that plugs into the top experimental HERO 1 breadboard.

Configurations:

- Kit ET-18-A** Basic HERO 1 Robot less arm and voice.
Ship wt. 66 lbs. **\$799.95**
- Assembled ETW-18-WA** HERO 1 without arm assembly
Ship wt. 65 lbs. **\$1699.95**
- Kit ETS-18-37** HERO 1 with Arm and Remote Control
operating at 75.43 MHz and with voice. 89 lbs. **\$1299.95**
- Kit ETS-18-38** HERO 1 with Arm and Remote Control
operating at 75.67 MHz and with voice. 89 lbs. **\$1299.95**
- Assembled EWS-18-35** HERO 1 with Arm and Remote
Control operating at 75.43 MHz. Ship wt. 95 lbs. ... **\$2149.90**
- Assembled EWS-18-36** HERO 1 with Arm and Remote
Control operating at 75.67 MHz. Ship wt. 95 lbs. ... **\$2149.90**

Accessories:

- Kit ET-18-1** HERO 1 Arm with gripper mechanism.
Ship wt. 6 lbs. **\$349.95**
- Assembled ETW-18-1** HERO 1 Arm. Ship wt. 5 lbs. **\$549.95**
- Kit ET-18-2** HERO 1 Voice. Ship wt. 1 lb. **\$99.95**
- Kit ET-18-35** Remote Control Accessory for HERO 1 that
operates at 75.43 MHz. Ship wt. 5 lbs. **\$249.95**
- Assembled ETW-18-35** Remote Control Accessory that
operates at 75.43 MHz. Ship wt. 5 lbs. **\$399.95**
- Kit ET-18-36** Remote Control Accessory for HERO 1 that
operates at 75.67 MHz. Ship wt. 5 lbs. **\$249.95**
- Assembled ETW-18-36** Remote Control Accessory for HERO
1 that operates at 75.67 MHz. Ship wt. 5 lbs. **\$399.95**
- ET-18-4** A plug-in Demo ROM containing several routines
demonstrating all of HERO 1's motor and sense circuits and
voice. Ship wt. 1 lb. **\$49.95**
- ET-18-5** Monitor ROM listing. Ship wt. 1 lb. **\$39.95**
- Assembled ET-18-6** Memory Expansion Board allows the
addition of over 40K of memory. 2 lbs. **\$49.95**
- ETA-18-6** Memory Expansion RAM (8K x 8) chip that installs
onto the ET-18-6 memory board. Ship wt. 1 lb. **\$24.95**



SKILL 3 An ideal teaching tool, HERO 1 is a completely self-contained robot that interacts with you and its environment. HERO 1 detects sound, light, motion and obstacles and travels over a course that you predetermine. The robot can see and hear through on-board light, sound and motion detectors plus a sonar ranging system. The sound detector hears over a 300 to 5000 Hz frequency range while the light detector sees over the entire visible spectrum and into the infrared range. HERO 1's motion detector senses movement up to a distance of 15 feet while a sonar system determines ranges between objects and the robot.

HERO 1's abilities are limited only by your imagination. For example, you can get an optional Arm with Gripper and program it to pick up small objects with its manipulator. The arm moves through five axes and can lift 16 ounces when retracted. You can also purchase the optional voice synthesizer. It not only lets HERO 1 simulate the sound of human speech, but it can also speak in complete sentences. You can see a

ET-18-7 Automatic Mode ROM that plugs into HERO 1 and enables the robot to move independently around a room while avoiding obstacles. Ship wt. 1 lb. **\$29.95**

ET-18-9 HERO 1 BASIC is a plug-in ROM that allows you to program HERO 1 in a simple integer BASIC with modifications to use the robot's voice synthesizer and its various motors and sensors. Requires an ET/ETW HERO 1, an ET-18-6 Memory Expansion Accessory, one or more ETA-18-6 Memory Expansion RAM, an ETW-18-10 RS-232 Interface Accessory, a terminal or computer with a terminal emulation program and a serial interface cable such as the HCA-10 or

HCA-11 on page 65. Ship wt. 1 lb. **\$49.95**

SAVER! ETS-18-9 Expansion System. Everything needed to let you program your robot. Includes: BASIC ROM, RS-232 Interface, Memory Expansion Board and one Memory Expansion RAM. Ship wt. 6 lbs. **\$179.80**

ET-18-11 HERO 1 Demo Cassette contains programs on cassette tape demonstrating the robot's sensors and voice along with a variety of arm and body movements.

Ship wt. 1 lb. **\$14.95**

Assembled ETW-18-10 RS-232 Interface allows serial communication between the robot and a terminal or computer. Requires ET-18-6 Memory Expansion Board. 1 lb. ... **\$59.95**

Learn robotics and industrial electronics

Our Robotics and Industrial Electronics Course teaches



you how robots

work. After a review of elementary electronic principles, you'll be introduced to robot mechanics, computer control and low, medium and high-technology robots. From there, you'll master different power systems and familiarize yourself with the operation of various AC and DC motors and generators, industrial hydraulic and pneumatic systems and DC stepper motors.

You'll get an over-all understanding of the robotics system as we link computer applications with mechanical principles. You'll also learn how to write robot control programs and see how sensing systems and voice synthesis work.

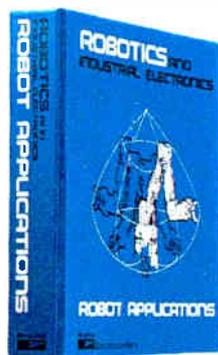
Do the optional experiments and let your HERO 1 guide you to a practical understanding of the principles of industrial electronics, computers, automated equipment, sensors, servos, stepper motors, controllers and more.

We recommend that you first complete EE-3101-A DC Electronics (page 71), EE-3102-A AC Electronics (page 71), EE-3201-A Digital Techniques (page 74), and EE-3401-A Basic Microprocessors (page 75).

EE-1800. 8 CEU's. 12 lbs. **\$99.95**

\$100 OFF! ROBOTICS TRAINING SAVERS

Our special offer includes: EE-1800 Robotics and Industrial Electronics Course, EE-1812 Robot Applications Course, EB-1802 Advanced Programming Experiments, ET-18-A Basic HERO 1 Robot, ET-18-1 Robot Arm with Gripper, and ET-18-2 Voice Synthesizer. **EES-1800.** Ship wt. 111 lbs. **\$1374.70**



Study real-world applications and design of industrial robots

Learn about the driving technologies behind advanced industrial robots, why robots are important, and where they go from here with our Robot Applications Course.

You'll start

with a review of robotics basics. Next, you'll plug into an in-depth study of how corporations use tasks, payback reliability, quality and other factors in deciding the need for and kind of industrial robot to buy. You'll learn about the process of signal conditioning that gets a signal from sensor to microprocessor controller. Plus, you'll gain a thorough knowledge of the different types of vision, tactile and environmental feedback sensor systems. This comprehensive coverage is designed to give you a solid understanding of the capabilities, present uses and limitations of industrial and domestic robots.

We then take you to the future manufacturing plant, where we explore "computer-aided" production and the possible future applications of industrial robots.

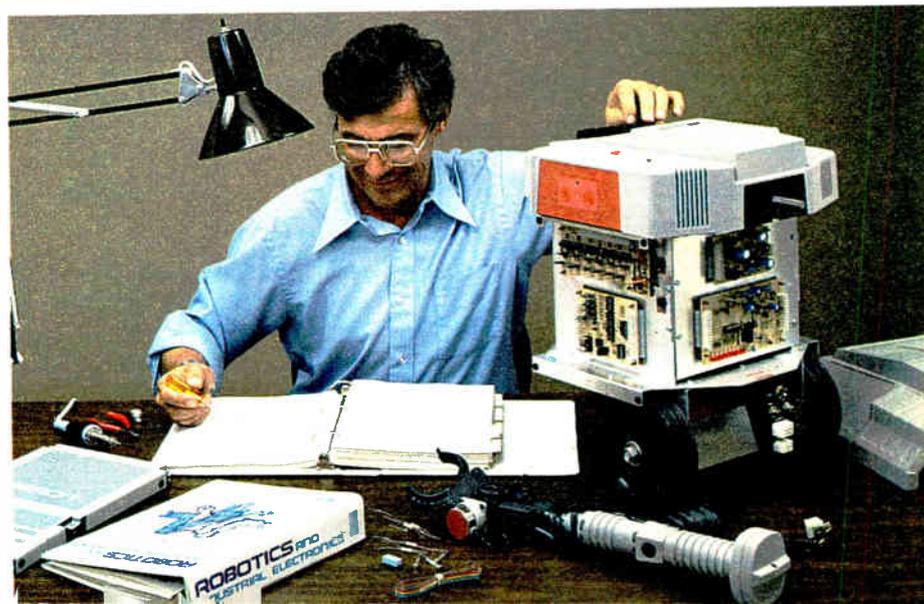
We reinforce your learning with nine experiments that you can perform on HERO 1. All components for the experiments are included. You'll even get an audio cassette tape containing the experiment programs for this course.

Pass the optional final exam and earn 4.0 Continuing Education Units. **EE-1812.** Ship wt. 6 lbs. **\$99.95**

Advanced programming experiments for HERO 1

Master the operation of your HERO 1 and unlock the power of the Robot Language Interpreter. Our sixty-one programming experiments show you how with a wide range of examples that teach general programming principles, including subroutines stored in HERO 1's monitor ROM.

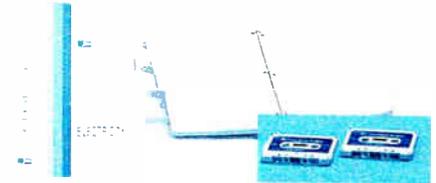
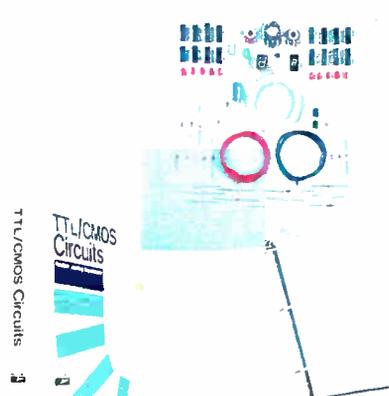
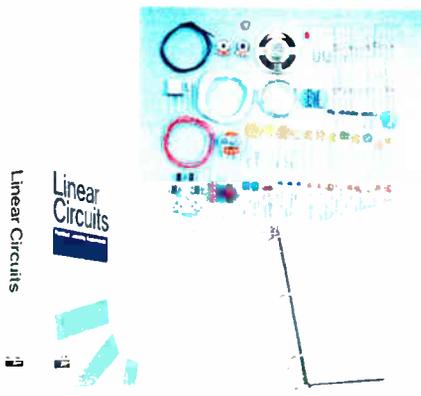
EB-1802 Ship wt. 1 lb. **\$24.95**



Introductory courses that will spark your interest and give you that special head start

If you're starting out in electronics, we've got a diverse assortment of courses and learning aids just for you. Our courses can do everything from giving you a working knowledge in fundamentals and concepts of AC and DC electricity to providing instruction in soldering that includes soldering a working light blinker. We teach you about linear circuits by covering dozens of basic circuits and their modifications. We also have a course that examines TTL/CMOS circuits in detail and another that teaches you all about printed circuit boards; their

properties, manufacturing processes, and how to make your own. Our offerings even include an overview of fundamental electronic concepts for beginners and an Electronics Learning Dictionary that defines electronic's technical terms. And as always, you can earn valuable CEUs: 4.0 for courses EH-701, EH-702 and EE-3140-A, 2.0 for EI-3134 and 1.0 for EE-3100. The ET-3300-B Trainer is used with EH-701 and 702, while the ET-3600 or ETW-3100-B Trainer is used with EE-3140-A.



Beginning electricity

This audio/visual supplemented course teaches you the concepts of direct and alternating current, circuit theory and electromechanical systems. You'll also learn about electrical devices and how to solve basic problems in electricity.

EE-3100 Ship wt. 5 lbs. \$29.95

Cover basic circuits with our linear circuits course

Learn basic circuit operation and modifications through concise descriptions and schematics. You'll construct over 30 linear circuits including various amplifiers and modulators. A background in DC and AC Electronics and Semiconductor Devices is necessary.

EH-701 Ship wt. 2 lbs. \$54.95

Learn digital logic design and use in basic circuits

Our TTL/CMOS Course gives you a basic knowledge of both digital transistor-transistor logic and complimentary metal oxide semiconductor building blocks and how they function.

EH-702 Ship wt. 3 lbs. \$59.95



Concepts of Electronics course teaches the basics



Concepts of Electronics is an ideal course for the person just starting out in the field of electronics. You'll learn about the properties of electricity and the operation of various electronic devices and circuits. Gain additional insight with included hands-on experiments.

EE-3140-A Ship wt. 9 lbs. \$69.95



Learn soldering

This course teaches you professional soldering facts and techniques. You'll learn the chemistry of soldering, proper soldering iron size, cleaning and tinning the soldering iron, and more.

EI-3133 Ship wt. 3 lbs. \$19.95



Master the printed circuit

This course teaches you all the steps necessary for making circuit boards from scratch. You'll put your knowledge into practice with an actual photo-electric lamp switch and touch switch.

EI-3134 Ship wt. 7 lbs. \$69.95

Your complete reference for electronics technical terms

Our Tutorial Dictionary defines terms in 832 pages and contains a summary of 16 electronics-related topics.

EB-1010 Ship wt. 3 lbs. \$16.95

Video and accredited self-study courses

Heathkit/Zenith Continuing Education is accredited by the National Home Study Council and licensed as a school by the State of Michigan. So, you can be sure that all Heathkit Self-Instruction Programs are quality self-study programs.

Continuing Education Units (CEU's), a nationally-used method of recognizing achievement in non-credit adult education, may be earned by passing the optional final examination

of self-study courses with a 70% or higher score.

You can obtain video courses from our Heathkit Video Training Series. These courses help make your studies more effective and economical, too. Our video courses include: Microprocessors, Digital Techniques and Soldering. For complete details, write: Heath Company, Dept. 518-000, Benton Harbor, MI 49022. To order call TOLL-FREE: 1-800-253-0570.

classroom version courses

	Course	Text ship wt 2 lbs.	Price	Workbook ship wt 2 lbs.	Price	Instructor's Guide ship wt 1 lb.	Price	Assembled Trainer wt 6 lbs.	Price	Parts ship wt 1 lb.	Price	Cassettes ship wt 2 lbs.	Price
Introductory	Concepts of Electronics	EB-6140 (3 lbs.)	24.95	EB-6140-40 (1 lb.)	10.95	EB-6140-50	9.95	ETW-3600	199.95	EB-6140-30	29.95	NOT USED	
	Basic Electronics												
	DC Electronics	EB-6101-A	19.95	EB-6101-41 (1 lb.)	10.95	EB-6101-51	9.95	ETW-3600	199.95	EB-6101-31 (2 lbs.)	24.95	EEA-3101-A	19.95
	AC Electronics	EB-6102-A (3 lbs.)	19.95	EB-6102-41	10.95	EB-6102-51 (2 lbs.)	9.95	ETW-3600	199.95	EB-6102-31	19.95	EEA-3102-A	19.95
	Semiconductor Devices	EB-6103-A (3 lbs.)	19.95	EB-6103-41	10.95	EB-6103-51	9.95	ETW-3600	199.95	EB-6103-31	19.95	EEA-3103-A	19.95
	Electronic Circuits	EB-6104-A	19.95	EB-6104-41	10.95	EB-6104-51	9.95	ETW-3600	199.95	EB-6104-31	34.95	EEA-3104-A	19.95
	Test Instruments	EB-6105 (4 lbs.)	19.95	EB-6105-40	10.95	EB-6105-50	9.95	ETW-3600	199.95	EB-6105-30	29.95	EEA-3105-A	19.95
	Electronic Communications	EB-6106	19.95	EB-6106-40 (1 lb.)	10.95	EB-6106-50	9.95	ETW-3600	199.95	EB-6106-30	34.95	EEA-3106-A	19.95
	Digital Techniques	EB-6201-A (3 lbs.)	24.95	EB-6201-41	11.95	EB-6201-51	9.95	ETW-3700	199.95	EB-6201-31	34.95	EEA-3201-A	19.95
	Digital Techniques Additional Experiments	NOT USED			EB-6201-71 (1 lb.)	12.95	EB-6201-52	9.95	ETW-3700	199.95	NOT USED		NOT USED
Data Communications and Networks	EB-8090 (5 lbs.)	24.95	EB-8090-40 (1 lb.)	10.95	EB-8090-50	9.95	ETW-1000 (13 lbs.)	369.95	EB-8090-30	19.95	NOT USED		
Microprocessor Technology	Microprocessors	EB-6401-A (4 lbs.)	24.95	EB-6401-41 (1 lb.)	11.95	EB-6401-51	9.95	ETW-3400-A	359.95	EB-6401-31	64.95	NOT USED	
	Microprocessor Interfacing	EB-6402 (5 lbs.)	24.95	EB-6402-40 (1 lb.)	10.95	EB-6402-50	9.95	ETW-3400-A	359.95	EB-6402-30	64.95	NOT USED	
	Microprocessor Applications	EB-6405 (3 lbs.)	24.95	EB-6405-40	10.95	EB-6405-50	9.95	ETW-3400-A	359.95	EB-6405-30 (2 lbs.)	54.95	NOT USED	
	Advanced 16-bit Microprocessors	EB-8088 (4 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	
Advanced Electronics	Operational Amplifiers	EB-601	19.95	EXPERIMENTS IN TEXT		EB-601-50	9.95	ETW-3300-B	194.95	EB-601-30	24.95	NOT USED	
	IC Timers	EB-603	19.95	EXPERIMENTS IN TEXT		EB-603-50	9.95	ETW-3300-B	194.95	EB-603-30	29.95	NOT USED	
	Phase-Locked Loops	EB-604	19.95	EXPERIMENTS IN TEXT		EB-604-50	9.95	ETW-3300-B	194.95	EB-604-30	29.95	NOT USED	
	Optoelectronics	EB-605	19.95	EB-605-40 (1 lb.)	9.95	EB-605-50	9.95	ETW-3300-B	194.95	EB-605-30	29.95	NOT USED	
	Laser Technology	EB-610	19.95	EB-610-40 (1 lb.)	10.95	EB-610-50	9.95	EWS-4200 (12 lbs.)	395.00	EB-610-30 (3 lbs.)	39.95	NOT USED	
	Electro-optics	EB-611	19.95	EB-611-40 (1 lb.)	10.95	EB-611-50	9.95	ETW-3300-B	194.95	EB-611-30 (2 lbs.)	79.95	NOT USED	
	Robotics and Automation	Intelligent Machines	EB-1900	19.95	EB-1900-40 (1 lb.)	10.95	EB-1900-50	9.95	ETW-19-A (147 lbs.) Mtr Frt	4499.95	EB-1900-30 (2 lbs.)	39.95	NOT USED
Electronics for Automation		EB-1901	19.95	EB-1901-40 (1 lb.)	10.95	EB-1901-50	9.95	EB-1901-30			69.95	NOT USED	
HERO 2000 Programming and Interfacing		EB-1950 (5 lbs.)	59.95	NOT USED						NOT USED			
Robotics & Ind Electronics		EB-1801 (4 lbs.)	29.95	EB-1801-40	14.95	EB-1801-50	9.95	EWS-18-35 EWS-18-36 (95 lbs.)	2149.90	EB-1801-30 (2 lbs.)	44.95	NOT USED	
HERO 1 Advanced Experiments		EB-1802 (1 lb.)	24.95	NOT USED								NOT USED	
Computer Servicing	Computer Fundamentals	EB-2001 (3 lbs.)	19.95	EB-2001-40	10.95	EB-2001-50	9.95	ETW-100 (33 lbs.)	1095.00	EB-2001-30	39.95	NOT USED	
	Computer Peripherals	EB-2002	19.95	EB-2002-40 (1 lb.)	10.95	EB-2002-50	9.95	ETW-100 (33 lbs.)	1095.00	EB-2002-30	39.95	NOT USED	
	Computer Maintenance	EB-2003	19.95	EB-2003-40 (1 lb.)	10.95	EB-2003-50	9.95	ETW-100 (33 lbs.)	1095.00	EB-2003-30	29.95	NOT USED	
Circuit Design	Passive Circuit Design	EB-6001 (3 lbs.)	19.95	EB-6001-40	10.95	EB-6001-50	9.95	ETW-1000 (13 lbs.)	369.95	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.)	369.95	EB-6002-30	19.95	NOT USED	
	Analog Circuit Design	EB-6003 (4 lbs.)	19.95	EB-6003-40 (1 lb.)	10.95	EB-6003-50	9.95	ETW-1000 (13 lbs.)	369.95	EB-6003-30	19.95	NOT USED	
	Digital Circuit Design	EB-6004 (4 lbs.)	19.95	EB-6004-40	10.95	EB-6004-50	9.95	ETW-1000 (13 lbs.)	369.95	EB-6004-30	44.95	NOT USED	
CAD	AutoCAD	EB-609 (6 lbs.)	39.95	NOT USED		EB-609-50	9.95	NOT USED		NOT USED		NOT USED	

Electro-optics – the wave of the future

Explore two of today's most fascinating and useful new technologies...lasers and fiber optics. Get a good working knowledge of both through comprehensive texts and hands-on experiments. Our laser course teaches you

See laser technology in action with your own laser trainer

This exciting trainer is used in all experiments in the EE-110 Laser Course. The Laser Trainer uses a Helium Neon (HeNe) gas laser that generates intense coherent light in the visible spectrum. Your Trainer also includes a receiver/monitor for receiving the beam and for measuring the relative power of the signal. The receiver has a built-in detector, audio amplifier and speaker for reproducing sound transmitted over the laser beam. Also includes a tripod mount and signal input jacks for use with an external signal source.

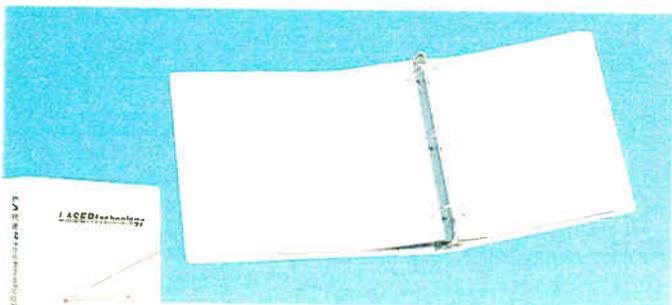
Kit ETS-4200 Ship wt. 12 lbs. \$279.95

Assembled EWS-4200 Ship wt. 12 lbs. \$395.00

SAVER! Purchase both the Laser Technology Course and the ETS-4200 Laser Trainer with Receiver and save \$30.00.



EES-110
Ship wt. 32
lbs. \$349.90

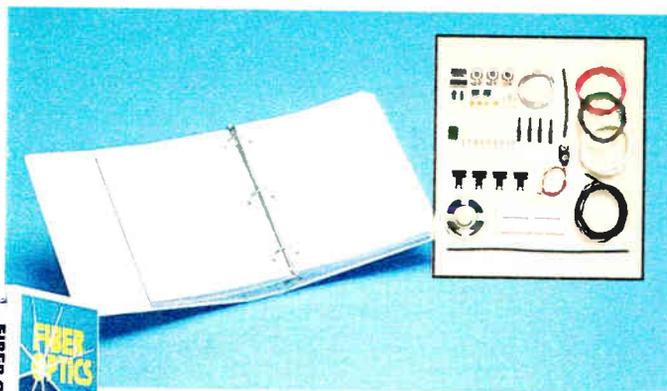


Learn all about lasers

Be on top of one of the most thrilling breakthroughs in technology with our Laser Technology Course. Lasers are being applied in many areas including medicine, industry, communications, science and precise measurements of distances on earth and in space. You can't afford not to be laser-literate. That's why we've designed this course to give you a solid understanding of laser basics such as optical terms and concepts, characteristics of laser light, laser design and construction, types of lasers, components used in laser design and common applications to everyday life and safety. You'll go beyond ordinary book learning by performing 15 experiments on your own Laser Trainer (purchased separately). These experiments include transmitting and reproducing sound over a laser beam. Come explore with us.

EE-110 Ship wt. 7 lbs. \$99.95

the basic characteristics of the laser by letting you operate a commercial-grade low-power Class II laser. In our fiber optics course, you'll learn how the fiber optic cable is utilized in communications and actually build working fiber optic links. Both courses are worth 3.0 CEUs each.



Learn what the fiber optics revolution is all about

Fiber optics have become an integral part of modern communications. They provide cost-effective rapid signal transmission for data communications as well as multiple and simultaneous telephone and TV signals. Our five-unit Fiber Optics Course gives you a thorough understanding of this important technology.

Your study will start with the nature of light and principles of the transmission medium. You'll then explore fiber types, their construction and how they propagate light, as well as the importance of numerical aperture, source area and radiation pattern in energy launch, and loss factors.

You'll learn about active devices used to generate and detect fiber optic transmission light. You'll study light-emitting diodes; physical construction, theoretical operation, biasing characteristics and several types of fiber optic LED design considerations. Our discussion of laser components and characteristics concludes with laser emissions and principles associated with the injection laser diode use in fiber optic circuits.

The most stimulating section of the course comes when you tie all component parts together into an operational fiber optic link. You'll closely examine requirements of various types of links and learn which components best fulfill certain requirements. Plus, you'll examine different systems in use today and see how they perform as a whole. You'll even learn how to design a system with the required bandwidth and minimum loss of power.

Four hands-on experiments let you construct a modulated source driver circuit, fiber optic receiver circuit and actual fiber optic links. You'll gain valuable design experience as you observe the parameters of a fiber optic link directly. These experiments require the ET-3700 or ET-3200-B Digital Trainer, an oscilloscope, multimeter and common hand tools (not included). All other necessary parts are furnished.

We suggest that you take EE-3101-A DC Electronics and EE-3102-A AC Electronics or have equivalent knowledge before taking Fiber Optics. EE-3201-A Digital Techniques or equivalent knowledge is recommended but not required.

EE-4201 Ship wt. 6 lbs. \$99.95

Advanced electronics for every interest

This series lets you choose from among five courses, each providing valuable information on a specific area of electronics including: op-amps, circuit filter design, IC timers, phase-locked loops, light sources and the different types of optoelectronic displays. All courses contain parts for included experiments performed on the ET-3300-B trainer. And all courses are worth 3.0 Continuing Education Units.



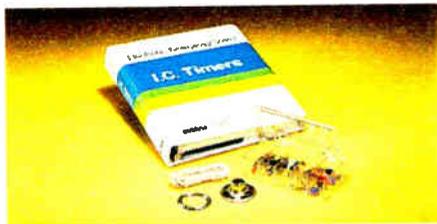
Study the ideal amplifier

A detailed study of common op-amp parameters, basic op-amp linear circuits, integrator and differential circuits and more. You'll learn about current/voltage and voltage/current converters, generators, active filters and bipolar FET op-amps. To take this course, you'll need a background that includes the Basic Electronics Series. EE-101 Ship wt. 5 lbs. \$49.95



Learn to design filters

With our Active Filters Course you can become proficient in: active filters with op-amps, plotting and predicting frequency responses, breadboarding all types of filters, plus bandpass and state-variable filters. You'll need knowledge from the Basic Electronics Series. EE-102 Ship wt. 5 lbs. \$44.95



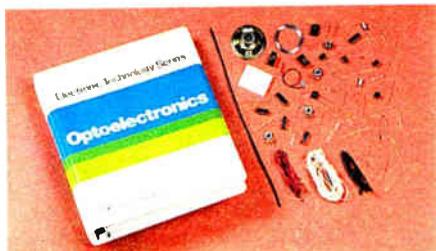
Learn all about timers

See how IC timers work, what they do and how they are applied to logic functions, output drive and time delay circuits, wide-range pulse generators, and much more. You'll need knowledge from the Digital Techniques Course. EE-103 Ship wt. 4 lbs. \$49.95



Phase-locked loops

Look into PLL principles, phase detectors, voltage controlled oscillators, loop filters, digital frequency synthesizers and much more. You'll need a background that includes the Basic Electronics Series and Digital Techniques Course. EE-104 Ship wt. 5 lbs. \$54.95



Up-to-date optoelectronics

Pick up important knowledge on light sources and different types of optoelectronic displays available. You'll also learn how to drive and multiplex them. Plus, we give you an in-depth look at light-sensitive components like photodiodes, phototransistors, solar cells, optocouplers, lasers and fiber optics. To take this course, you'll need to have successfully completed EE-3101-A DC Electronics and EE-3201-A Digital Techniques courses. EE-105 Ship wt. 5 lbs. \$64.95



Our trainer puts more fun into your experiments

If you've ever tack-soldered an experimental circuit together to see what happens, you'll enjoy the convenience of a plug-in breadboard Trainer. It provides several circuit building conveniences that save you from most of the common annoyances you run across in circuit building and experimentation.

First, you get seven solderless circuit boards, enough room for larger and more complex circuits. For fast circuit assembly and easy circuit modification, sockets are designed to accept up to #20 (0.032") solid wire and most common component leads. Socket spacing is arranged to accommodate any size dual, in-line integrated circuit package. Next, you'll enjoy the convenience of optional voltages to power breadboard experiments. And it's all supplied by three self-contained power supplies.

There's no mess and no parts confusion, no tangled wires and no connections that come unsoldered. So you can concentrate on important things like your circuit and what it's doing.

Output voltages available at power sockets are +5 volts DC ($\pm 4\%$) at 1.5 amps, 0 to +12 volts DC at 100 mA, and 0 to -12 volts DC at 100 mA. All supplies are short-circuit protected by fuse and fixed current limiting. Two ground connectors are also available.

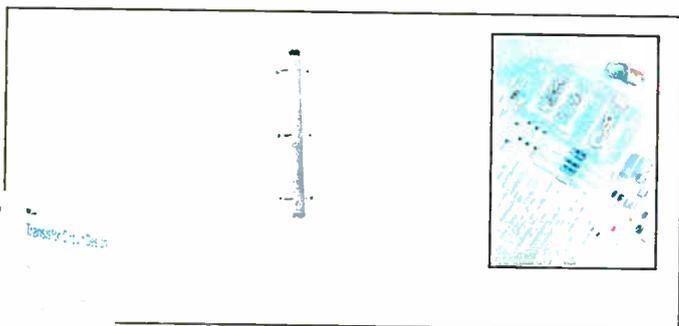
Requires 120 VAC and 60 Hz power. UL listed. 3 1/2" H x 12" W x 12" D.

Kit ET-3300-B Ship wt. 6 lbs. \$99.95

Assembled ETW-3300-B Ship wt. 6 lbs. \$194.95

Learn circuit design with this fascinating engineering series

This series teaches you everything you need to know for analyzing and designing a variety of practical circuits. **Passive Circuit Design** helps you to develop design skills through analytical techniques and associated math concepts. **Transistor Circuit Design** teaches you how to design circuits using transistors, as well as how to develop appropriate AC and DC equivalent circuits needed in the circuit design process. In **Analog Circuit Design**, you'll learn how to analyze and design circuits that serve as building blocks in modern electronic systems. And **Digital Circuit Design** provides a working knowledge of digital electronic skills needed by electrical as well as computer engineers and technicians. The thrust of our program is to give you as comprehensive and practical a course of study as possible. From circuit analysis to hands-on training with the ET-1000 Analog/Design Trainer, you're sure to get a good start in engineering.



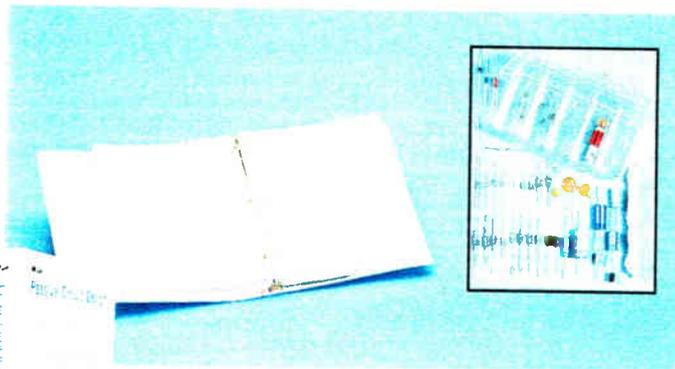
Learn to design transistor circuits

Transistor Circuit Design teaches you the basic techniques for designing circuits using transistors. Begin with a discussion of transistor characteristics and relevant parameters. Next, see how to develop appropriate AC and DC equivalent circuits needed in designing transistor circuits. Finish by studying the actual circuit design process.

This course, worth 4.0 CEUs, includes thirteen exciting experiments and requires previous electronics background, which you can get by taking our Passive Circuit Design Course. **EE-1002 Ship wt. 9 lbs. \$64.95**



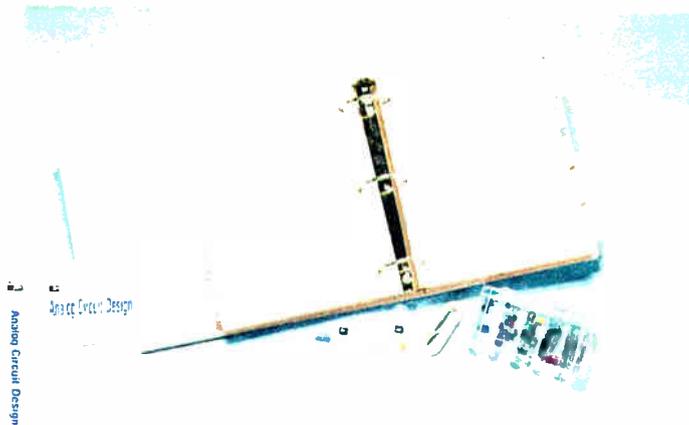
Discover the fun of kitbuilding at your **Heath/Zenith Computers & Electronics Center.**



Study passive circuit design and analysis

The foundation of our Engineering Design Series teaches you how to analyze and design circuits using components that do not provide a power gain. To begin with, you'll review DC circuit analysis, then go on to study AC circuit analysis, non-ideal properties of real components and methods for selecting appropriate devices for given applications. Later you'll learn how to design unregulated power supplies using numerous rectifier circuits and smoothing filters. Plus, you'll see how to design other passive circuits like clippers, peak detectors and waveshaping circuits.

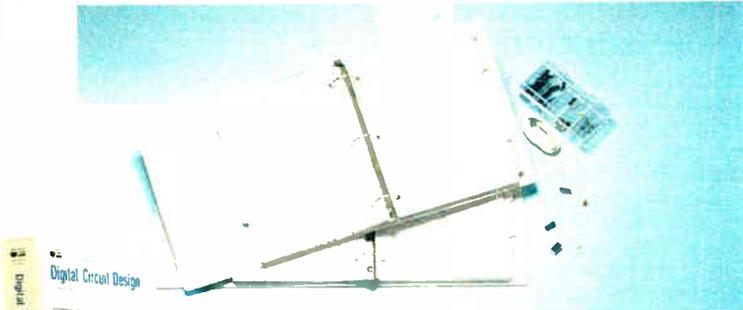
Requires a basic knowledge of DC and AC electronics, algebra and trig. Includes ten hands-on experiments. 4.0 CEUs. **EE-1001 Ship wt. 9 lbs. \$54.95**



Learn basic analog circuit design techniques

Learn how to analyze and design circuits that are more reliable and effective than circuits using discrete components. With the Analog Circuit Design course, you'll begin by learning to analyze and design several amplifier and comparator circuits using the versatile operational amplifier. You'll study op amps and comparators, both of which are used in designing instruments like a digital probe. You'll also learn to analyze and design linear regulators, oscillators and waveform generators. Twelve experiments are included.

We suggest you complete both Passive and Transistor Circuit Design before taking this course. Worth 4.0 CEUs. **EE-1003 Ship wt. 9 lbs. \$69.95**



Digital Circuit Design

Enter the real world of electronics with our digital circuit design course

This course provides you with a fascinating journey into digital design, including a close look at the logic circuit – the basis for decision and memory circuits used in all digital computers.

Your journey begins with a discussion of digital logic gates that are used as the fundamental building blocks of all digital electronics. You'll review design considerations that relate to various digital IC technology options with an overview of

various digital IC devices. From there, you'll design working circuits using logic decision circuits.

Your new found knowledge will rapidly grow as you learn a host of interesting skills. You'll learn how to: incorporate memory elements into the operation of a digital circuit, input data, and output results of logic operations to the outside, real world with interfacing analog-to-digital and digital-to-analog converters. You'll finish your journey by solving problems arising in designed circuits through the use of test instruments and general problem-solving guidelines.

Since we treat the logic circuit as a simple input/output device, you won't need much electronics background at all. You'll simply need to know the two-state binary system and basic electronic circuit principles, both of which are covered in two appendix selections. All this enables you to take this course at any stage of your electronics design education.

And you'll get so much more, like detailed experiments that you can build on your Trainer plus 6.0 Continuing Education Units that you'll earn on passing the optional final exam. A single trace scope and a multimeter are also needed to perform the experiments.

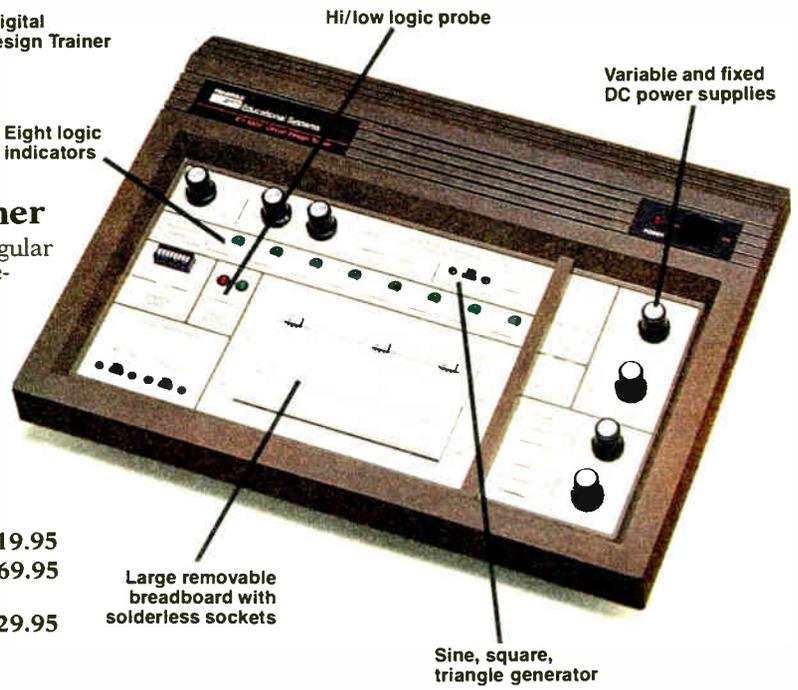
EE-1004 Ship wt. 10 lbs. \$99.95

Analog/Digital Circuit Design Trainer

Analog/digital circuit design trainer

Our solderless double Breadboard Trainer is a regular minilab for learning the basic techniques of circuit design in all courses on this and the previous page. It includes a built-in function generator for producing sine, square and triangle waveforms from 1 Hz to 100 kHz in five switch-selectable ranges. Also features variable and regulated positive and negative 1.2 to 20 volt DC power supplies, built-in logic probe and two 60 Hz sine wave signal sources of 15 VAC and 30 VAC. Operates on 105-130 VAC or 210-260 VAC RMS, 50/60 Hz and has dimensions of 4¾" H x 15¾" W x 10¾" D.

- Kit ET-1000 Ship wt. 14 lbs. \$219.95**
- Assembled ETW-1000 Ship wt. 13 lbs. \$369.95**
- Accessories: **ET-1000-1 Extra Removable Breadboard. Ship wt. 1 lb. \$29.95**



Teach yourself how to get the most from your computer and software through self-study

New course on Artificial Intelligence and Expert Systems Fundamentals

This introductory course provides a thorough overview of AI and the development of expert systems including many different programming languages. Business managers, engineers and technical people can learn how to use these concepts and techniques to their advantage. Topics

cover knowledge representation, natural language processing, voice recognition, computer vision, robotics and programming with LISP and PROLOG Languages.

Included with this easily readable two-volume course are experiments on two 5¼" floppy disks. Also included is a two-disk demonstration of Texas Instrument's PC Easy expert systems program (below). You'll need a Heath/Zenith Personal Computer or compatible equipped with 512KB of RAM and one disk drive to use the software contained in this course. After successfully completing the optional final exam you earn 6 CEUs and receive a certificate of recognition.

EC-1126 Ship wt. 6 lbs. \$99.95

New expert systems building tool

Personal Consultant Easy software from Texas Instruments is an excellent tool for learning about and for developing expert systems. Use it to quickly and efficiently create a system to solve business, scientific, technical and other problems. Has powerful and helpful features. Software requires a Heath/Zenith PC or compatible with 512K RAM and one disk drive.

EC-1127 Ship wt. 3 lbs. \$495.00



New CAD/CAM: A Hands on Approach

This exciting CAD/CAM course supplies much-needed information about the improving tools and techniques that are rapidly occurring in the manufacturing environment. The course begins with an overview of computer-aided drafting (CAD) and computer-aided manufacturing (CAM). It continues with the workstation concept, hardware, software, the cost parameters associated with CAD/CAM, numerically controlled machinery, data communications and intelligent machines.

On-disk experiments focus on the manipulation of drawings, rather than creating new ones. And you use AutoCAD which is also included. Experiments require a Heath/Zenith or IBM PC compatible computer equipped with 256K RAM, two 5¼" disk drives, and CGA or Hercules video capability. Worth 6.0 CEU credits after passing final exam.

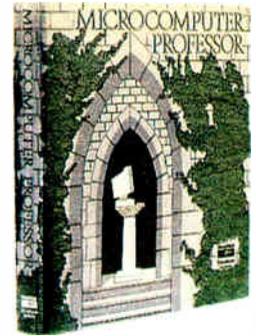
EES-109 Ship wt. 12 lbs. \$79.95

New Microcomputer Professor course

Become your own computer consultant with this thorough and simply written tutorial on personal computer systems. The expert guidance contained in this course enables you to make an informed decision about purchasing the right computer, peripherals like printers and modems, and software that will satisfy your particular problems.

This practical course is written especially for the beginner and it contains hands-on experiments that illustrate course concepts. Experiments require a Heath/Zenith or IBM PC or compatible computer using the MS-DOS operating system. Successfully pass the optional final exam and receive a certificate of achievement from Heathkit Educational Systems and 2.0 Continuing Education Units (CEUs).

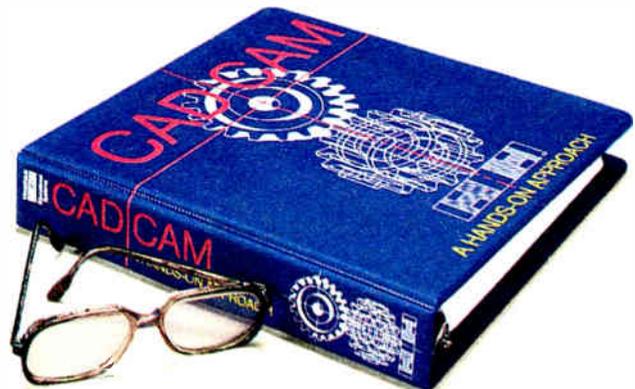
EC-1123 Ship wt. 5 lbs. \$99.95



Learn MACRO-86 Assembly Language

Learn to program virtually any computer using the familiar Intel 8086 series of microprocessors and Microsoft DOS. For this course you should have access to a Heath/Zenith PC, an upgraded ET-100 Trainer, or an IBM PC or compatible with the appropriate operating system. This course requires MACRO-86 software and support programs. For MS-DOS Version 3, the MACRO-86 Assembler is part of the CB-3163-30 Programmer's Package found on page 56. You should also be familiar with the operating system and have access to system programs (and supporting files). Pass the optional final exam and earn 5.0 Continuing Education Units.

EC-1201 Ship wt. 10 lbs. \$59.95

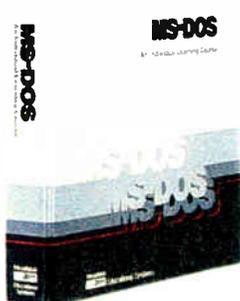


MACRO-86 Programming Algorithms

A natural follow-up course to MACRO-86 Assembly Language (page 90) that demonstrates an important phase in computer programming. Find out how to use a major tool to solve problems on a computer with a structured plan...an algorithm. Use provided programs or programs that you learn to write that clearly demonstrate the covered material.

Experiments in the course are written for computers using the Intel 8088 microprocessor such as: the H/Z-100, Heath/Zenith PCs, an upgraded ET-100 Trainer, the IBM PC or compatible. The MS-DOS operating system and MACRO-86 Assembler (not supplied) are used in all experiments. A 5 1/4" floppy disk, included with the course, contains experiments, programs and demonstrations. Worth 4.0 CEUs.

EC-1202 Ship wt. 6 lbs. \$59.95



Know how to effectively use MS-DOS*

A self-study course directed to the novice computer user. And it is accompanied by a cassette narration that guides the user through the course plus exercises that provide computer experience. See how MS-DOS Version 1, Z-DOS and PC-DOS are organized with

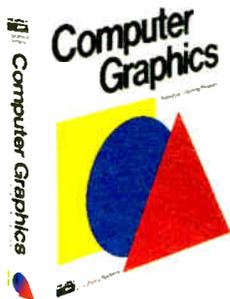
instructions on all the built-in commands.

Start with a background in the disk operating system. Then learn how to enter and edit command lines. You'll also cover the batch processor and the program debugger.

Fifteen computer exercises included on a 5 1/4" floppy disk provide an opportunity to use MS-DOS Version 1 features and commands. Use this course with an H/Z-100 Desktop, Heath/Zenith PC, an upgraded ET-100 Trainer, IBM PC or PC compatible. This course requires the MACRO-86 Assembler software. For MS-DOS version 3, the MACRO-86 Assembler program is part of CB-3163-30 Programmer's Package found on page 56. Some commands and files that are MS-DOS Version 2 and 3 specific are not covered. Pass the optional final exam and receive 3.0 Continuing Education Units.

EC-1121 Ship wt. 6 lbs. \$59.95

*MS-DOS is a registered trademark of Microsoft Corp.



Create your own dazzling graphics

Written for the beginner or experienced programmer, the High Resolution Graphics course presents a broad overview of a whole new world from creation to stimulating professional careers. Draw figures. Use color. Merge text with graphics. Animate graphics. Learn how to photograph on-screen graphics using ordinary camera

equipment. Learn to control the video screen of your H/Z-100 or Heath/Zenith PC. An IBM PC equipped with a color graphics card can also be used. Worth 6.0 CEUs.

EC-3000 Ship wt. 6 lbs. \$59.95

Software to make your computing go faster and easier

These software packages run on Heath/Zenith Personal Computers and compatibles equipped with a 5 1/4" disk drive and 128K RAM, and using MS-DOS Version 2 or later.

TRUE BASIC Programming Language: From the creators of the original BASIC comes a much better, more powerful TRUE BASIC.

ECT-1001 Ship wt. 4 lbs. \$149.95

Algebra II: Use it as an instructional aid for high school algebra II. Covers systems of equations, quadratics, etc.

ECT-1002 Ship wt. 1 lb. \$49.95

Trigonometry: Another instructional aid using radians or degrees to show trig functions, graphs, tables, solving triangles and roots of trig functions.

ECT-1003 Ship wt. 1 lb. \$49.95

TrueSTAT: A standalone interactive statistical analysis system that stresses simulation of various distributions. Can switch between graphic and tabular outputs.

ECT-1004 Ship wt. 1 lb. \$79.95

Professor DOS: A menu-driven tutorial that teaches common DOS applications plus basic and advanced commands.

ECT-1005 Ship wt. 1 lb. \$59.95

Professor Pixel: This tutorial introduces the fundamentals of graphics and music composition using BASIC.

ECT-1006 Ship wt. 1 lb. \$59.95

LOTUS 1-2-3 Tutorial: Learn to use the full power of 1-2-3 with this tutorial that covers more features.

ECT-1007 Ship wt. 1 lb. \$69.95

dBASE III Tutorial: Beginner or advanced user will learn from this in-depth tutorial.

ECT-1008 Ship wt. 1 lb. \$69.95

More PC tutorials

There's only one real way to learn about your computer and the software you run in it...and that's to use them. With these tutorials that's just what you get to do. Work directly with the software and hardware you are learning about. See how a program will actually respond when you input a command, make an entry or make a mistake.

CB-5063-22 Microstat tutorial. Ship wt. 2 lbs. \$80.00

CD-5063-5 Condor* III tutorial. Ship wt. 1 lb. \$99.00

CB-3163-36 Learning about the Heath/Zenith 150 and 200 series personal computers. Ship wt. 1 lb. \$40.00

CB-3163-37 MS-DOS Version 3 tutorial. Ship wt. 1 lb. \$40.00

RG-5063-3 Graftalk tutorial. Ship wt. 1 lb. \$39.00

*Condor is a registered trademark of Condor Computer Corporation.

The finest in assembled, high-tech electronic products

The following pages are loaded with exciting, innovative products that will interest you. From convenient security lighting to full five-year warranty telephones from Southwestern Bell, the quality and performance of these items are exceptional. And they're all factory-assembled. So your enjoyment can begin as soon as you unpack the box. On the next 12 pages you'll find products that can...

...light up an area for convenience, security and safety. Automatic lighting controls offer all this at little cost. And if you're running an outside light all night long, these alert sentinels can pay for themselves. They'll turn on lights only when needed, saving you precious energy.

...protect your family, home and possessions with effective measures that you can take. Easily installed by the average homeowner, security systems offer electronic protection beyond the deadbolt lock. They're flexible, expandable and can provide real peace of mind. Make your home a safe home without breaking your budget.

...automate your entire home. Personalize it electronically with a wide variety of light and AC outlet controllers and modules. Enjoy the freedom and convenience of the home of the future by ordering several components today.

...improve your testing and troubleshooting ability. In this section you'll find fully integrated precision measurement equipment like oscilloscopes, multimeters and logic probes. Test instruments to help technicians, engineers, maintenance repair workers and hobbyists repair and maintain electronic equipment in the shop, field, lab, factory or the home.

...enhance your life. Electronics in the home is making life easier, more comfortable, more convenient and fun. LED displays for your car. Electronic control of heating and air conditioning. Modern health aids. Protective multiple outlet strips. And more is awaiting you on the following pages.

...help you predict the weather. With the information gathered and displayed by these microprocessor-controlled weather instruments, your entire family can become amateur weather forecasters. Know the weather where you are, instantly.

...add electronic dependability to your phone system. Full-featured phones, cordless phones and answering machines from Southwestern Bell delight the eye and offer top performance. And you get a free, full five-year warranty.

A common characteristic of all these electronic products is their quality. They were selected for this catalog for that reason. They were also selected because of their performance and reliability. Quality products to meet your changing lifestyles. And we will continue to deliver more innovative and high-tech products with the same high standard of quality to make life more convenient and enjoyable for you.



Motion Sensor Light Control turns lights on and off

Provide your family with security, convenience and safety by installing the automatic Heath/Zenith Motion Sensor Light Control. Welcome late-arriving guests to your home with an illuminated walkway or driveway. Or discourage intruders by flooding your yard with inescapable light. The SL-5310 Light Control easily connects to your present outside incandescent or halogen lights to provide lighting whenever heat from moving objects is detected.

The SL-5310 utilizes reliable passive infrared sensor technology to activate lighting automatically. The light control uses a high-quality, precision-crafted sensor for extreme sensitivity. It can detect heat from moving objects up to 60 feet away in a 110° arc providing over 2000 square feet of coverage. And the SL-5310's sensitivity control is conveniently adjustable. Plus a swivel mount allows you to aim the light control over a 180° range to cover a specific or broad area. The SL-5310 Light Control also uses an overlapping multi-zone detection field for complete area coverage – it's inescapable.

A five-minute delay automatically shuts off the lighting only after the area the Light Control covers returns to normal. This saves energy and saves you money. Another energy-saving feature is the built-in photocell. It deactivates the SL-5310 Control in daylight to save enough in one year to more than pay for the control (versus all-night lighting). A manual override lets you switch on the outside lights from your inside wall switch.

The SL-5310 controls up to 500 watts of incandescent or halogen lighting. A unique walk-test design allows you to test the controller while you are installing it and aiming it for the best detection field. The light control has a watertight housing for safe use in all weather conditions. And the SL-5310 comes with easy-to-follow instructions for installing and operating the controller. Uses household 120 VAC, 60 Hz power. Overall size is 2¼" H x 4" W x 8¾" L.

The SL-5310 also has a full 1-year warranty. The controller will be promptly replaced if it fails to work properly within one year of purchase.

Assembled SL-5310-A Light Control with mounting plate and light fixture as pictured (floodlights not included).

Ship wt. 2 lbs. **\$69.95**

Assembled SL-5310 Light Control without mounting plate and light fixture. Ship wt. 2 lbs. **\$59.95**



Use your VISA or MasterCard to make your purchase!

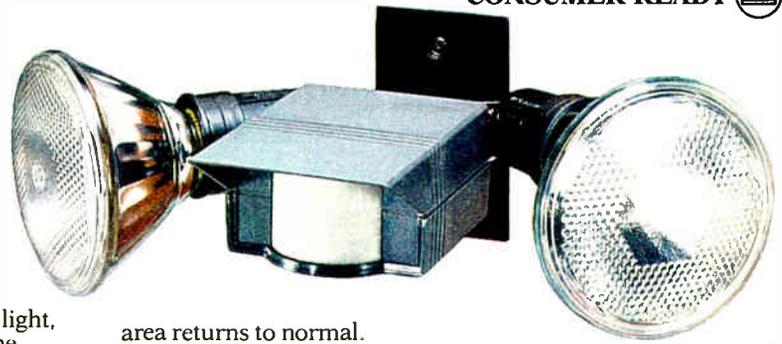
Take the convenience of security lighting indoors

The Heath/Zenith SL-5320 Advanced Light Control offers a new dimension in lighting control - outside *and* inside lighting control. And it combines all the features of the SL-5310 (page 92) plus increased wattage rating and a variable shut-off delay.

Besides turning on outside lights when heat and motion are detected, the SL-5320 also sends two unique signals over the power line into your home. These signals communicate with modules like those on pages 15 and 96. The first Light Control signal activates any device connected to the receiver module set to accept the signal. When the SL-5320 turns on an outside light, an inside light, radio, TV or other device also turns on. The additional devices will also turn off when the monitored area returns to normal. The second signal will work even in daylight to announce activity in the monitored area.

With the Advanced Light Control you can connect up to 1000 watts of incandescent or halogen lighting. You also have the advantage of varying the shut-off time of lighting connected to the control. Select from 1 to 20 minutes of delay before lights are automatically shut off after the monitored

CONSUMER-READY 



area returns to normal.

Comes with a full 1-year warranty. It uses 120 VAC, 60 Hz and has dimensions of 2¼" H x 4" W x 8¾" L.

Assembled SL-5320-A Light Control with mounting plate and light fixture as pictured (floodlights not included).
 Ship wt. 2 lbs. **\$109.95**
Assembled SL-5320 Light Control without mounting plate and light fixture. Ship wt. 2 lbs. **\$99.95**



Motion Sensor Light Control for decorative lighting

Mount this Heath/Zenith

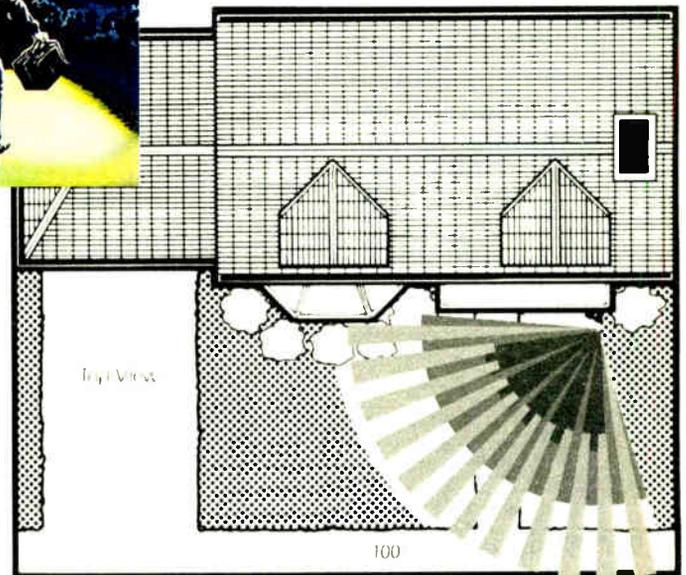
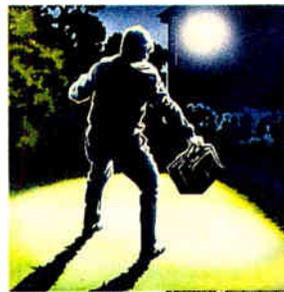
SL-5410 Light Control next to your decorative front or back porch light and get the convenience and security of an automatic motion/heat-sensing lighting switch. The compact size of this control allows you to easily install it in tight locations. And the SL-5410 is weather resistant for reliable operation in rain, snow and driving winds.

The SL-5410 Light Control uses the same safe and dependable passive infrared sensor with an overlapping multi-zone detection field as used in our other fine lighting controls. It can detect heat and motion up to 50 feet away in an adjustable field consisting of a wide 110° arc. The SL-5410 can even be adjusted for the amount of sensitivity that you need.

Other features of this excellent lighting control include three modes of operation and an adjustable 1 to 20 minute delayed lighting shut-off. In the automatic mode, lights turn on only at night when movement is detected. A test mode allows you to check aim and sensitivity. And a manual override enables you to switch on the controlled lighting whenever you need it.

The SL-5410 Control handles up to 500 watts of either incandescent or halogen lighting and is easy to install. It uses normal household 120 VAC and has dimensions of 4¾" H x 2⅝" W x 6¼" D (includes mounting shaft). Full 1-year warranty.

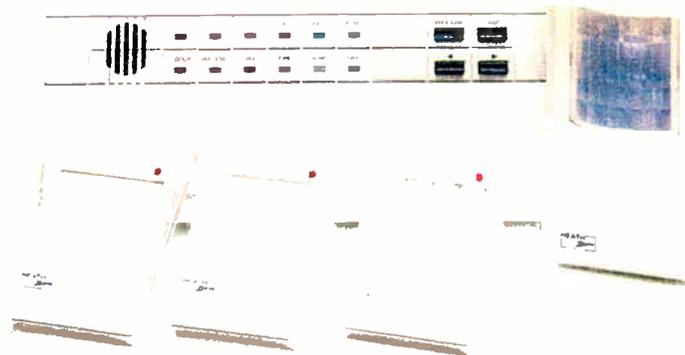
Assembled SL-5410 Ship wt. 2 lbs. **\$44.95**



Typical coverage pattern



Light controllers are recognized as effective fighters in crime prevention by the Neighborhood Crime Prevention Coordinating Committee, the national organization for Neighborhood Watch programs.



Wireless Security System – complete security plus simple installation

The Heath/Zenith SS-5910 Wireless Security System is a deluxe package that can handle just about any type of protection your home and family needs. It offers flexibility, expandability and sophistication. And it's as easy to use as it is to install. Plus it has the advantage of electronic remote control.

The SS-5910 System consists of a passive infrared motion detector, two sets of door/window transmitters and a Personal Command Remote. And all these units are wireless which means no tedious installation or unsightly wires running throughout your house. This also makes the System easy to expand with units listed in the accessories below.

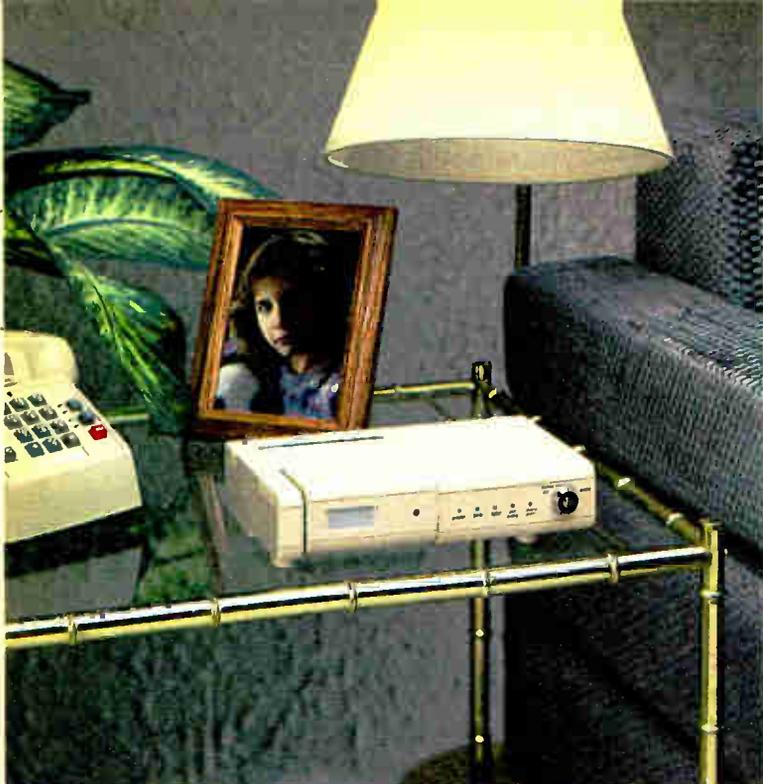
From the control console you can conveniently control infrared, window and door sensors placed throughout your home. Control is also possible by using the included Personal Command Remote and the optional wireless keypad. You have the flexibility to arm or disarm any sensor or combination of sensors at any time through three operating modes – OFF, HOME and AWAY. OFF disables all but the emergency alarms. HOME and AWAY protect you and your possessions with different combinations of sensors when you are either home or away. You choose the type of protection you want.

The SS-5910 monitors eight protection areas called zones. These consist of six general zones and two emergency zones. One emergency zone is for fire and the other for panic. The emergency zones are always active for your constant protection. You can program the six general zones according to your lifestyle and what you want protected at a certain time, while you're home or away or both.

Other features of this advanced system is an internal tamper-proof alarm that sounds if someone tries to disassemble the unit. It also has an optional emergency power backup system in case of power failure. A self-test allows you to check the operation of the entire system. Includes a power cube for use with 120 VAC and all wireless units include a battery. Comes with a full 1-year warranty.

Assembled SS-5910 Ship wt. 6 lbs. **\$399.95**

Accessories: **Assembled SSA-5910-1** Wireless Passive Infrared Detector. Ship wt. 1 lb. **\$119.95.** **Assembled SSA-5910-2** Wireless Door/Window Transmitter. Ship wt. 1 lb. **\$29.95.** **Assembled SSA-5910-3** Battery Accessory. Ship wt. 2 lbs. **\$29.95.** **Assembled SSA-5910-4** Personal Command Remote. Ship wt. 1 lb. **\$59.95.** **Assembled SSA-5910-5** Wireless Keypad. Ship wt. 1 lb. **\$69.95.** **Assembled SSA-5910-6** Siren. Ship wt. 1 lb. **\$19.95.**



magnetic contact sets (listed in the accessories) to the SS-5810. Or connect other alarm devices such as a smoke detector.

The SS-5810 Integrated Security System uses a broad coverage PIR sensor to detect an intruder's presence. The coverage pattern is approximately 6' H x 32' W x 39' L. And the sensor is vertically adjustable so you can move the detection pattern to cover different areas.

The SS-5810 is on-guard while you're home or away. In the HOME mode, this security system monitors wired devices 24-hours a day, protecting you even while you're asleep. In the AWAY mode, the SS-5810 is totally alert with all sensors, built-in and external, monitoring your possessions and your home. Any detected presence will set off a piercing alarm. And any attempt to tamper with the system while you're away will also cause the alarm to blast. Other custom features include a panic button for emergencies, adjustable entry and exit delays, alarm status LEDs, adjustable alarm timer and optional emergency power supply. Operates on 120 VAC.

Assembled SS-5810 Ship wt. 3 lbs. \$149.95

Accessories (pictured above, left to right): **SSA-5810-1** Remote Passive Infrared Detector. Ship wt. 1 lb. \$49.95.

Assembled SSA-5810-2 One pair Door/Window Magnetic Contacts. Ship wt. 1 lb. \$2.95. **Assembled SSA-5810-3** Maintenance-free rechargeable battery. Ship wt. 2 lbs. \$24.95.



Economical security system

Instant security and protection are yours as soon as you unpack the Heath/Zenith SS-5810 Integrated Security System. All you have to do is plug it in and aim the built-in passive infrared (PIR) detector. You're protected by a high-quality, reliable security system and at a fraction of the cost of other systems. This is an ideal system for apartments, small homes and single rooms.

And this ready-to-go system can be expanded to protect your entire home. Just hard-wire additional PIR detectors and



Door alarm plus chime – protection you can't get with a door lock

A door lock won't stop a thief. But the Heath/Zenith SD-5710 Door Alarm and Chime will sound a piercing alarm to frighten him away. And you'll be alerted to an open door.

When it's not standing sentry duty, the SD-5710 can be switched to the "Visitor" mode. In this mode, the alarm/chime greets guests with a pleasant welcoming chime.

The door alarm cannot be deactivated without the proper code. And you choose the unique 4-digit code from a selection of 1680 possibilities. Your particular four numbers are entered from the easy-to-use keypad right on the alarm.

The compact SD-5710 is easy to install on doors or windows with included mounting hardware. Its pleasing design complements almost any decor. The alarm/chime is powered by a 9-volt battery. And the SD-5710 has our assurance of quality with a full 1-year warranty. Get the SD-5710 Door Alarm and Chime and enjoy the added safety and security that you can't get with an ordinary door lock.

Assembled SD-5710 Ship wt. 1 lb. \$29.95



Get savings and convenient home control with X-10 devices

1 Now you have even more choices on how to personalize your home electronically with X-10 POWERHOUSE controllers and modules. Use the Home Control Interface for security whether you're at home or away. You program the Interface from your personal computer, then disconnect it so your computer can be used for other tasks. The Interface controls up to 256 modules and you can program up to 128 events. Three different software programs are available that use easy-to-follow menus or graphic maps of your home. **Assembled BC-290-A** Interface for Apple IIe/IIc. Ship wt. 3 lbs. *Was \$49.99 Now \$39.99*. **Assembled BC-290-M** Interface for Macintosh. Ship wt. 2 lbs. *Was \$49.99 Now \$39.99*. **Assembled BC-290-P** Interface for IBM PC and compatibles. Ship wt. 2 lbs. *Was \$49.99 Now \$39.99*.

2 Radio Control System gives you wireless remote control of lamps and appliances. Turn on lights from your driveway for convenience. Keep one at bedside for security. Give one to an elderly or disabled person to flash in case of emergency. The receiver also lets you control up to 7 additional modules by retransmitting the control signal over house wiring. **Assembled BC-5000** Transmitter and Receiver. Ship wt. 1 lb. . . . \$39.99 **Assembled BC-504** Extra Transmitter. Ship wt. 1 lb. . . . \$19.99 **Assembled BC-501** Extra Receiver. Ship wt. 1 lb. . . . \$29.99

3 Maxi Controller enables you to control up to 16 groups of modules for blanket control of lamps and appliances. **Assembled BC-503** Ship wt. 1 lb. . . . \$24.99

4 **Assembled BC-227** Wall Receptacle Module rated at 15 amps. Ship wt. 1 lb. . . . \$24.99

5 **Assembled BC-260** Mini Controller controls up to eight groups of modules. Ship wt. 2 lbs. . . . \$12.99

6 **Assembled BC-262** Timer Command Console for timed control of lights and appliances. Ship wt. 3 lbs. . . . \$29.99

7 **Assembled BC-2700** Telephone Alarm Responder lets you phone home to activate lights or other devices. Requires 9V battery. Ship wt. 2 lbs. . . . \$49.95

8 **Assembled BC-465** Lamp Module, 300 watts maximum load. Ship wt. 1 lb. . . . \$12.99

9 **Assembled BC-466** Appliance Module turns appliances on/off. 15 amp resistive load, 1/3 hp motor, 500 watt lighting, 400 watt TV/stereo. Ship wt. 1 lb. . . . \$12.99

10 **Assembled BC-284** Burglar Alarm Interface Module turns on selected lights, appliances, siren or selected lights can flash on and off. Ship wt. 1 lb. . . . \$39.99

11 **Assembled BC-467** Wall Switch Module, 500 watt load. Ship wt. 1 lb. . . . \$12.99

12 **Assembled BC-4777** Three-Way Wall Switch Module replaces hall and stair 3-way switches. Maximum 500 watt load. Ship wt. 1 lb. . . . \$24.99

13 **Assembled BC-245** Perpendicular-Pronged Air Conditioner Module. 240 VAC receptacle for 20 A load. 1 lb. . . . \$29.99

14 **Assembled BC-2807** Thermostat Set. Requires BC-466 Module above. Ship wt. 1 lb. . . . \$19.99



NEW

Dual trace 25 MHz oscilloscope

Meet a broad range of applications in design, testing and servicing of both analog and digital circuits and equipment with this precision scope. It features alternate triggering, trace magnification and an 8 x 10 cm internal graticule.

Assembled SO-4226 Ship wt. 22 lbs. **\$549.95**

Specifications: **VERTICAL DEFLECTION:** Deflection Factor: 5 mV to 5 V/div \pm 3%; 10 steps in 1-2-5 sequence with variable control. **Rise Time:** Approx. 14 ns. **Overshoot:** Less than 3%. **Input Impedance:** 1 M Ω , 25 \pm 3 pF. **Operating Modes:** CH1, CH2, DUAL and ADD. **Chop Frequency:** Approx. 250 kHz. **HORIZONTAL DEFLECTION:** Sweep Mode: AUTO, NORMAL and SINGLE. **Sweep Time:** 0.2 μ s to 0.5 s/div; 20 steps in 1-2-5 sequence with variable control and X-Y mode. **Magnify:** X10. **Sweep Time Accuracy:** 3%. **Linearity:** 3%. **X-Y MODE:** Sensitivity: Same as CH1 vertical axis. **Frequency Response:** DC to 1 MHz (-3 dB). **TRIGGER:** Source: CH1, CH2, LINE and EXT. **Coupling:** AC, HF REJ, TV and DC. **Polarity:** + or -. **Mode:** AUTO, NORM and SINGLE. **GENERAL:** Calibration Voltage: 2 V P-P \pm 2%, 1 kHz square wave (positive-going). **Power:** 100/117 VAC; 50/60 Hz. **Dimensions:** 6 1/2" H x 12 1/2" W x 17" D.



NEW

Dual trace 50 MHz oscilloscope

For critical applications we have an advanced 50 MHz scope equipped with features to make your job easier, including delayed sweep. This scope is an outstanding value for hobbyists, technicians and engineers.

Assembled SO-4251
Ship wt. 22 lbs. **\$799.95**

Specifications: **VERTICAL DEFLECTION:** Factor: 5 mV to 5 V/div \pm 3%; 10 steps in 1-2-5 sequence with variable control. **Magnify:** X5. **Rise Time:** Approx. 7.0 ns. **Overshoot:** Less than 3%. **Operating Modes:** CH1, CH2, DUAL and ADD. **Chop Frequency:** Approx. 250 kHz. **HORIZONTAL DEFLECTION:** Modes: A, A INT, B and B TRIG'D. **A SWEEP:** Time: 0.2 μ s to 0.5 s/div; 20 steps in 1-2-5 sequence with variable control and X-Y mode. **Magnify:** X10. **Sweep Time Accuracy:** 3%. **B SWEEP:** Delay System: Continuous and triggered delay. **Sweep Time:** 0.2 μ s to 9.5 ms/div. **Sweep Time Accuracy:** 3%. **Delay Time:** 2 μ s to 5 ms/div. **Delay Time Accuracy:** 4%. **Delay Jitter:** 0.0001 or less. **EXT HOR MODE:** Trace swept by signal applied to EXT IN terminal. **TRIGGER:** Source: CH1, CH2, LINE and EXT. **Coupling:** AC, HF REJ, TV and DC. **Polarity:** + or -. **Modes:** AUTO, NORM and SINGLE. **Power:** 100/117 VAC. **Dimensions:** 6 1/2" H x 12 1/2" W x 17" D.



Credit card orders call TOLL-FREE:

1-800-253-0570

Alaska and Michigan residents call: 616-982-3411.

Durable and easy-to-operate clamp-on ammeter

This miniature, pocket size clamp-on meter provides high accuracy in measuring AC amps and volts plus a resistance scale. And for instant continuity checks, a built-in buzzer sounds when resistance is less than 2 kohms. In addition, this handy meter features data hold display readings for all functions and ranges, a large 3 1/2 digit LCD display, 1.0% basic accuracy and a black and red probe set. Includes 9 volt battery.

Assembled SM-2208 Ship wt. 1 lb. **\$69.95**

Specifications: **AC VOLTAGE:** Ranges: 750 V, 200 V. **Resolution:** 1 V, 750 V range. 0.1 V, 200 V range. **Accuracy:** \pm (1.0% of reading + 3 digits) from 45 Hz to 400 Hz. **Over Voltage Protection:** 1200 VDC and 850 VAC on both ranges. **Input Impedance:** 1 M Ω . **AC CURRENT:** Ranges: 200 A, 300 A. **Resolution:** 0.1 A, 200 A range. 1.0 A, 300 A range. **Accuracy (50/60 Hz):** \pm (2.0% of reading + 1 digit). **RESISTANCE:** Range: 2000 ohms. **Resolution:** 1 ohm. **Accuracy:** \pm (1.0% of reading + 1 digit). **Overload Protection:** 250 V DC/AC. **Other Features:** Automatic polarity, over range indication, automatic zero, low battery indication. **Dimensions:** 1" H x 2 1/2" W x 7 3/8" L.



NEW

Pocket Size Digital Meter

Here's a low-cost, compact multimeter with all the measuring capability you'll need for jobs around the house and in the shop. It has a 3 1/2 digit LCD display that shows readings up to 1999, an audible continuity checker and a diode test.

Assembled SM-2310
Ship wt. 1 lb. **\$49.95**

Specifications: **DC VOLTS:** Ranges: 200 mV, 2.0 V, 20 V, 200 V, 1000 V. **Resolution:** 0.1 mV. **Basic Accuracy:** \pm 0.5%. **DC CURRENT:** Ranges: 200 μ A, 2.0 mA, 20 mA, 200 mA, 2 A. **Resolution:** 0.1 μ A. **Basic Accuracy:** \pm 0.75%. **AC VOLTAGE:** Ranges: 200 V, 750 V. **Resolution:** 100 mV. **Basic Accuracy:** \pm 1.2%. **RESISTANCE:** Ranges: 200 Ω , 2 k Ω , 20 k Ω , 200 k Ω , 2 M Ω . **Power:** Single 9-volt transistor battery (included). **Dimensions:** 1" H x 2 3/4" W x 5" L.





FREE CASE

Heath DMM from FLUKE

Get a FREE soft carrying case – a \$9.95 retail value – when you purchase this deluxe multimeter with its dual digital and analog bar-graph display. You also get the resolution of costlier 4½-digit meters, touch-hold function and a continuity checker with beeper. Remember your FREE case, just enter SMA-77-1 on the order form and “No Charge” in the price column.

Assembled SM-77 3 lbs. . . . \$129.95

Accessories: **SMA-77-1 Soft Carrying Case.** Ship wt. 1 lb. **\$9.95.** **SMA-77-2 Holster Case.** Ship wt. 1 lb. **\$5.95.**

Specifications: **DC VOLTS: Ranges:** 320 mV, 3.2 V, 32 V, 320 V, 1000 V. **Max. Sensitivity:** 0.1 mV. **Basic Accuracy:** ±(0.3% reading + 1 digit). **AC VOLTS: Ranges:** 3.2 V, 32 V, 320 V, 750 V. **Max. Sensitivity:** 1 mV. **OHMS: Ranges:** 320Ω, 3200Ω, 32 kΩ, 320 kΩ, 3.2 MΩ, 32 MΩ. **Max. Sensitivity:** 0.1Ω. **AC/DC AMPS: Max. Reading:** 10 A. **Max. Sensitivity:** 0.1 mA. **POWER:** Single standard 9 volt battery (included).



Highly-precise digital pocket multimeter

The smallest autoranging DMM made and its practically goof proof. The 3½ digit LCD automatically shows the reading in the correct range up to a maximum 1999 display. A built-in continuity checker with buzzer alarm adds convenience. Includes hard cover wallet carrying case and test probes. A perfect and inexpensive “spare meter” only ⅜” thick.

Assembled SM-2300 1 lb. . . . \$24.95

Specifications: **DC VOLTAGE: Range:** 2000 mV to 400 V. **Accuracy:** ±(1.3% reading ± 2 digits). **Maximum Input:** 500 VDC or 500 VAC RMS. **AC VOLTAGE: Range:** 2000 mV to 400 V. **Accuracy:** ±(2.3% reading ± 5 digits). **RESISTANCE: Range:** 2000Ω to 2000 kΩ. **Accuracy:** ±(2.0% reading ± 2 digits). **CONTINUITY CHECK: Range:** 2000Ω. **CONTINUITY BEEPER:** <2000Ω ± 10Ω. **POWER:** Two LR-44 batteries (included). **DIMENSIONS:** 4¼” H x 2¼” W x ⅜” D.



TTL/CMOS Logic Probe

Simplify logic circuit testing with this powerful Logic Probe troubleshooting tool and its built-in audible beeper. Use both high and low tones to check out TTL and CMOS circuits operating at up to 20 MHz. Input over-voltage protected to ± 50 VDC or 220 VDC/AC for 15 seconds. Slim styling makes this probe comfortable and easy to hold.

Assembled ST-7420

Ship wt. 1 lb. **\$39.95**

Specifications: **Input Impedance:** 1 megohm. **LOGIC THRESHOLDS: TTL:** Low, 0.8 V ± 0.2 V DC; High, 2.3 V ± 0.2 V DC. **CMOS:** Low, 30% of circuit V_{cc}; High, 70% of circuit V_{cc}. **GENERAL: Controls:** Threshold select (TTL or CMOS), Pulse/Memory. **Pulse LED (Yellow) Flashing Time:** 500 ms. **Power Supply Protection:** ± 20 V. **Voltage Range:** 5V to 15 VDC. **Dimensions:** ⅝” H x ¾” W x 7⅜” L.



Auto G-Meter

Attractive display indicates forces from 0.1 to 0.8G with green, yellow and red LEDs as you swing your car around a favorite corner, accelerate or brake. Volt meter mode lets you check your battery in a 10 to 15 volt range. For use with 12 volt negative ground systems only. 1⅝” H x 6¾” W x 1” D.

Assembled CGW-1562 Ship wt. 1 lb. \$39.95



Graphic LED Tachometer

Red, yellow and green LEDs show a car’s engine RPM from 0 to 6000 in 500 RPM steps. Also a battery checker. Use with 12 volt systems. Not for use with diesel engines.

Assembled CTW-1572 Ship wt. 1 lb. \$24.95

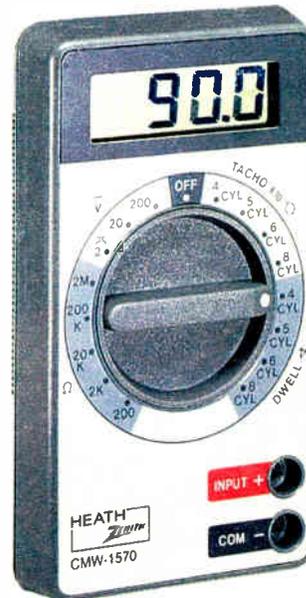
Handheld Digital Engine Analyzer

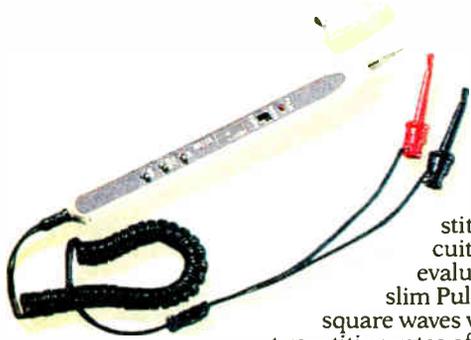
The Heath Digital Engine Analyzer is small enough to store in your glove compartment but more than big enough to help you keep your car’s engine running at its peak efficiency. Or use it to find the cause of a malfunctioning motor.

Check dwell of 4-, 6- and 8-cylinder engines to 90° with a resolution of 0.1° within ± 1.5% accuracy. Check engine RPMs up to 10,000 with a resolution to 10 RPM and an accuracy of 1.5%. Measure DC voltages in three ranges up to 200 volts within an accuracy of ± 0.7%. There are five resistance ranges from 200 ohms to 2 megohms to aid in checking out wiring and electrical circuits.

The Digital Engine Analyzer has an easy-to-read LCD display and operates up to 200 hours on the included 9 volt battery. The meter comes with test leads and an instruction manual. Analyzer has dimensions of 5” H x 2¾” W x 1” D.

Assembled CMW-1570 Ship wt. 1 lb. \$49.95





Digital Pulser Probe

Inject your own substitute logic pulses into circuits for quicker and easier evaluation of problems. This slim Pulser Probe can generate square waves with 10 μ s pulse widths at repetition rates of 0.5 pulses per second or 400 PPS. A handy troubleshooting tool.

Assembled ST-7430 Ship wt. 1 lb. **\$39.95**

Specifications: **Sync Input Impedance:** 1 megohm. **Pulse Width in Pulsed Output:** 10 μ s at 100 mA load. **Pulse Repetition Rate:** 0.5 PPS/400 PPS. **Output Current:** (1) Pulse Mode: 100 mA sink or source maximum. (2) 90% Pulse Mode: 20 mA sink or source maximum. **Supply Voltage:** 5V to 15V. **Dimensions:** 5/8" H x 3/4" W x 7 3/8" L.

Utility thermometer also keeps time

Check a wide range of temperatures, 19.9° to 68.8° C (68° to 155° F), indoors and out with this portable, multi-purpose digital thermometer. Use it as a guide in adjusting heaters and cooling equipment or for measuring water temperatures. You'll find this portable thermometer extremely helpful in many applications.

Manually set minimum and maximum temperatures, and an audible alarm will warn you of exceeded limits. The probe tip can be immersed in water or easily placed into heating/cooling ducts. A 3-foot 3-inch cord allows you to place the probe almost anywhere. Also includes an external sensor mounting fixture. A handy built-in clock supplies the time. Includes battery. Not intended for use as a fever thermometer. Has dimensions of 4 1/4" H x 2 5/8" W x 3/4" D.



Assembled SM-2326 Ship wt. 1 lb. **\$34.95**

Multiple outlets and protected power strips

Take advantage of these low prices to get a multiple outlet strip that will relieve the crowding around your AC wall outlet. These three power strips supply an extra six grounded outlets for use with computer systems, audio and video equipment, shop tools, kitchen appliances — any where that you run short of AC outlets. These power strips are also extremely useful in the office.

All three of these multi-outlet strips from Pacific Electriccord have 6-foot long cords, are UL approved and are finished in an attractive beige enamel on a durable steel case. Separate features offer three choices of protection.



Configurations:

Multi-Outlet Strip with circuit breaker and lighted rocker switch.
Assembled PM-1493 2 lbs. . . **\$14.99**

Multi-Outlet Strip with single line surge protection, circuit breaker, lighted rocker switch and a green "working suppression" light.
Assembled PM-1494 2 lbs. . . **\$24.99**

Multi-Outlet Strip with full 3-line surge protection, EMI and RFI filter, circuit breaker, lighted rocker switch and a green "working suppression" light.
Assembled PM-1495 2 lbs. . . **\$39.99**



Surge protected AC outlet strips

The power protection specialists from Perma Power have designed two surge protected multiple AC outlet strips that meet the new UL standards. Both are designed to prevent damage to your sensitive electronic equipment due to power line surges. And both feature a unique positive shutdown mechanism to prevent unprotected equipment from being operated in the event of surge suppression failure. Both have 6 AC outlets.

The RT-610 Surge Suppressor has single stage filtering provided by 3 metal oxide varistors, and a 1 year warranty.

The RS-610 Extended Life Surge Suppressor has better surge protection in the form of a uniquely-engineered four-element, two-stage filter. And it has a 5 year warranty.

Assembled RT-610 Surge Suppressor. Ship wt. 2 lbs. **\$49.99**

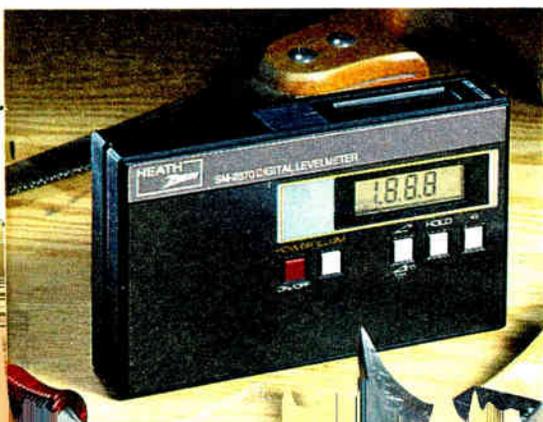
Assembled RS-610 Extended Life Surge Suppressor. Ship wt. 2 lbs. **\$79.99**

Keep it level with digital accuracy

Easily measure crucial angles and grades with the Heath/Zenith Digital Level-meter. This unique tool uses a photoelectric transducer and microprocessor control to supply angle readings accurate to 0.5° over a wide $\pm 120^\circ$ measuring range. View readings from almost any position with the help of two LCD displays. And with the push of a button, a beeper will let you know when your level is perfectly horizontal. A built-in light aids readings in dim light and the display can be locked in for out-of-sight readings. This amazing shop helper operates on two "AA" batteries (not included). It has dimensions of 3 3/4" H x 4 1/4" W x 1 3/8" D.

Assembled SM-2370 Ship wt. 1 lb. **\$99.95**

Accessories: **SMA-2370-1** Level-meter Base securely holds the SM-2370 making it into a 60 cm (23.6 inch) long level. Ship wt. 2 lbs. **\$39.95**





An advanced, portable weather measurement system

Now you can monitor local weather conditions with your own personal handheld unit. Imagine being able to carry a sophisticated weather station with you when you're traveling, backpacking, camping, boating, hunting or participating in any other outdoor activity. All you do is press the touchpad keys for instant, up-to-date weather information.

The fundamental BW-100 unit is compact enough to travel along with you in your shirt pocket. It gives you time, date and current temperature (Fahrenheit) using a built-in temperature sensor. The High/Low function keeps track of the highest and lowest temperature until you clear the readings to begin a new recording period. Take the BW-100 along cycling or walking, and use the Elapsed Time function instead of a stopwatch. The BW-100 is designed with an automatic power-down feature to extend battery life. Requires 3 "AAA" batteries (not included) or optional BW-2 Battery/Charger Accessory.

Choose the BW-200 for its wind speed, wind direction and wind chill features. The BW-200 includes a quality anemometer with mounting hardware and two attached 40' lead-in cables that you can extend with two optional BW-4 Extension Cables. Temperature is displayed in Celsius or Fahrenheit. Leave the BW-200 in your cabin for the winter and return later to check High/Low readings for the coldest and warmest recordings made during the past winter. The High/Low function also gives you the highest wind speed recorded to determine peak wind gusts over a given period of time. More importantly, especially for outdoor activities in the winter, is the wind chill factor. Press the SP/CH key for alternating wind speed and

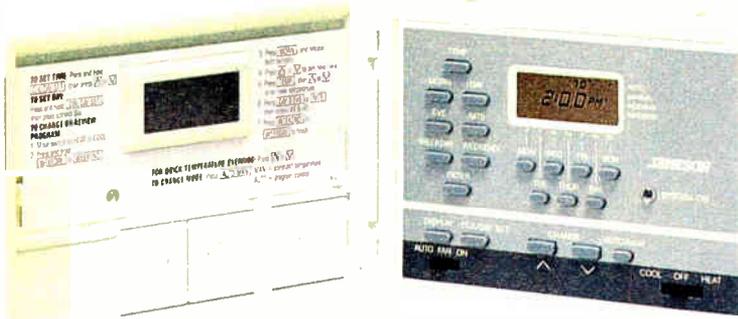
wind chill recordings. Since temperature is not always a reliable indication of how cold you will feel outdoors, chill factor is one of the most important pieces of weather information to have in cold climates. The BW-200 also requires either 3 "AAA" batteries (not included) or optional BW-2 Battery/Charger Accessory. Temperature probe with 11' attached cable is included.

Or choose the BW-300 which adds barometric pressure, altimeter and optional rain fall functions. The most exciting feature, the Altimeter, displays your altitude. And its Bi-Directional Alarm allows you to set an audible and visual alarm for any increasing or decreasing altitude. With the optional BW-10 Rain Gauge, the BW-300 displays daily recording and the accumulated rainfall over any time period you choose. In addition to the remote sensor temperature probe, it also has a built-in sensor for measuring indoor temperature. The BW-300 requires 3 "AAA" batteries (not included) or the optional BW-2 Battery/Charger Accessory.

- ❑ **Assembled BW-100** Ship wt. 1 lb. \$39.99
- ❑ **Assembled BW-200** Ship wt. 2 lbs. \$159.95
- ❑ **Assembled BW-300** Ship wt. 3 lbs. \$299.95

Accessories:

- BW-2** Includes three Ni-Cd Batteries and AC Power Adapter/Charger. Ship wt. 1 lb. \$19.99
- BW-4** 40' Extension Cable for extending any of the sensor cables. Ship wt. 1 lb. \$9.99
- ❑ **BW-10** Rain Gauge with 40' cable included. Ship wt. 2 lbs. \$49.99



Energy saving thermostat

The Set-Back Thermostat is a smart investment in energy efficiency. It replaces your existing thermostat and lets you plan daily household temperatures to suit your lifestyle.

You can't afford to pass up this chance to cut your heating and cooling costs up to 25%—without sacrificing comfort or convenience. During the winter you can program the

Thermostat to keep the house cooler when you're sleeping or away from home, but have the house warm and comfortable when you need it. You can program up to 4 temperature changes a day with separate programs for weekdays and weekends. And if you don't work a regular schedule, any two days can be selected as your weekend days—they don't even have to be consecutive. The Thermostat is easy to understand and operate and can even be programmed while disconnected from the system. So you can work comfortably at a table with the manual in front of you.

It's designed to fit most gas, oil or electric heating and air conditioning systems with 24-volt controls (3, 4 and 5 wire types). Manual includes full explanation of compatible systems and complete installation procedures. Return for a full refund if you find that the Thermostat is not compatible with your heating and cooling system.

Assembled E-200 Ship wt. 1 lb. \$69.99

A digital thermometer to trust

Trust the dependable accuracy of this digital fever thermometer with beeper and automatic power-off system. Includes battery. 4 3/8" H x 1/2" W x 3/8" D. (Color and manufacturer may vary.)

Assembled BH-110
Ship wt. 1 lb. \$9.95



Blood pressure monitor

Keep an accurate, printed record of your blood pressure and pulse rate with this professional desktop instrument. Date and time are also printed out so you have an exact time of the reading for later referral.

Includes batteries and printer paper.

Assembled BH-1750
Ship wt. 5 lbs. \$99.95



See-thru alarm clock

It's a smart looking addition to your desk or a dependable take-along alarm. It's an extraordinary clock with a time and date display that seems to float in mid-air. This alarm clock displays time to the second in either a 24-hour or 12-hour format with AM and PM indicators. Press a button and the month and date appear. When the alarm sounds press "snooze" for an additional 4-5 minutes of sleep. Battery included.

Assembled GDP-3900 Ship wt. 1 lb. \$14.95



Recharge your nickel-cadmium batteries

This easy-to-use Jeckson Battery Charger can handle up to 10 "AA," "C," or "D" batteries in any combination. It can also charge up to three 9-volt transistor batteries at the same time for a total of 13 batteries.

Just place the batteries in the compartment and close the see-through lid. Spring-loaded terminals adjust to battery size making it easy to charge different sized batteries. And batteries are kept snugly in place while recharging. Tri-colored red/green/orange LEDs indicate which type of batteries are being recharged. Typical charging time is from 14 to 16 hours for most batteries, providing you with fresh batteries overnight.

Assembled BP-1234 Ship wt. 4 lbs. \$24.99





A single-line, full featured memory phone

Southwestern Bell's Memory Phone is especially convenient for business, an elderly person, a child or just for those frequently called numbers. The Memory Phone features one-touch dialing of up to 24 telephone numbers and three emergency numbers. Other features include last number redial and hold, plus pause spacing and combination dialing for codes and long distance access. An electronic ringer has High/Low and Off position. It's a welcome addition to any home or office that needs big features at an affordable price. It's styled for use either as a desk or wall telephone and has switchable pulse/tone dialing. Requires three "AA" batteries (not included) for memory and feature functions.

Assembled BT-1550
Ship wt. 3 lbs. \$79.95



Full featured wall phone



This is a phone that you'll value for its essential features and simple, attractive styling. It's everything you need in an easy to install wall-mounted phone.

It's switchable to work with both Tone and Pulse (rotary) phone systems. And if ringer loudness is ever a problem, a switch allows you to select from three loudness levels. Add a full five-year warranty to these functional features and you have a Bell quality basic telephone that can't be beat.

And you won't have any trouble installing this phone. Modular connectors and jacks insure easy installation and the wall phone fits to most standard wall mounting plates.

Assembled FC-2505
Ship wt. 3 lbs. \$44.99



Traditional desk telephone



Here's another quality telephone to meet your essential needs. You'll find that this phone is a good-looking and functional addition for your home or work place.

It can be used with either Tone or Pulse (rotary) phone systems. And the desk phone has an especially handy feature that allows you to disconnect the microphone so you can talk privately to someone nearby without the caller hearing you. Plus you can easily adjust ringer loudness to your liking with the ringer volume switch. You get real value with these features plus a full five year warranty from Southwestern Bell. Installs easily with modular connectors and jacks.

Assembled FC-2500
Ship wt. 4 lbs. \$44.99

The familiar Southwestern Bell logo is your assurance of quality backed by a full five-year extended warranty free to Heath Customers



A convenient cordless phone

You'll appreciate the convenience of always having a phone nearby with this cordless Freedom Phone from Southwestern Bell. Take the hand-held unit with you and you can make calls anywhere up to 1000 feet from the base. If you're tired of running to another room to catch the phone or just can't afford to miss a call when

you're out-of-doors, this phone is your answer. Plus, you get features like a built-in two-way intercom, hands-free speaker phone and nine-number memory. All this in addition to automatic redial, external ringer on handset, volume control, digital-coded security and switchable pulse/tone dialing.

Assembled BT-1700 Ship wt. 5 lbs. \$169.95

California law requires the following statement: FCC-approved Freedom Phones will be serviced under provisions outlined in the manufacturer's warranty.



5 YEAR WARRANTY

Two-in-one answering machine/telephone

This highly stylized system from Southwestern Bell has dual flexibility and use. It's a telephone and answering machine combined and at a price less than many separate units. It features dual standard cassettes for recording personalized messages and unlimited message length. When you're too busy for unnecessary interruptions, the call monitoring feature allows you to screen incoming calls. And when you're away, the beeperless remote capability allows easy access to messages just by calling your machine from a touch-tone phone. Plus you'll get features like two-way record, call counter, memo record, automatic redial, ring select and pulse/tone switching. Easy to install and operate.

Assembled BT-1600 Ship wt. 7 lbs. \$159.95



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Please use special order form on reverse side.

1. Hobbyist's Precision Knife Set

People who build kits usually like to work with their hands on a variety of tasks. This X-Acto set of three knives and ten super-sharp blades in assorted sizes and shapes will simplify precision cutting of all sorts of materials. Cut mats for pictures. Carve intricate details. Use to hang wallpaper and perform many other household and craft tasks.

Having a suggested retail value of \$12.95, this FREE gift can be yours with any order of \$25 or more from this catalog received within the next 30 days. **GDP-5459**

2. See-Through Alarm Clock

A unique addition to your desk or a dependable take-along alarm. The time and date display on this extraordinary clock seems to float in midair. Displays time, date or alarm set time and features an hourly chime, 12 or 24 hour display and snooze function for additional 4-5 minutes of sleep. Includes battery and carrying case. With a suggested retail value of \$14.95, you can select this clock as one of your FREE gifts if you place your order of \$25 or more from this catalog within 30 days. **GDP-3900**

3. Tekna Micro-Lite™

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dark places – anywhere a reliable light is needed. And for use by or in the water, the Micro-Lite is designed to be water resistant to 2,000 feet. Operates on only two tiny "n" size alkaline cells (included). At an \$11.95 suggested retail value, this famous Tekna Micro-Lite could be yours if you select this free gift with an order from this catalog of \$25.00 or more within the next 30 days. **GDP-5457**

4. Travel Alarm/Calculator

This smart-looking alarm clock has quartz dependability, full-function calculator convenience... all in a single, compact case that fits in your pocket. That's what you get with the Pierre Cardin Travel/Alarm Calculator. Includes calendar. LED displays and attractive black case. Normally a \$25.00 suggested retail value, it's one of the FREE gifts you can select if your order from this catalog within the next 30 days totals \$25 or more. **GDP-5473**

