Heathkit®

Full color video depth
sounder/fish finder –
see page 2

INTERPHASE
SPECTRA

DEPTH
AUTO
ZOOM
SPEED
SHALLOW
ALARM
DEEP
ALARM

ON-BRIGHT-OFF   GAIN

Heath Company

P.O. Box 1288

Benton Harbor, MI 49022

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Our Spring catalog comes to you with an array of new products, some in kit form and others assembled. All are carefully selected, high quality products we think you'll find special because of their unique features, functions or price.

We've screened and tested every product in this catalog to ensure you the kind of quality that we know you expect.

And every product is backed by Heath's dedicated service and support departments. You can buy with confidence.

Enjoy your trip through the catalog. And remember, our service to you is always as close as the phone.

Sincerely,

William H. Johnson
President, Heath Company

MI-2040

MI-2020

Video depth sounders and fish finders

Video takes to the water to enhance your boating and fishing enjoyment. Two commercial quality depth sounders/fish finders are ready to satisfy every boater from pleasure cruiser to offshore fisherman. The MI-2040 has a full color display which shows fish and bottom in eight brilliant colors depending on fish size and echo strength. Color also provides maximum definition of changing fish and bottom conditions. The MI-2020 has an amber screen with 4 levels of shading that provides exceptional contrast and definition in daylight and minimizes eyestrain when used at night.

On the big, high resolution six-inch screens of both models there are several other simultaneous digital readouts. Boat speed up to 50 knots is continually displayed to the nearest 0.1 knot. Surface water temperature is also continuously displayed in tenths of a degree F from 32.0° to 99.9°F. Plus a distance log displays the distance traveled up to 99.9 nautical miles and can be reset while underway. The MI-2040 also has an automatic bottom tracking function that always keeps the bottom in view.

Both of these video sounder/finders are designed with simplicity and ease-of-use in mind. Only five keys control many functions including six depth ranges: 0-50, 0-100, 0-250, 0-500, 0-1000 and 0-1500 feet. 30 zoom ranges, 20% of any depth range displayed across the entire screen, allow close inspection of shallow, middle and deep water ranges. Three manual speeds plus a "Freeze" position are available, plus an "Auto" position for automatic tracking where picture speed changes with boat speed. Separate, adjustable alarms warn of changing fish and bottom conditions above or below preset levels.

The depth sounders/fish finders are compact, extremely rugged and water resistant. Internal circuitry is protected from the elements by an O-ring sealed case and waterproof keyboard. A unique feature automatically selects the optimum of two output powers (85 watts RMS or 150 watts RMS) according to the depth range.

The MI-2040 and the MI-2020 require 11 to 15 VDC (less than 1.5 amps) to operate. Both come with a clip-on sun shield, 12 volt power cable with in-line fuse, gimbal mounting bracket with knobs and an operation manual. The MI-2040 has dimensions of 6¼" H x 8" W x 11⅞" D. The MI-2020 has dimensions of 5½" H x 7½" W x 11⅞" D. Both require either the transom mount or thru-hull transducer listed below.

Assembled MI-2040 Color Depth Sounder/Fish Finder. Ship wt. 12 lbs. **$570.00**

Assembled MI-2020 Amber screen Depth Sounder/Fish Finder. Ship wt. 8 lbs. **$350.00**

Accessories:

Assembled MIA-2020-1 Transom mount transducer. Ship wt. 1 lb. **$29.95**

Assembled MIA-2020-2 Thru-hull transducer. Ship wt. 3 lbs. **$99.95**

Specifications: **Pulselength and Sounding Rates:** 6 pulselengths and sounding rates automatically optimized for depth range in use. Pulselength varies from 0.25 ms to 6 ms. **Transmitter Power:** Two-level output produces 85 watts RMS (680 peak to peak) on first 3 ranges and 150 watts RMS (1200 peak to peak) on 3 deepest ranges. **Transmit Frequency:** 50 kHz or 200 kHz. **Transducer Beam Angle:** 200 kHz = 20°, 50 kHz = 40°.

Portable Loran C locator

The MI-3000 Loran C is simple to operate and priced to fit any boater's budget with totally automatic operation heading a long list of easy-to-use features.

On the 2-line liquid crystal display you get current position in latitude and longitude or time difference (TDs), TDs in tenths or hundredths, current boat speed and course over ground, time to go to a destination, cross track error (how far you are off a desired course), course made good, and left/right steering information. Also displayed are course and bearing (magnetic or true) to any position and magnetic variation.

The simple, waterproof 12-key keypad allows easy storing and recalling of up to 100 favorite fishing spots, buoys or other important locations. You can chain together up to 40 spots and have the MI-3000 automatically help you steer to each one. Set the audible alarm to sound when you get close to your destination. Or use the alarm to warn you when your boat drifts off your anchor or from your favorite spot.

The MI-3000 receives all present Loran C GRIs and features automatic station selection. Five internal notch filters eliminate interfering noise produced by other low frequency transmissions and other electronic equipment.

The MI-3000 can continue to work even if the shore-based transmitter or one of its secondary transmitters fail. You'll find this important feature on few other Loran units, one that will keep the MI-3000 working when others won't.

This Loran C receiver has a 24-hour clock and includes two count-up timers. A plan mode is also available for calculating the course and distance between any two locations. Additional secondary factor (ASF) corrections for mountain ranges and ground conductivity are already built in for easier operation. And a one-button "Take Me Home" feature guides you backwards over your previous course to your starting point.

Efficient microprocessor circuitry in the MI-3000 uses less than a 1/10th of an amp for up to 100 hours of continuous use on the internal rechargeable battery. Or permanently install the Loran, connecting it to your boat's 12 VDC electrical system and use the battery as a safety backup in case of a power failure. Requires 10 to 14 VDC.

The MI-3000 is housed in a sturdy O-ring sealed case, water resistant for years of trouble-free service. The unit includes a built-in rechargeable battery, extending antenna, mounting bracket and knobs, 110 VAC battery recharger and an operations manual. 3¾" H x 6¾" W x 4½" D.
Assembled MI-3000 Ship wt. 12 lbs. **$399.95**

Portable handheld marine radio

A new generation in marine radio technology puts the best of marine radio in the palm of your hand. And the small, lightweight MI-202 radio is available at a price that is affordable for even the most thrifty boater. Use the new MI-202 portable to make marine telephone calls, listen to the latest weather information, talk to boats, summon help or just listen to all the activity on your favorite fishing channels.

All U.S. and International channels are rapidly accessible by a single button and are conveniently displayed on a backlit top-mounted liquid crystal display. With a single keystroke you can immediately tune to the marine emergency channel 16, a special priority channel of your choice or the local weather channels. Use one of four scanning modes to keep current on the surrounding activity. Included is a special "Emergency Weather Alert" scan so you'll know right away about any unexpected weather changes.

This handi-talkie has a frequency range from 156.025 MHz to 162.55 MHz. A single HI/LO output power switch lets you transmit at either 1 watt or 3 watts. External mike and speaker connectors enable the use of other accessories or even turn the portable into a fixed station transmitter/receiver.

This marine radio is water resistant for use in all types of weather. And the included rechargeable battery will keep your radio on the air for hours with normal use. The battery can be recharged from either 110 VAC with the included recharger or from a 12 VDC power source such as a car or boat battery.

The MI-202 comes with a battery pack, ¼ wave rubber whip antenna, leatherette vinyl carrying case, belt clip, 110 VAC wall charger and an owner's manual. The radio has dimensions of 6¾" H x 2½" W x 1⅜" D without knobs or antenna. It weighs approximately 1 pound with battery and antenna.
Assembled MI-202 Ship wt. 3 lbs. **$199.95**

Specifications: **GENERAL: Frequency Range:** 156.025 MHz to 162.550 MHz. **Channel Spacing:** 25 kHz. **Frequency Stability:** 0.0005%. **Power:** Internal rechargeable battery pack, 9.6 VDC at 500 mA. **Antenna:** ¼ wave rubber whip. **RECEIVER: Channels:** 91. **Sensitivity:** 0.25 μV at 12 dB Sinad/0.5 μV at 20 dB quieting. **Selectivity:** + 8.2 kHz/ − 8.0 kHz at − 6 dB down, + 12.8 kHz/ − 12.7 kHz at − 60 dB down. **Squelch Sensitivity:** 0.15 μV (threshold), 0.33 μV (tight). **Spurious/Image Rejection:** 70 dB. **Intermodulation Rejection:** 60 dB. **Adjacent Channel Rejection:** 65 dB. **Audio Output:** ½ watt at 8 ohms, 10% distortion. **Signal-to-Noise Ratio:** Better than 45 dB. **TRANSMITTER: Channels:** 54. **RF Output:** 3 watts, switchable to 1 watt. **Max Deviation:** ± 5 kHz. **Spurious Radiation:** − 65 dB or better. **Splatter Filter:** 18 dB/octave. **Distortion:** ± 3 kHz at 1 kHz tone, less than 10%. ± 5 kHz at 1-3 kHz tone, less than 10%. **Modulation Response:** 6 dB/octave preemphasis.
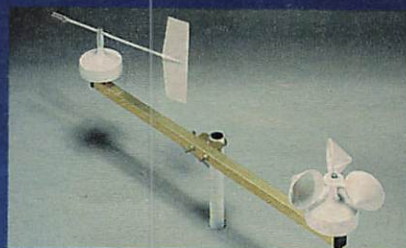
14	% 42	29.82	70
Wind Speed and Direction	Humidity	Barometric Pressure	Indoor and Outdoor Temperatures

Includes precision wind sensor assembly

Heathkit ID-5001   advanced weather computer

NEW

See March Kitbuilder's Journal

The Heathkit Advanced Weather Computer puts you in touch with the weather

SKILL LEVEL 3. The ID-5001 Advanced Weather Computer supplies all the information you need for making correct decisions about your local climate. Homeowners, sports enthusiasts and professional meteorologists can make use of the accurate environmental data collected, measured, and displayed by this state-of-the-art personal weather station.

A striking cobalt blue backlit digital liquid crystal display shows wind speed in miles-per-hour, knots, or kilometers per hour. A 16-point compass shows wind direction. Indoor and outdoor temperatures are continuously displayed in Fahrenheit or Celsius, barometric pressure in inches of mercury or millibars. Arrows show rising and falling values and their rates. A 6-digit 12- or 24-hour clock with day and date, selectable automatic leap year and daylight savings time correction will keep you on schedule.

Get minimum and maximum readings plus time and date of occurrence, wind chill temperature, and FOG display (with optional humidity sensors). Audible and visual ALERT and ALERT-WARN signals warn of severe conditions. Additional options listed below. Required cables IDA-1290-1,2,3 are described on page 7.

Kit ID-5001 Ship wt. 18 lbs. **$499.95**

$AVER! Get a free RS-232 Interface accessory by purchasing the ID-5001 and both the humidity and rain gauge accessories.
Kit **IDS-5001-1** Ship wt. 25 lbs. **$599.85**
Accessories:
Kit IDA-5001-1 Indoor and outdoor relative humidity sensors. Ship wt. 3 lbs. **$59.95**

Kit IDA-5001-2 Rain gauge sensor. Ship wt. 3 lbs. **$39.95**
**Kit IDA-5001-3** RS-232 Computer Interface includes parts to be installed into ID-5001. Hayes command compatible. Ship wt. 1 lb. **$49.95**

SPECIFICATIONS: WIND SPEED:* Displays: Two significant digits. Separate indicators show use of miles-per-hour, knots or knotmeters-per-hour. **Gust Mode:** Instantaneous peak wind speed. **Memory:** Date, time and magnitude of minimum or maximum wind gust. Rate change selectable from last hour or last 24 hours. **Average Mode:** One minute wind speed average. **Memory:** Date, time and magnitude of minimum or maximum average wind speed. Rate change selectable from last hour or last 24 hours. **Accuracy:** ±5% or better. **WIND DIRECTION:* Display:** 32 points of resolution. One of 16 indicators arranged in a circular compass configuration. Identified by compass points and radial degrees. **Gust Mode:** One second averaging. **Memory:** Direction when minimum or maximum gust occurred. **Average Mode:** 60 second averaging. **Memory:** Average direction when minimum or maximum average wind direction occurred. **Wind Mode:** One minute averaging of displays to nearest 10 degrees. **THERMOMETER: Displays:** 2½-digit readout with "-" sign outdoor indicator, Fahrenheit-Celsius indicators, and rising/falling indicators. Rate of change averaged per hour. **Temperature:** −40° C to +70° C. −40° F to +158° F. **Accuracy:** ±1.0° from −40° C to +70° C. ±2.0° from −40° F to +158° F. **Memory:** Date, time and magnitude of minimum and maximum temperatures since cleared; change in the last 24 hours. **BAROMETER: Displays:** 4-digit readout. Separate indicators show if pressure is rising or falling. Rate of change averaged per hour. **Pressure Range:** 28.00 to 32.00 in. Hg (inches of mercury), 948 to 1083 millibars. **Accuracy of Reading:** 28.00 to 32.00 in. Hg, ±0.25% (±0.075 in. Hg), 0.033%/C. **Memory:** Date, time and magnitude of minimum and maximum pressure since memory was cleared, change in the last 24 hours.

GENERAL: Power Requirements: 120/240 VAC, 50/60 Hz. **Dimensions (overall):** 5¾" H x 15½" W x 8¾" D. **Weight:** 9.8 lbs.

*In conformance with the National Weather Service Federal Meteorological Handbook #9, *Aviation Weather Observation:* Chapter A8 section 3 and 3.5, Specifications for Supplementary Aviation Weather Reporting Stations.

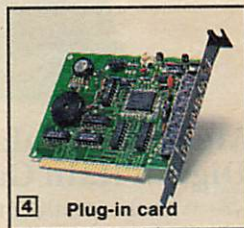Anemometer included with BW-200 and BW-300

**** WEATHER BULLETIN ****
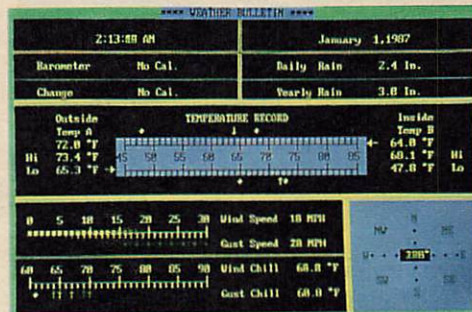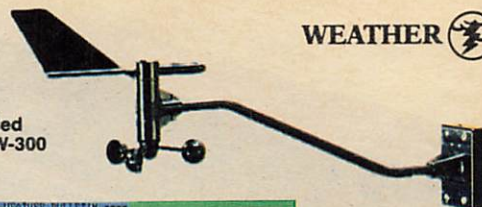
Computer screen display using BW-400 plug-in card

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. The High/Low function also gives you the highest wind speed recorded to determine peak gusts over a given period of time. Press the SP/CH key for alternating wind speed and wind chill recordings for a reliable indication of how cold you will feel outdoors. 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 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.

1 **Assembled BW-100** Ship wt. 1 lb. **$39.99**
2 **Assembled BW-200** Ship wt. 3 lbs. **$159.95**
3 **Assembled BW-300** Ship wt. 3 lbs. **$299.95**

4 *NEW!* **Assembled BW-400** Plug-in card for IBM PC and compatibles. Supplies all information measured by our BW-300. Collects data even when the computer is off. Ship wt. 4 lbs. **$449.95**

Accessories:

BW-2 Includes three NiCd 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**

5 **BW-10** Rain Gauge with 40' cable included. Ship wt. 2 lbs. **$49.99**

BW-300 SPECIFICATIONS: Barometric range: 13 to 31 in./330mm to 787mm. **Altitude:** −980 to +21,500 ft./−299 to 6553 m. **Daily or Accumulated Rainfall:** 999.9 in. max./999.9mm max. **Temperature A:** −99°F to +350°F/−99°C to 177°C. **Temperature B:** −20°F to +150°F/−29°C to 66°C. **Wind Direction:** 0° to 350°. **Wind Speed:** 0 to 200 mph/0 to 320 kph. **Wind Chill Factor:** −199°F to 350°F/−199°C to 177°C.

Plug-in card

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 tells you what you need to know before selecting a kit to build: the type of circuitry used, from simple (1) to sophisticated (3); the 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 one of our world-famous assembly manuals. Each manual is written so that even the most inexperienced person can build any Heath kit.

Digital Weather Computer

3 The Heathkit Digital Weather Computer is an indispensable addition to your home. It's also suited 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. Its 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 readings 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. 7).

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 7¼" 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** ±5% or better. **Direction Display: Accuracy:** ±11.25°. **THERMOMETER: Temperature Range:** −40° to 70°C; (−40° to 158°F). **Accuracy:** ±1° on Celsius readings; ±2° on Fahrenheit readings. **BAROMETER: Pressure Range:** 28.00 to 32.00 in. Hg (inches of mercury), 948 to 1083 millibars. **Basic Accuracy:** ±0.25% plus ±0.033%/°C. **Operating Temperature:** Outdoor assemblies, −40°C to +70°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 to products reviewed in current KBJ issues. Also, KBJ offers **discount coupons in every issue** for selected Heath products.

Order KBJ-2000-NM today and get six big issues for only $14.95. Use your VISA, MasterCard, American Express or Heath Revolving Charge. Call TOLL-FREE 1-800-253-0570 24 hours a day. In Michigan call 1-800-782-2702.

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. dollars for Canada, APO/FPO and all others: $22.95.

Measure rainfall with the Digital Rain Gauge

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 2½" H x 7" W x 5" D. The sensor measures 9" in diameter x 9⅝" H. Includes 60' cable and power cube for 120 VAC operation.

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

Monitor the weather with your own station

2 Keep track of the weather in style with the Heathkit 5-Function Weather Station. Use it to get accurate weather information as it happens. True indoor/outdoor temperatures are displayed in Fahrenheit or Celsius with a switch to select indoor or outdoor readings. Professional grade sensors also monitor barometric pressure and wind speed and direction. The anemometer/weathervane mounts to any standard 1" to 1½" mast.

Designed for quality and reliability, the Weather Station operates with minimum power consumption and has a non-corroding remote transmitter assembly to ensure years of trouble-free service. The Weather Station can be wall-mounted or used as a desk set with the included stand. Wall-mounted, 20½" L x 7" W x 2" D. Desk mounted, 6¾" D. Uses 120 VAC, 60 Hz.

Kit ID-1290 Ship wt. 8 lbs. **$169.95**
Accessories: **IDA-1290-1** 50' cable. 2 lbs. **$11.95**
IDA-1290-2 100' cable. Ship wt. 4 lbs. **$19.95**

IDA-1290-3 150'
cable. Ship wt. 6 lbs. **$26.95**

Other Specifications: **Wind Speed:** 0-30 mph, ± 2 mph; 0-90 mph, ± 5 mph. **Direction:** 8-point readout over 360°; 16-point resolution by lighting two adjacent lights. **Temperature:** 0° to +120°F, ±2°F (typ. INDOOR); −40° to +120°F (typ. OUTDOOR). **Barometric Pressure:** 28-31 inches of mercury within 0.5 inches, accurate up to altitudes of 10,000 ft. **Operating Temperature:** Receiver, 32° to 100°F; Transmitter −40° to +120°F.

Monitor air moisture for comfort and savings

2 Now you can reduce heating and cooling costs with the Heathkit Relative Humidity Instrument. It helps you determine when to turn on the humidifier indoors or the best time to paint outdoors. You get accurate readings even in remote locations with the electronic sensors and 100' transmission cable. Bright ½" digits display the humidity in percent. Choose alternate indoor/outdoor readings or display one reading constantly. Also learn how it operates with our comprehensive assembly manual. Measures 2½" H x 7" W x 5" D.

Kit ID-2295 Ship wt. 6 lbs. . . . **$99.95**

Other Specifications: **Measurement Range:** 10%-90% relative humidity. **Accuracy:** 25°C, ±10 counts; 0°-55°C, ± 20 counts. **Operating Temperature Range:** 0°-55°C (32°-131°F.) **Power Requirements:** 120/240 VAC, 50/60 Hz.

Use digital technology to monitor the winds

2 The Heathkit Digital Wind Speed/ Direction Indicator combines both a non-corroding anemometer and weather vane for truly accurate readings with an attractive indoor console display that has 16-point resolution for easy viewing. You can wire the Indicator to read in two of three scales: mph, km/h or knots, plus you can calibrate for either true north or magnetic north. Requires one of the 8-wire cables from the ID-1290 accessories (above). Operates on 120 VAC. 2½" H x 7" W x 5" D.

Kit ID-1590 Ship wt. 7 lbs. . . . **$99.95**

Other Specifications: **Wind Speed:** 0-99 mph, ± 1 digit or ±10%. **Wind Direction:** 8-point readout over 360° with 16 points of resolution. **Wind Speed Sensitivity:** 3 mph, 4 km/h, or 2 knots. **Operating Temperature: Receiver:** 0° to 150°F. **Transmitter:** − 40° to 150°F. **Power Requirements:** 108-132 VAC, 50/60 Hz.

A better household thermometer

2 Accurate temperature readings are also convenient with our Digital Indoor/Outdoor Thermometer. Large, orange display digits can be clearly seen at any time of day or night, plus two sensors allow for continuous or alternating indoor/outdoor readings. The 2½ digit display even shows above- and below-zero temperature in Fahrenheit or Celsius. Operates on 120 VAC, 60 Hz. (Order ID-1390-BE for 240 VAC, 50/60 Hz operation.) Has measurements of 2½" H x 7" W x 5" D.

Kit ID-1390-B Ship wt. 4 lbs. . . **$89.95**

Other Specifications: **Temperature Range:** −40° to +120°F, −40° to +50°C. **Accuracy:** ± 1°C from − 15°C to +50°C, ±2°C from − 40°C to −15°C; ± 1°F from +20°F to +120°F, ±2°F from −40°F to 20°F.

Personalized name plate

HANDCRAFTED BY
JOHN SMITH

You've finished your kit and everything looks and works great because you did it yourself. Indicate the special care and skill you've invested in your finished kit with an engraved name plate. Made of solid brass and brushed to a jeweler's finish, it has a self-adhesive backing for easy, no-mess application.

7

Two-wheel drive Ultima R/C race car

NEW

SKILL LEVEL 2 Designed by racers for racers, the 1987 world champion Ultima sets the industry standard in 2WD off-road competition. Its completely new, state-of-the-art design features a super-tight, super-durable monocoque aluminum frame for decreased weight and increased durability. Improved, double wishbone nylon suspension is based on the design of another racer, the world-champion Optima, making the Ultima a virtually unbeatable racing buggy.

Oversize, coil-spring oil-filled Kyosho shocks on all four wheels smooth rough terrain, while low-profile, pin spike tires on oversize wheels provide superb traction. And, for road-grabbing power, the Ultima's heavy-duty power train includes gear differential.

The clear Lexan body features an aerodynamic wing for stability, and wide-open architecture leaves working parts easily accessible. A 540-size motor (included) powers the Ultima, but any Kyosho LeMans "hop-up" motor can be installed to make the world champion even hotter.

Required for operation are a 2-channel radio, 6-cell battery pack, and charger (all shown on page 9). Designed to run fast on any racing surface and handle the toughest terrain and obstacles, the easy-to-build Ultima is 14.2" long and weighs only 3.8 pounds.

Kit RC-102 Ship wt. 5 lbs. $139.95

$AVER! Kit RCC-102 System includes RC-102 Ultima, RC-601 6-cell Quick Charger, RC-650 6-cell Battery, RC-802 Pulsar Pro-200 Radio. Ship wt. 35 lbs. $239.95

Four-wheel drive Optima Mid R/C race car

NEW

SKILL LEVEL 2 Kyosho has upgraded the design of the Optima Mid by mounting the motor mid-ship for aluminum optimum weight distribution and handling. The newly-added, aerodynamic rear wing is also adjustable for enhanced control. The power delivery system has also been improved with the incorporation of the latest in R/C off-roading – belt drive technology. The heavy-duty, metal-reinforced belt won't stretch or break and is much more efficient than traditional chain drive systems. With a super-hot LeMans 240ST motor as standard equipment, the Optima Mid has the power to pursue and overtake the competition.

The true geometry, special-formula nylon suspension of the Optima Mid features extra-long double wishbones for superior wheel travel and ride wherever you race. Famous Kyosho Gold adjustable, oil-filled shocks on all four wheels provide perfect dampening for any track condition. Built on a rugged alloy aluminum chassis pan that keeps racing weight low, the Optima Mid is protected by an FRP upper chassis plate with a full enclosure belt shield. This buggy can handle the most hazardous off-road obstacles with ease, and come out a winner.

The Optima took off-road racing by storm in 1985, and in 1988 the Optima Mid is revving up at the starting line, fully able to continue the winning legend. Adding a 2-channel radio, 6-cell battery, and charger to an Optima Mid is a sure way to the head of the victory list at your track! Weighing in at 3.35 pounds, this superior race car measures 13.8 inches long by 9.4 inches wide.

Kit RC-101 Ship wt. 5 lbs. $199.95

$AVER! Kit RCC-101 System includes RC-101 Optima Mid, RC-601 6-cell Quick Charger, RC-650 6-cell Battery. RC-802 Pulsar Pro-200 Radio. Ship wt. 35 lbs. $294.95

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Michigan residents call:
1-800-782-2702

Electric Valencia Motorglider

Beginning and intermediate fliers will delight in the quiet, electric-powered Valencia that flies with the grace of a glider. Loops, barrels and inverted flight are easy and fun to perform with the 70″ wingspan Valencia. High aspect ratio wings feature the Eppler 178 airfoil and built-in washout to enhance low speed stability. Aerodynamic shape and high T-tail make the Valencia a beautiful little plane.

The Valencia is easily built since all major parts are pre-assembled. Its light-weight MonoKote covered balsa wings are prebuilt, as is the strong, damage-resistant polypropylene fuselage. The blow molding process used for the fuselage produces an unbelievably light body with incredible strength.

The Valencia includes a powerful Kyosho LeMans 240E electric motor for exceptionally quiet flight. And, its radio equipment is conveniently located and easily accessible through the plane's canopy.

The Valencia requires a 2- or 3-channel radio, 6-cell battery and charger. Length is 34.25 inches, weight 49.3 ounces. A complete decal set is included. No painting is required.

Join the world of electric powered flight with the Valencia Motorglider.

Kit RC-401 Ship wt. 5 lbs. **$159.95**
***$AVER!* Kit RCC-401** System includes RC-401 Valencia Motorglider, RC-650 6-cell Battery, RC-602 12-volt Multi-charger, RC-802 4-channel Radio. Ship wt. 35 lbs. **$284.95**

NEW Pulsar Pro-2000 2-channel radio

Expertly designed for RC drivers, the Pulsar 2-channel radio's precision balanced pistol grip is made for comfortable right or left-hand racing all day long. The balanced design places the center of gravity in the center of your hand, virtually eliminating wrist fatigue.

Other features include servo reversing switches to simplify servo installation, ratcheted fine-tuning trims for steering and throttle channels, and NiCd recharging jack and power meter conveniently located on the transmitter. Batteries not included.

Assembled RC-801 Ship wt. 1 lb. **$69.95**

4-channel radio

For use with the Valencia Motorglider, the Aristo-craft 4000 4-channel radio features servo reversing on all four channels. Its new compact stick design includes adjustable stick tension for a softer or harder touch. In addition, stick length is adjustable for easy operation.

This 4-channel radio features two high torque servos, charge connector for optional NiCd batteries, onboard LED power indicator and RF power meter. Heavy-duty water and dust-tight servos deliver 42 oz./in. of torque. F.C.C. approved.

RC-802 Ship wt. 1 lb. **$89.95**

6-cell quick charger

Easy to use and great for beginners. Equipped with heavy-duty battery clips, the Quick Charger economically fast-charges a 6-cell, 1200 mAh battery in 15 minutes from any 12-volt power source. The mechanical 15-minute timer shuts off automatically at the end of a charge cycle to prevent overcharging. An easy and economical way to charge NiCd batteries. Current is factory pre-set.

Assembled RC-601 Ship wt. 1 lb. **$19.95**

12-volt Multi-charger

The highly versatile Multi-charger fast charges, slow charges or discharges 4- to 7-cell NiCd packs in the 500-4000 mAh range. The electronic timer automatically shuts off and audibly signals the end of a charge cycle. Output current is fully adjustable with the on-board power meter, and the handy discharge switch makes cycling packs easy.

Assembled RC-602 Ship wt. 2 lbs. **$29.95**
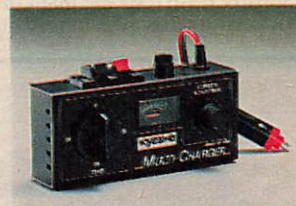
6-cell flat pack battery

Reliable, rechargeable high capacity NiCd cells. Factory computer matched for excellent performance. Tab-less internal connections welded for high output.

RC-650 Ship wt. 1 lb. . . . **$19.95**

20″ Zenith remote control digital TV with high quality picture and sound

Zenith's Digital System 3 20″-diagonal stereo receiver/monitor brings you your favorite program or special event with remarkable picture detail and stereo broadcast sound. And the contemporary styling of the honey oak veneer cabinet gives the unit a high quality look which blends with any decor.

Your eyes will appreciate pure, bright, true-to-life colors. Zenith's Chromacolor Contrast Picture Tube combines tinted phosphors and black matrix with reflection-absorbing glass to produce exceptional contrast and color fidelity. Colors are constantly in balance thanks to Zenith's exclusive digital computer "brain" which automatically monitors and adjusts the output of reds, blues and greens.

For your listening pleasure, the SD-2035-H offers Multi-Channel Television Sound (MTS) for clear, precise broadcast sound through computer-processed audio signals. Audio modes can be selected by remote control with separate bass, treble and balance controls.

The System 3 digital chassis features computer controlled precision and large scale integrated circuits for peak performance. In addition, the digital comb filter electronically sharpens your picture by providing maximum resolution of the TV signal. You'll also have digital true-lock picture hold, automatic color clarifier, automatic fringe-lock circuit and an electronic power sentry voltage regulator.

The built-in world system teletext, available over most cable TV systems, allows you to receive news, sports, weather, or business reports at the touch of a button. Use the remote control teletext mode to select pages of text, superimpose text over ordinary TV video, or choose print size.

The 178 channel tuning capability permits reception of all VHF/UHF broadcast channels and up to 122 cable channels. Quartz-controlled electronic tuning automatically locks onto the exact broadcast frequency. Select the channel you want by instant entry, timed entry, or by up/down programmable favorite-channel scanning which skips unwanted channels.

The push button control panel allows you to adjust all controls by rocker switch or membrane keypad. And, if settings are accidentally changed, the reset button will return controls to a factory-set level. Use the remote control flashback feature to instantly return to the last channel you were watching. Or, watch two programs alternately during the same viewing period.

NEW

Simulated TV picture

Parents will appreciate the Parental Control feature which allows them to lock out any unwanted viewing channels for up to 12 hours.

Other features of the SD-2035-H include a single antenna connector for VHF, UHF and CATV, two 4″ x 10″ woofers, two 2″ tweeters, picture control, sharpness control, and Redi-Plug Access Port.

In addition, the Auxiliary Jack Panel audio/video input/output jacks allow direct hookup between video/audio sources and the TV for superior picture and sound. Input jacks allow connection of a video camera, video disk player, or video cassette recorder. Output jacks provide a source of video and audio signals for recording purposes or permit the feeding of stereo TV sound to external speakers or your stereo system. Route the TV stereo signal into a stereo amplifier and use the TV's remote control to adjust volume. The digital connection center on the back of the set provides for easy connection of accessory products. Set measures 17³⁄₁₆″ H x 28″ W x 19″ D.

Assembled SD-2035-H Ship wt. 95 lbs. Mtr. Frt. . . **$549.00**

Zenith Source Selector

NEW
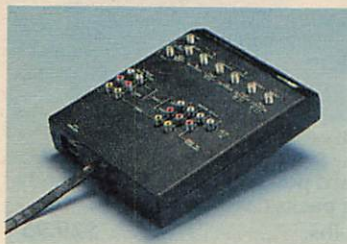
The Zenith Source Selector is a sophisticated accessory designed for inconspicuous mounting on the back of your Zenith Digital TV. The Selector provides convenient remote control selection of multiple program sources. Connect up to 4 RF sources (VCR, scrambled or non-scrambled CATV, etc.) plus several audio/video sources (VCR, FM radio, computer, etc.) in various ways. Any connected source can be selected by remote control and routed to either your Zenith Digital TV, VCR or both. Even simultaneously route one source to your TV, another to your VCR.

Assembled S-14-A Ship wt. 5 lbs. **$59.95**

Swivelling video center

NEW

This handsome, golden oak finish swivelling video center is the perfect match for the SD-2035-H color TV shown above. Its durable, protective finish will give you years of long-lasting beauty.

The video center accommodates a 20″ table model or a 25-27″ cube type color TV, VCR and accessories. Magnetically secured doors push to open, and the video center swivels on a stationary base so that you can adjust it to the best viewing angle. Assembly is required. Complete and concise instructions and special assembly tools are included. Measures 24⅛″ H x 29³⁄₁₆″ W x 15½″ D.

GRA-2035-1 Ship wt. 65 lbs. **$79.95**

8′ projection TV with Remote Control

SKILL LEVEL 2 Turn your living room or family room into your own private theater with the Zenith projection remote control color TV. All you'll need is the popcorn as you sit down in front of the 8-foot diagonal picture.

The projection TV can project right onto your viewing room wall as long as the surface is flat white or off white. Optimum size for viewing is an 8-foot diagonal area, but any wall with a 7- to 10-foot area will work as well. If you do not have an adequate wall surface, the projection TV can be used with a screen such as the GRA-8000-3 described below. You'll want a distance of approximately 12 feet from the back of the TV to the projection surface, whether you're using a wall or a screen.

Use the remote control pushbutton keyboard to turn the TV on and off, select channels, scan your favorite pre-programmed channels and adjust volume. You can also mute the sound, recall channel number and time, and select TV stereo, monaural or second audio sound by remote control. The flashback feature provides you with instant return to the last channel you were watching.

Enjoy Multi-Channel TV Sound (MTS) which provides you with clear, crisp stereo broadcast reception. Select the most pleasing sound adjustment with separate bass, treble and balance controls. And delight in extended stereo control which electronically increases the apparent separation of your speakers, giving a more "spacious" sound to your favorite program.

Optical lens and picture tube coupling increases contrast and brightness by reducing the number of reflecting surfaces. Each tube is liquid cooled for long life and superior light output. Use the TEST switch to determine optimum image centering, and correct a misconverged image with convergence controls on the control panel. You'll also get all VHF/UHF broadcast channels and up to 122 cable channels with the 178 channel tuning capability of the GR-8000. Quartz-controlled electronic tuning automatically locks into the exact broadcast frequency.

Other features include a 100% modular chassis for peak performance, digital true-lock picture hold, automatic fringe-lock circuit, electronic power sentry voltage regulator, single antenna connector for VHF, UHF and CATV, two 5″ oval speakers, and built-in crosshatch generator for convergence adjustments. The pecan color contemporary style cabinet measures 10¼″ H x 31″ W x 25″ D.

Kit GR-8000 Ship wt. 128 lbs. Mtr. Frt. **$1495.00**

Simulated TV picture

TV floor stand

The pecan color finish of the Zenith TV and VCR floor stand perfectly matches the finish of the projection television shown above. Built-in castors make it easy for you to move the stand around the room to the most convenient projection location.

The GRA-8000-1 is designed with a flat top surface to hold the Zenith projection television and with additional shelf space below to house your VCR. Dimensions of the floor stand are 12³⁄₁₆″ H x 3⅛″ W x 25⅛″ D.

GRA-8000-1 Ship wt. 64 lbs. . . . **$59.95**
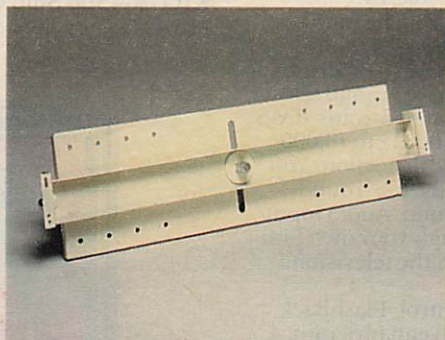
Ceiling mount for GR-8000

Mount your GR-8000 projection TV in your family room viewing area. The unit is designed for mounting to a finished ceiling where joists are accessible. Can also be attached directly to a slab ceiling.

GRA-8000-2 Ship wt. 16 lbs. . **$49.95**

Credit card orders call **TOLL-FREE** 24 hours a day:

1-800-253-0570

Michigan residents call:
1-800-782-2702
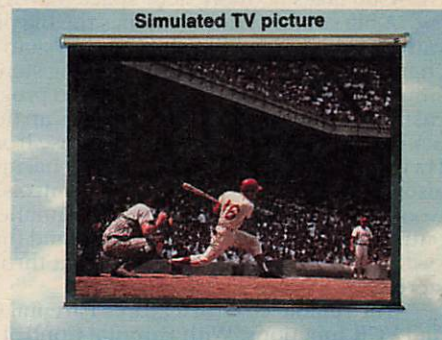
98″ diagonal screen

The GRA-8000-3 is a heavy-duty, manually operated pull-down screen specially designed for use with the Zenith projection system. If you don't have a flat white wall surface large enough for projection purposes, the GRA-8000-3 is a good quality screen that will serve the purpose.

Designed for systems with three separate light sources, this matte finish 98″ diagonal screen prevents the side-to-side color distortion which can occur with conventional screens.

GRA-8000-3 Ship wt. 16 lbs. **$149.95**

Fun sized 9″-diagonal AC/DC color TV

SKILL LEVEL 2 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 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 preassembled and the GR-9009 has a built-in crosshatch generator. Includes sun screen, earphone, built-in whip antenna, DC power cord and flush-mounted carrying handle. Cabinet measures 10¼″ H x 10½″ W x 11⅞″ D.

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

Enjoy television more on this 45″-diagonal super screen

SKILL LEVEL 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 multichannel 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, 6½″ round woofers and 2½″ 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 CRTs 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 also use the TV as a monitor for your VCR, video camera or video disc player.

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

Kit GR-4500 Ship wt. 256 lbs., Mtr. Frt. **$1495.00**

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True-to-life color with a spacious 27"-diagonal screen and stereo sound

Slide-out panel gives you complete audio and video control

Cut out the rounded corners and flatten your 25-inch screen. You'll find yourself with 25 square inches more picture – a full 27-inch diagonal screen. Surround the screen with stereo sound. Then 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. 120 VAC/60 Hz.

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. **$649.00**

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. **$599.00**
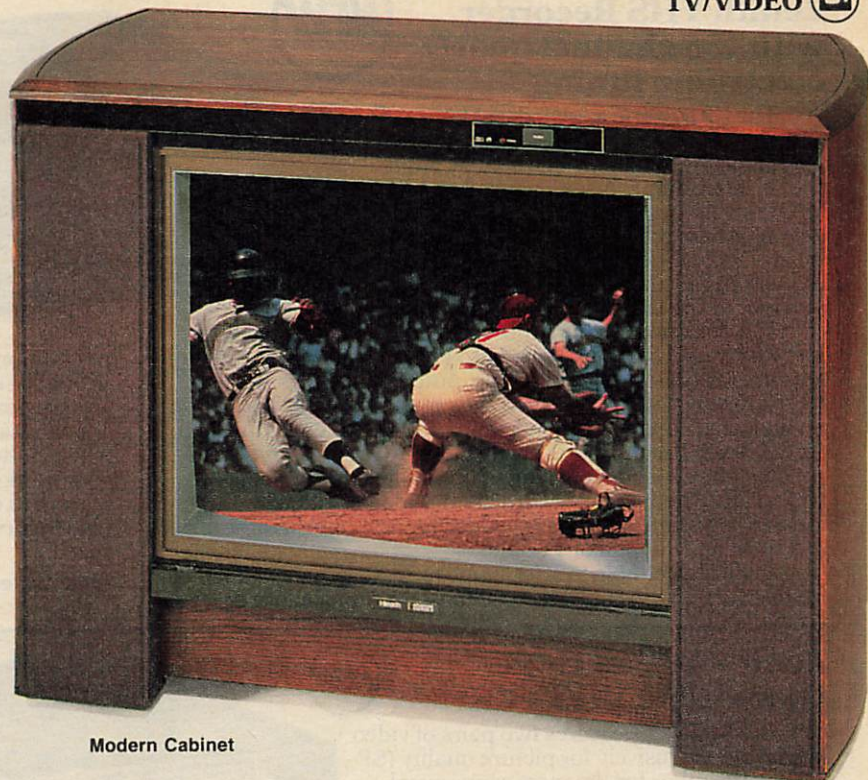
Modern Cabinet

Simulated TV pictures
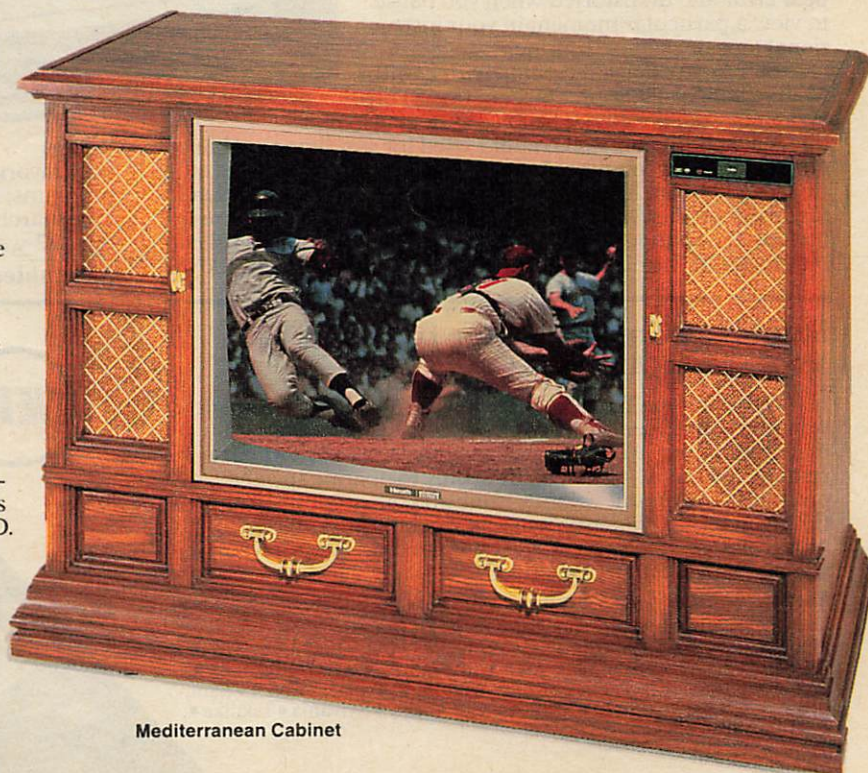
Mediterranean Cabinet

Zenith VHS Recorder with 156 channel quartz electronic tuning

NEW

The VRD-100 is a 2-head, cable-compatible VCR which includes 101 cable channel tuning. Channels are selected by direct access or scanning. A series of high quality (HQ) circuits creates sharp edges around dark and light areas, sharpens detail in images where texture is important, and reduces irrelevant noise in the light and dark portions of the video signal.

You don't need to remember to turn on a Zenith VCR before inserting a cassette. With Auto Power-On the VCR turns on automatically as you insert a tape. Auto Eject allows you to eject a tape without turning on the power. And with automatic rewind, your tape will automatically rewind when it's finished, ready to play the next time around. The 2 week, 4 event timer permits unattended recording of up to 4 events over a 2 week period. And the Instant Record feature means that with the touch of a button you can record 30 minutes of programming at a time, up to a total of 4 hours.

You'll also be able to select your recording mode: SP for best picture quality, or EP for the most economical use of tape.

In addition, your VCR will set the correct playback speed automatically. During playback, just touch the pause button and you can interrupt viewing to answer the phone. Or use the pause button to advance the tape continuously, simulating slow motion or instant replay. Use the new VHS Index Search System to quickly locate your favorite programs, scanning a tape in forward or backward mode at seven times normal speed.

Assembled VRD-100 Ship wt. 18 lbs. **$279.95**

Zenith 4-head cable-compatible VHS VCR

NEW

The VRD-500 features two pairs of video heads, one exclusively for picture quality (SP mode), the other for the most economical use of tape (EP mode). Your picture will appear clear and undistorted when you pause to view a particular moment in your instructional tape or exercise routine.

Stereo broadcast reception with Zenith's Multi-Channel TV Sound System (MTS) provides true stereo sound. The MTS system also reproduces a second, non-stereo audio, used for simultaneous bilingual or similar programs. And, as you enter days, start and stop times and channels, the remote, on-screen programming feature displays the data on your TV screen. Additional features include 157 channel quartz electronic tuning, including 101 cable channels; the new VHS Index Search System that quickly

locates your favorite programs; Counter Go-To for fast, accurate tape searching; and unattended recording of up to 4 events over a 2-week period. Zenith Video Operating Guide included.

Assembled VRD-500 Ship wt. 18 lbs. **$499.00**

Remote control center for your TV, VCR and CATV

NEW

Operate your TV, VCR and cable converter from a single remote control. Zenith's personal control center, programmable for multiple brands, is as easy to use as any ordinary remote. Set the switches one time only to operate specific products. The on/off, volume, mute and other control functions will remain independent and can be adjusted from any mode. Designed to control units operated via IR (infrared) signals. 3 AAA batteries included.

Assembled GDZ-143 Ship wt. 1 lb. **$39.95**

Operates many recent models of these TV Brands**:
Akai • AOC • Centurion • Coronado • Curtis-Mathes • Emerson • Fisher • GE • Goldstar • Hitachi • KMC • KTV • Magnavox • MGA/Mitsubishi • NEC • Panasonic • JC Penney • Philco • Portland • Quasar • RCA • Sampo • Samsung • Sanyo • Scott • Sears • Sharp • Sony • Sylvania • Teknika • Toshiba • Wards • Zenith.

Operates many recent models of these VCR Brands**:
Cannon • Curtis-Mathes • Emerson • Fisher • GE • Goldstar • Hitachi • JVC • Magnavox • Marta • Marantz • MGA/Mitsubishi • NEC • Panasonic • Quasar • RCA • Samsung • Sanyo • Scott • Sears • Sharp • Sony Beta • Sony Video 8 • Sylvania • Toshiba • Vector Research • Wards • Zenith Beta • Zenith VHS.

Operates these Cable Converters**:
General Instrument Starcom CS • Jerrold 450 • Jerrold VI/SRC II • Oak Sigma • Pioneer • Scientific Atlanta • Tocom VIP • Zenith.

**Zenith cannot guarantee that the PCC will operate every model of the brands listed.

14

Take perfect pictures with this super lightweight full-featured Camcorder

Be there when it happens. And be prepared with a light-weight video movie camera you can take wherever you go. The Zenith VM-6300 is a complete, compact video recording system weighing less than three pounds, including battery and cassette. Simply turn the power on, drop in a blank mini-cassette and record. Those memories will be there year after year.

Once you've recorded a sequence, replay the scenes through the viewfinder so you'll know exactly what you've filmed. The viewfinder provides easy-to-use indicators for recording and manual mode, status of focus and filter, plus warnings for tape end, low battery, low light and contrast. The date/time selector allows you to label each recording on the spot so you'll remember exactly when you filmed a sequence. You'll also be able to add subtitles to your tapes and credit titles that scroll up or down.

The VHS Camcorder will record up to one full hour of your special event on VHS-C mini-cassettes using the extended play EP mode. And, 4-head scanning assures optimum picture playback quality, regardless of your playback speed. Exposure is automatic and electronically monitored to ensure accuracy indoors and out, even in extremely low lighting, down to 10 lux. Plus, the ½ inch CCD pickup device has 250.000 picture elements for superior color and 320 lines of horizontal resolution, still offering reduced power drain and giving you long operation on standard or high-capacity batteries.

Other features include high speed 1/1000 shutter for recording fast action shots and for clear, well defined pause and slow motion playback pictures; omni-directional condensor microphone for simultaneous monaural sound recording; convenient, easy-to-use switch-activated controls grouped for ready access; 2-way power capability for recording using the camera mounted battery pack and AC power supply. New HQ (high quality) circuitry with White Clip and Detail Enhance-

ment gives you excellent picture detail and clean, crisp images. And fast, f/1.4, 6:1 auto-focus, 2-speed power zoom lens with macro capability allows easy focusing of close-up shots.

Included accessories are AC adapter/charger, rechargeable battery, cassette tape, cassette adapter and shoulder strap. Optional padded carrying case is compartmentalized to hold video camcorder and accessories, including two battery packs.

VM-6300 Ship wt. 8 lbs. **$1095.00**

Accessory:
VAC-630 Hard Shell Carrying Case. Ship wt. 5 lbs. . . **$99.95**

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 make a perfect Christmas gift to remind someone of a special past occasion. Use the BV-612 with your own video camera or camcorder. An adjustable tablepod mount allows for easy set-up with your projector and video camera.

The new V-617 Converter puts an end to unorganized photo albums and boxes filled with your photo prints. With the V-617 Converter you can transfer photo prints up to 4" x 6" 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 video camera and the Converter's adjustable tablepod mount.

Assembled BV-612 Ship wt. 3 lbs. **$99.95**
Assembled V-617 Ship wt. 6 lbs. **$99.95**
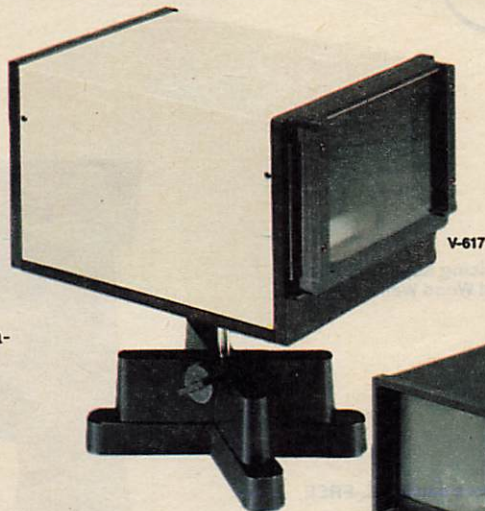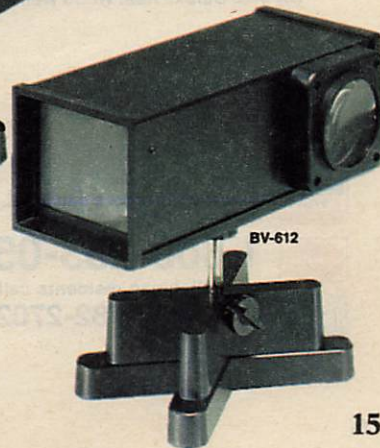
$AVER! Purchase both BV-612 and V-617 at the same time and save $50.
Separately $199.90
$AVER Price **$149.90**

15

WERSI PRISMA DX-5 Keyboard

NEW

DX-5 Digital Voicing Keyboard with
DX-5-TS Deluxe Real Wood Walnut Base

16

Puts the world of sound at your fingertips

SKILL LEVEL For the first time ever, we're proud to offer you this innovative, easy-to-play, digital voicing keyboard. From WERSI, one of the world's leading keyboard manufacturers, the Prisma DX-5 lets *you* produce a variety of music with the latest microcomputer technology available. Its advanced design is guaranteed to inspire you to musical accomplishments you've never dreamed of.

Featuring the newly developed digital natural sound system, the PRISMA DX-5 is capable of producing any sound existing in nature with unbelievable authenticity: grand piano, Spanish acoustic guitar, even the sound of a complete modern band or symphony orchestra, plus much more. And if you're a novice or beginning player, you'll enjoy the perfect auto-accompaniment and automatic chords, as well as live-recorded drum sounds and digital delay and echo effects. You even get a variety of synthesizer features.

The PRISMA DX-5 keyboard is fully computerized and also connects to any PC or home computer for recording and playback of music. And for yet more flexibility, a library of additional cartridges can individualize the DX-5 to your musical taste: from classical to contemporary, from waltzes to rock 'n roll. What's more, the keyboard is composed of modular groups and interchangeable sections for easy expansion and updating.

Elegantly styled in a real-wood walnut cabinet, the DX-5 includes a host of advanced features:

- central and special effects electronics
- 8-note polyphonic
- a main operating panel and elements
- 2 keyboards
- a quality stereo amp
- four built-in high performance speakers
- mono/stereo audio output
- line-in stereo
- headphone jack
- MIDI In/MIDI Out
- volume control master
- 16-digit LED display
- transposer function
- 8 total presets/16 programs
- 8 programmable total presets
- 30 DMS instruments
- 9 drawbars

There's even a *built-in self-diagnostic system.*

What's more, this exciting new keyboard is easy to set up. Wiring is simple – just plug in the ribbon cables. No tuning necessary. Plus you can pre-test each board before connecting the whole instrument.

Operates on 110/220 VAC. 6" H x 45" W x 21" D.

Kit DX-5 WERSI Digital Voicing Keyboard Instrument (upper part of unit only). Ship wt. 49 lbs. . . . . . **$1,995.00** (does not include amplifier)

Check out the sound for yourself!

Call **1-800-253-0570** and we'll send you a complete information package telling you all about the Prisma DX-5, including an audio cassette recording of its sounds.

DX-5DEM. Ship wt. 1 lb. . . **$4.95** (Price includes shipping and handling. Fully refundable against purchase of the Prisma DX-5. Once you hear the Prisma DX-5, you'll want this quality instrument for yourself – and your family. So call today.

DX-5 Digital Voicing Keyboard with DX-5-CP Portable Stand with Swell Pedal

DXA-5-2 WERSIMATIC Rhythm/Accompaniment

ROM and RAM Cartridges

ACCESSORIES:

Kit DX-5-TS Deluxe Real Wood Walnut Base. Includes 2 x 80 Watt Stereo Amplifier, 4 Speakers, 13-Note Pedalboard, and Swell Pedal. Ship wt. 84 lbs. **$1,155.00**

Kit DX-5-CP Portable Stand with Swell Pedal. Ship wt. 19 lbs. **$210.00**

DXA-5-1 Voice Expansion Card for 16 note Polyphonic. Ship wt. 1 lb. **$495.00**

DXA-5-2 WERSIMATIC Rhythm/Accompaniment. Ship wt. 1 lb. **$370.00**

DXA-5-3M Mechanical Reverb. Ship wt. 2 lbs. **$75.00**

DXA-5-3D Digital Reverb. Ship wt. 4 lbs. **$529.00**

DXA-5-4 Adjustable Bench. Ship wt. 26 lbs. **$169.00**

DXA-5-5 Factory Voice ROM Cartridge. Ship wt. 1 lb. **$95.00**

DXA-5-6 Factory Rhythm ROM Cartridge. Ship wt. 1 lb. **$95.00**

DXA-5-7 Custom Voice RAM Cartridge. Ship wt. 1 lb. **$75.00**

DXA-5-8 Custom Rhythm RAM Cartridge. Ship wt. 1 lb. **$75.00**

DXA-5-9 13-Note Pedalboard. Ship wt. 12 lbs. **$169.00**

DXA-5-10 Carrying Bag for DX-5. Ship wt. 6 lbs. **$145.00**

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NEW

LiteSet cordless personal telephone for hands-free communication

Imagine that you're sitting at your desk, your hands occupied with paperwork. The phone rings and the caller requests that you not only take down an important message, but that you look up a reference at the same time. You do it every day...holding your shoulder close to your ear so that the receiver won't fall to the floor as you read, write and talk on the phone at the same time. Or imagine wanting to be outside gardening or reading and relaxing in your favorite lawn chair. But you can't risk being away from the phone. You're expecting an important call and have to stay indoors so you'll hear the phone ring.

The new LiteSet cordless phone has been designed for these and other situations that make holding a conventional receiver uncomfortable or staying close to a traditional phone inconvenient. This cordless phone is a radical new design for hands-free communication.

Its specially designed modular base unit is easy to install. It connects to your wall jack, giving you the freedom to move up to 1000 feet away. You'll carry the unbelievably lightweight headset and pocket-size dial pad with you as you move freely around the house, office or yard. You can receive calls and dial out no matter where you are. And there's no need to wear the headset until a call comes in or you want to place a call since your calls ring from the dial pad. A 4-foot cord connects the headset to the dial pad so you can slip it into your pocket or fasten it onto your belt for absolute freedom of movement within the 1000 foot range.

Last number redial, call cancelling, tactile-feel keypad, mute switch and two volume settings are standard features of the LiteSet dial pad. Switchable tone/pulse dialing is controlled from a switch in the base unit. You'll be amazed at the actual weight of the set. The pad weighs in at only 5.5 ounces and the 3-inch long headset an amazing 0.5 ounces, giving you unprecedented comfort as you experience hands-free communication.

Assembled RF-100-1 Ship wt. 3 lbs. **$199.95**

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. You'll 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. **$129.95**

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 is a telephone and answering machine combined at a price less than that of many separate units. It features dual standard cassettes for recording personalized messages and unlimited message length. When you're too busy for 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 two-way record, call counter, memo record, automatic redial, ring select and pulse/tone switching.

Assembled BT-1600 Ship wt. 7 lbs. **$159.95**

Digital clock

Dependable and easy to use, this reliable digital clock is perfect for anyone just getting started in kit building. Time and day are displayed in large 4-digit, 7-segment LEDs. For comfortable reading day or night, brightness automatically varies according to surrounding light. A built-in battery backup feature keeps internal circuitry running in case of power failure. A snooze pushbutton on the top of the cabinet causes the alarm to sound at 9-minute intervals whenever pressed. Attractively styled dark grey cabinet measures 2⅞" H x 7⅛" W x 4⅜" D. Operates on 120/240 VAC, 50/60 Hz. Battery not included.

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

Most Accurate Clock

Experience the precision of a microprocessor-based timepiece that is synchronized with the National Bureau of Standard's 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, the GC-1000 automatically re-sets to the correct time even after a power failure. Outdoor antenna may be required. 3⅞" H x 9" W x 6¼" D.

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

Accessories:

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

GCA-1000-3 Heath/Zenith computer interfacing software. 3 lbs. **$49.95**

See-through alarm clock

It's a smart looking addition to your desk or a dependable take-along alarm with a time and date display that seems to float in mid-air. Shows 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**

Energy saving draft detector

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**
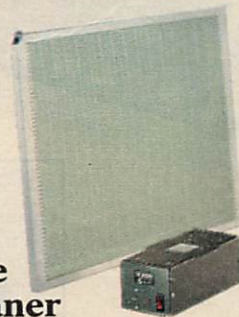
Furnace Air Cleaner

The Furnace Air Cleaner works with your heating or air conditioning system to reduce the effects 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. The power supply operates one filter and runs on 120 VAC. Requires easy-to-install 1" filters. (Also works with GD-2196 2" filters.) 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**
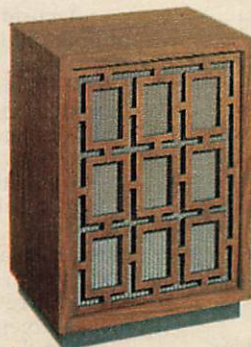
Portable Air Cleaner

Enjoy cleaner, fresher air in your home with the Heathkit Portable Air Cleaner. It helps solve your toughest air cleaning problems, 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 air clean and fresh. An easy one-evening kit with power supply, 3-speed fan control and filter already assembled. Uses 120 VAC, 60 Hz. 26½" H x 17¼" W x 13½" D.

Kit GD-1297 Ship wt. 59 lbs. **$249.95**

Accessory:

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

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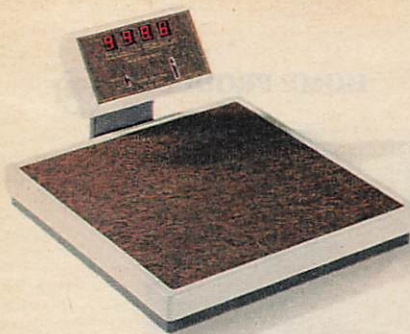
Accurate Digital Scale

SKILL LEVEL 1. Whether you're serious about losing weight or just a fitness enthusiast, you'll appreciate the precise readings from a scale that utilizes the latest in strain-gauge technology. No springs to wear out like conventional scales, the Heathkit Digital Scale uses a sensitive strain-gauge mechanism that detects weight changes as small as ¹⁄₁₀th of a pound. The scale can measure a letter as light as 2 ounces and is built to check the weight of a 300 pound item.

All weights appear in bright LEDs in your choice of pounds or kilograms on a removable display. A manual zero adjustment makes it easier to weigh small items with accuracy. Requires 6 "C" batteries. An easy two-evening kit.

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

A digital thermometer to trust

Trust the dependable accuracy of this digital fever thermometer with beeper and automatic power-off system. Includes battery. 4⅜" H x ½" W x ⅜" 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 printed paper.
Assembled BH-1750
Ship wt. 5 lbs. **$99.95**

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 suite 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.

It's designed to fit most gas, oil or electric heating and air conditioning systems with 24-volt controls (3, 4 and 5 wire type). Will not work with the following systems: heat pump, high voltage electric baseboard or electric ceiling heat, gravity flow, or "Millivolt." Manual includes full explanation of compatible systems and complete installation procedures. Return for a full refund if not compatible.

Assembled E-200 Ship wt. 1 lb. **$69.99**
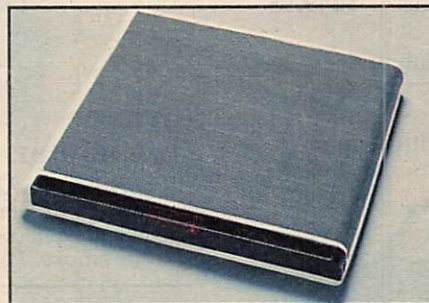
UPSCALE electronic digital scale

Accurately measure your weight with the cordless, remote-readout electronic UPSCALE. It uses state-of-the-art strain gauge technology to measure your weight down to the pound. Then it beams that information by infrared light to a remote module that you can hold in your hand or hang on a wall. You have the convenience of reading your weight on a LCD display directly in front of you – not down on the floor.

And with the UPSCALE you have the added convenience of a digital clock/calendar. Time is displayed in hours and minutes using a 12-hour format. When selected, the date is alternately displayed by month, day and year. A count-down timer and 4 alarm modes can help you keep track of exercise periods when you're not using this highly sensitive scale for weight measurement.

The electronic scale automatically turns on when you step on the tough, attractive platform. After your weight is calculated, the display will remain on for 10-12 seconds, then switch to the time. Low battery indicators let you know when it's replacement time. Requires two 9-volt alkaline batteries. Full 5-year warranty.

Assembled BH-8500 Ship wt. 7 lbs. **$99.99**

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Programmable electronic doorbell

SKILL LEVEL 1. 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. 5¾" H x 8⅝" W x 2⅝" D.

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

Groundtrack metal locator

SKILL LEVEL 1. 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 3½ lb. weight make the Groundtrack extremely easy to handle. Use it with or without headphones. The telescoping shaft collapses to 22½" 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 36)
Ship wt. 2 lbs. **$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**

Utility thermometer also keeps the time

Check a wide range of temperatures, −19.9° to 69.8°C (−2.2° to 157.6° F), indoors and out with this portable, multipurpose digital thermometer. Use it as a guide in adjusting heaters and cooling equipment or for measuring water temperatures. You'll find that this accurate thermometer will be extremely helpful in many applications.

Manually set minimum and maximum temperatures and an audible alarm will alert you to exceeded limits. The probe tip can be immersed in water or easily placed into heating and/or cooling ducts. A 3-foot 3-inch cord provides you with the freedom to place the probe almost anywhere. The thermometer also includes an external sensor-mounting fixture. A handy built-in clock supplies you with the time whenever you need it. Includes battery. Not intended for use as a fever thermometer. Has dimensions of 4¼" H x 2⅝" W x ¾" D.

Assembled SM-2326 Ship wt. 1 lb. . *Was* $34.95 *Now* **$24.95**

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X-10 POWERHOUSE home security system

Home security and convenience are yours with the X-10 POWERHOUSE home control system. The system not only protects your home while you're away, it makes life a little nicer when you're at home. And, you can enjoy the savings that come with planned control of your lifestyle. You'll be able to turn on lamps before you enter a room, switch on the coffee maker so that all-important first cup is brewed before you crawl out of bed, control your TV and radio from a distance – even turn on the air conditioner from the office so the house is cool when you get home. If you hear a strange noise in the yard when you're inside the house, you can turn on the outdoor security lights with the touch of a button. And, as you drive up to the house after dark, you'll be able to light the garage from the driveway. Manage your system from a computer interface, a hand-held remote radio control system, a single-location mini or maxi controller, or your telephone.
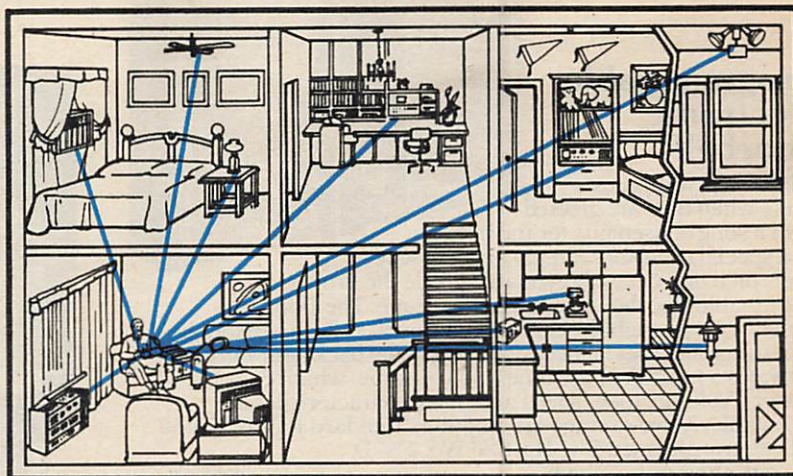
Controllers for the X-10 POWERHOUSE system

[1] The X-10 Computer Interface is an easy-to-use, powerful home control timer that will make your home a safer place to live and save you money on utility bills at the same time. Menu-driven software allows you to program up to 256 lights and appliances on your computer screen. Control on/off functions, brightness level of lights, and days of operation. Once you've programmed the interface from your computer, disconnect it and it will send the signals over your existing house wiring.

Assembled BC-290-A Interface for Apple IIe/IIc.
Ship wt. 3 lbs. **$39.99**
Assembled BC-290-M Interface for MacIntosh (not compatible with Mac II, Mac Plus, Mac GS)
Ship wt. 2 lbs. **$39.99**
Assembled BC-290-P Interface for IBM PC and compatibles.
Ship wt. 2 lbs. **$39.99**

[2] An excellent way to get into the world of X-10, the expandable Radio Control System gives you wireless remote control from inside or outside your house. Plug lights and appliances into the receiver module and control them from your bedside, easy chair or car. The receiver also lets you control up to 8 additional X-10 channels (any number of X-10 modules set to the same house and unit code) over house wiring.

Assembled BC-5000 Transmitter and Receiver.
Ship wt. 1 lb. . . . . *Was* $39.99 *Now* **$29.99**
Assembled BC-504 Extra Transmitter. Ship wt. 1 lb. **$16.99**
Assembled BC-501 Extra Receiver. Ship wt. 1 lb. **$19.99**

[3] The Maxi Controller commands up to 16 channels for blanket control of lamps and appliances. The "all lights on" button doubles as a panic switch in case of emergency.

Assembled BC-503 Maxi Controller. Ship wt. 1 lb. . . **$24.99**

[4] The Mini Controller gives remote control of up to 8 groups of lights and appliances connected to modules of your choice. Includes individual on/off, bright/dim, all units on/off.

Assembled BC-260 Mini Controller. Ship wt. 1 lb. . . . **$12.99**

[5] Control up to 8 groups of lamps and appliances by phone with the X-10 Telephone Responder. Call home to activate indoor and outdoor lighting, heating or air conditioning. Requires 9V battery.

Assembled BC-2700 Telephone Responder.
Ship wt. 2 lbs. **$49.95**

[6] The X-10 Timer Command Console makes your house look and sound lived-in when no one is home. It sends commands at the times you set, turning lights and appliances on and off automatically.

Assembled BC-262 Timer Command Console.
Ship wt. 2 lbs. **$29.99**

[7] The X-10 Burglar Alarm Interface transmits digital signals over your existing house wiring to control lights connected to plug-in modules or wall switch replacements. When the alarm trips, it sends signals to remote lights and alarms. You can even set it to flash all lights. Use the Burglar Alarm Interface in conjunction with an existing alarm system. Combine with Mini, Maxi or Telephone Controller for an expanded system.

Assembled BC-284 Burglar Alarm Interface.
Ship wt. 1 lb. **$39.99**

$AVER! **X-10 Starter Set:** includes BC-260 Mini Controller plus your choice of one of the following modules: BC-465 Lamp Module, BC-466 Appliance Module, or BC-467 Wall Switch Module. **To order:** List both model numbers and prices, then take a $6.00 allowance on your order. Ship wt. 2 lbs.

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NEW Garage door opener

The Stanley garage door opener's safety reverse system automatically opens the door if a bike or other obstruction is in its path. For nighttime convenience, a light/time delay keeps your garage lit so you can go to and from the car in a well lighted garage. A vacation switch turns off opener power for safety in your extended absence. And, a Stanley security feature allows you to shut off the opener from your car so it operates only when you want it to. Connect the opener to your X-10 system for control of indoor and outdoor lighting from the convenience of your car. Powered by a 1/3 H.P. motor, the BC-6000-1 handles all but the heaviest of doors.

Assembled **BC-6000-1** Ship wt. 3 lbs. **$189.95**
Assembled **BC-2481** Extra Transmitter. 1 lb. **$34.99**
Assembled **BC-2458** Garage Door Open Indicator
Ship wt. 1 lb. **$24.99**
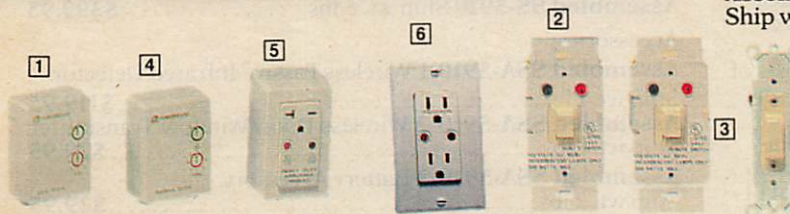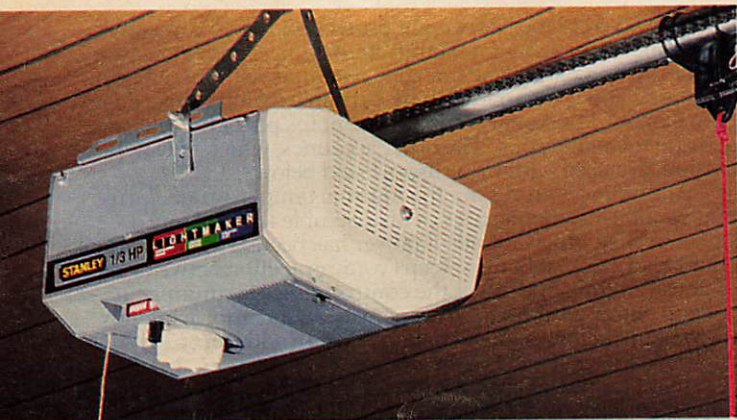
Modules for the X-10 POWERHOUSE System

Lamp modules for the X-10 system give you off/on and full range dimming control of normal incandescent lighting. You'll feel secure knowing that at the touch of a button you can bathe the house and yard in the brightest of lights. But you'll also relish the mood of a special moment as you dim the lights to set that special tone.

Simply plug each lamp into the appropriate module, then plug the module into any ordinary electrical outlet. That's all there is to it. The modules activate the lamps plugged into them. You'll control your home instantly with the push of a button or program everything to operate automatically at the times you want with the controllers on the preceding page. And, you can even set several modules to the same house and unit code for simultaneous operation, giving you practically unlimited options in home security and comfort.

1 Receives signals from your timer or controller to turn lamps on and off anywhere in the house. You'll have full-range dimming of lamps up to 300 watts.
Assembled **BC-465** Lamp Module.
Ship wt. 1 lb. **$12.99**
2 Installs within outlet boxes to replace your existing indoor wall switches. This automated module controls important indoor and outdoor lights such as hallway, porch, flood lights, etc. Up to 500 watts incandescent load. Comes with wire nuts and screws.

Assembled **BC-467** Wall Switch Module. Ship wt. 1 lb. **$12.99**
3 Use to control lights operated by two switches. 500 watt load. Wire nuts and screws are supplied for installation inside existing outlet boxes.

Assembled **BC-4777** 3-Way Wall Switch Set.
Ship wt. 1 lb. . . . *Was* $24.99 *Now* **$19.99**

X-10 appliance modules use relays for switching so they can handle motors, fluorescent lights and other inductive modes. Simply plug any appliance into the desired module for comfort, security and energy savings.
4 Receives signals from your timer or controller to turn on or off TVs, stereos, air conditioners or other appliances anywhere in the house. 15 amp resistive load, 1/3 hp motor, 500 watt lamps, 400 watt TV/stereo.
Assembled **BC-466** Appliance Module.
Ship wt. 1 lb. **$12.99**
5 For heavy-duty air conditioners and water heaters. 240 VAC receptacle for 20 amp load.
Assembled **BC-245** Perpendicular-Pronged. Air Conditioner Module.
Ship wt. 1 lb. **$29.99**
6 Installs within any outlet box to replace a standard duplex outlet. The top receptacle is then X-10 controlled while the bottom is always on. Comes with wire nuts and screws for
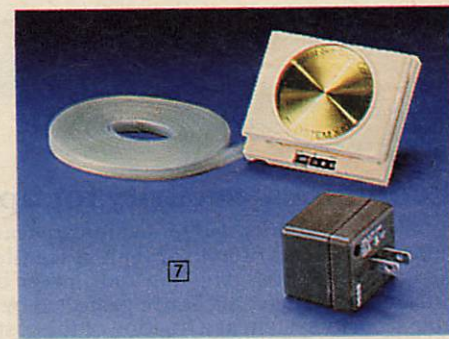
quick and easy connection, and attractive face plate. Rated at 15 amps.
Assembled **BC-227** Wall Receptacle Module. Ship wt. 1 lb. . . . . *Now* **$19.99**
7 Controls existing heating or air conditioning thermostats. Set different day and night temperatures for comfort and efficient use of energy. Requires BC-466 Appliance Module above.
Assembled **BC-2807** Thermostat Set.
Ship wt. 1 lb. **$19.99**
8 Allows computer control of 256 groups of modules with unlimited timing patterns.
Kit **GD-1530** RS-232C Computer Interface.
Ship wt. 3 lbs. *Was* $99.99 *Now* **$49.95**

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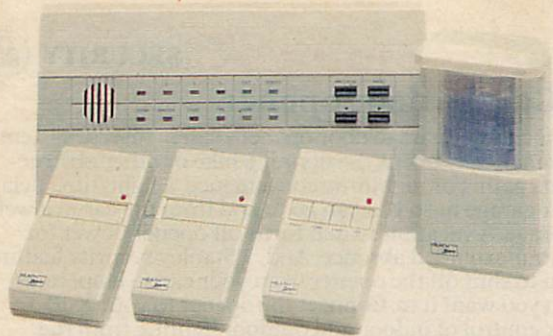
Wireless Security System – complete security plus simple installation

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 need. With the advantage of electronic remote control, it's as easy to use as it is to install.

The microcomputer-controlled SS-5910 system consists of a control console, a passive infrared motion detector, two sets of door/window transmitters and a personal command remote. All units are wireless which means no tedious installation or unsightly wires running through your house. This also makes the system easy to expand with our wide assortment of accessories.

From the control console or the personal control remote you can arm or disarm the system using any of three operating modes: OFF disables all but the emergency alarms; HOME and AWAY protect you and your possessions with different sensor combinations whether you are in or out of the house.

The SS-5910 monitors eight protection zones: two emergency and six general. Constantly active emergency zones are set for fire and panic. The fire zone responds without delay in any mode and is compatible with certain existing smoke detectors, while the personal command remote's panic button can activate the panic zone. The other six zones, which detect intrusion, are used with the sensors listed below.

Additional features are the internal tamper-proof alarm that sounds if someone tries to disassemble the unit and a status beeper which sounds if power has been lost. An optional emergency backup battery keeps your protection active in case of power failure. And when the control center is running on backup batteries, the status beeper will sound approximately three hours before battery backup ends. In addition, a self-test allows you to check the entire system.

Includes power cube for use with 120 VAC. All wireless units include 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**

Economical security for apartments

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 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 magnetic contact sets (listed in the accessories) to the SS-5810.

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 is vertically adjustable for a movable detection pattern.

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 backup battery. Operates on 120 VAC.

Assembled SS-5810 Ship wt. 3 lbs. **$149.95**

Accessories (pictured left to right):

Assembled 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. 1 lb. **$24.95**

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 intruders. 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, a pleasant welcoming chime will greet guests.

The door alarm cannot be deactivated without the proper code which you choose from a selection of 1680 possibilities. Your particular four numbers are entered from the easy-to-use keypad right on the alarm.

The compact alarm/chime is easy to install on doors or windows with included mounting hardware. And the SD-5710 has our assurance of quality with a 1-year limited 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. Powered by a 9 volt battery (not included).

Assembled SD-5710 Ship wt. 1 lb. **$29.95**

Wireless security system kit offers home protection

SKILL LEVEL 2 ① This professional, quality system easily installs to provide 24-hour protection for you and your home. The RF Security Receiver processes signals from detector/transmitters within a range of 150 feet and then provides an alarm for different situations. The Receiver is remotely controlled by either an optional handheld GDA-2800-4 Transmitter or an optional GDA-2800-9 Wall-Mount Transmitter (one required). The Receiver includes an indoor/outdoor alarm horn and an indoor annunciator. Uses 120 VAC, 60 Hz. 3¾″ H x 11½″ W x 8½″ D.

Kit GDA-2800-1
Ship wt. 24 lbs. $249.95

Accessories:

② **Assembled GDA-2800-2** Infrared Motion Detector/Transmitter covers 25′ x 35′ indoor area. Requires 9-volt battery. Ship wt. 1 lb. $149.95

③ **Assembled GDA-2800-3** Wired-Circuit Transmitter protects doors and windows. Also works with GD-1701 Flood Alarm (page 104).
Ship wt. 1 lb. $39.95

④ **Assembled GDA-2800-4** Remote Command Transmitter.
Ship wt. 1 lb. $49.95

⑤ **Assembled GDA-2800-5** Smoke Detector/Transmitter with separate alarm.
Ship wt. 2 lbs. $79.95

⑥ **Assembled GDA-2800-6** Four WINDOW BUG sensors and take-off contacts. Each protects up to 32 sq. ft. of glass. Ship wt. 1 lb. $49.95

Assembled GDA-2800-7 Four Magnetic/Reed Switches (not pictured) for single or parallel connection. 1 lb. **$24.95**

⑦ **Assembled GDA-2800-9** Keypad Controller operates like the GDA-2800-4 after entry of user secret code.
Ship wt. 2 lbs. $119.95

⑧ **Assembled GDA-1800-3** Extra Outdoor Alarm Horn (like shown).
Ship wt. 3 lbs. $24.95

$AVER! **GDS-2800-1** Starter System includes a Receiver kit, one Infrared Motion Detector, one Wired-Circuit Transmitter and one Command Transmitter. Ship wt. 43 lbs. *Separately* $489.80
System Price $399.95

Outdoor/indoor security lighting

The Heath/Zenith SL-5320 Advanced Light Control offers a new dimension in security lighting – outside *and* inside lighting control. Besides turning on outside lights when motion is detected, the SL-5320 sends a unique signal over the electrical wiring in your home. This signal communicates with modules like those on page 23. The Light Control signal activates any device connected to the compatible receiver module. When the SL-5320 turns on an outside light, an inside light, radio, TV or other selected device also turns on. The additional devices will also turn off when motion is no longer detected. A 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 – from 1 to 20 minutes – before lights are automatically shut off after the monitored area returns to normal. Comes with a 1-year limited warranty. Uses 120 VAC, 60 Hz. 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 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 up to 500 watts of 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 and motion from up to 60 feet away in a 110° arc providing over 2000 square feet of coverage. Sensitivity is conveniently adjustable while a swivel mount allows you to aim the light control over a 180° range.

The SL-5310 features a five-minute light shut-off delay, built-in photocell to deactivate the control during daylight hours, and a raintight housing for safe use in all weather conditions. Easily installed and comes with a 1-year limited warranty. Uses household 120 VAC, 60 Hz power. Overall dimensions are 2¼″ H x 4″ W x 8¾″ L.

Assembled SL-5310-A Light Control with mounting plate and light fixture (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

Save $20

GD-3610 shown
with optional
Floodlight Assembly

$20 off kit lighting control

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 trigger from the heat of your car as you enter your drive.

Security is a bonus as the light controller 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 a window is broken or other damage is done.

The sensor array, a new 8-beam type, offers a dramatic performance improvement 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 from less than a minute to more than 15 minutes turns the controlled lights off automatically after the detection area returns to normal.

Wire the GD-3610 to an existing wall switch to manually control the lights. A photo-transistor deactivates the Controller during daylight hours. Operates on 120 VAC, 50 or 60 Hz. Has dimensions of 14½" H x 5½" W x 4⅝" D.

Kit GD-3610 Ship wt. 4 lbs. .... *Was* $89.95 *Now* **$69.95**

Accessory:
Assembled GDA-3511-1 Dual Floodlight Assembly as pictured (bulbs not included). Ship wt. 5 lbs. **$29.95**
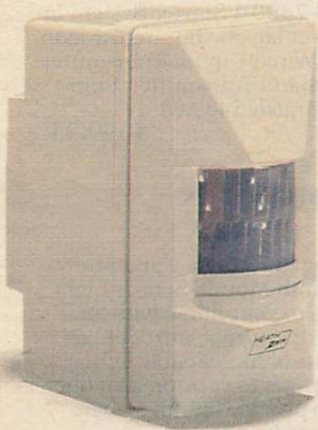
Convenient Entryway Motion Sensor Light Control

Mount this Heath/Zenith SL-5410 Light Control next to your decorative front or back porch light. You'll get all 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 raintight for safe 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 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 when needed.

The SL-5410 Control handles up to 500 watts of either incandescent or halogen lighting. It uses normal household 120 VAC and has dimensions of 4⅜" H x 2⅝" W x 6¼" D (includes mounting shaft). Full 1-year warranty.

Assembled SL-5410 Ship wt. 2 lbs. **$44.95**

Keyless Doorlock

Leave your keys behind when out jogging or working in the yard. The Keyless Doorlock lets you back in the house just by entering a four digit number of your choice. Change the code anytime. The door always locks behind you for added safety. 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. Includes a 120 VAC power cube. Keypad 4½" H x 2¾" W x 1½" D. Controller is 4⅜" H x 3" W x 1¼" D.

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

Keyless garage lock

Open your garage door without a key or transmitter. Stop worrying about stolen property from an open garage. The Digital Garage Door Lock works like the keyless lock above to activate your electric garage door opener. Easy to install.

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

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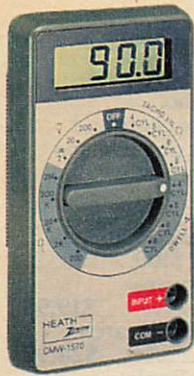
Engine Analyzer

Handheld meter for 4, 5, 6, and 8 cylinder engines. Test leads, battery and case included.

Measures **Dwell:** 0-90, 0.1% resolution, 1.5% accuracy 0.2. **Tach:** 0-10,000 RPM, 10 RPM resolution, 1.5% accuracy 50 RPM. **DC Volts:** 2, 20, 200 V ranges 0.7% accuracy 1 digit. **Ohms:** 200, 2K, 20K, 200K, 2M ranges 1% accuracy 1 digit.

Assembled CMW-1570 1 lb.　**$49.95**

Auto G-Meter

Indicates forces from 0.1-0.8G as you corner, accelerate, or break. Voltmeter checks battery in 10-15 volt range. +12 volt systems only. Dimensions are 1⅝" H x 6¾" W x 1" D.

Assembled CGW-1562 Ship wt. 1 lb. **$39.95**

LED Tachometer

Shows engine RPM from 0-6000 in 500 RPM steps, checks battery from 11.5-17 VDC. Use with 12 volt systems. Not for diesel engines.

Assembled CTW-1572 Ship wt. 1 lb. **$14.95**

Exhaust Gas Analyzer

SKILL LEVEL 1 Keep your engine running at maximum efficiency. Use the Heathkit Exhaust Gas Analyzer to evaluate and adjust your car's emission control system. You'll get better gas mileage, and your car will meet its clean air standard, mandatory in some states.

The Analyzer can hang on a partially open window or sit on a level surface. The sensor that's used to detect gases at the exhaust pipe ahead of the catalytic converter is made of rugged stainless steel with a flexible probe tip for easier tail pipe insertion. 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**

Windshield Wiper Delay

SKILL LEVEL 1 This handy device adds an adjustable delay to most single and 2-speed windshield wipers. Now at an affordable price you can add to your car an expensive feature found in luxury cars. And, the CH-1068 is easy to build and easy to install.

The kit includes a test lamp with instructions for locating and identifying wiper wiring in your car's electrical system. Incompatible with motor-reversing hidden wipers. Contact your car dealer for your automobile's wiring specifics.

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

Charging system tester

SKILL LEVEL 1 Diagnose faulty components in your car's charging system with accuracy and ease. A two-wire setup and three quick tests show 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 faulty (causing the battery to become overcharged), or if the alternator stator windings and rectifier diodes are functioning properly. No external power or battery required. Has dimensions of 5½" H x 2¾" W x ¾" D.

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

Emergency siren/PA

SKILL LEVEL 1 This compact and mobile siren/PA is designed for the public service volunteer or professional. Open up traffic with 55 watts of attention-getting automatic or manual wail, hi-lo emergency tone or yelp. Use the 20-watt public address position or switch to the radio position for monitoring incoming calls while you're 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 only. Consult authorities before installing or operating. The emergency siren/PA has dimensions of 2⅞" H x 8⅜" W x 7⅝" D.

Kit GD-1810 Ship wt. 6 lbs. **$109.95**

Accessory:
Kit GDA-18-2 Concealed grill speaker. Ship wt. 10 lbs. **$109.95**

New Novice Enhancement privileges for entry level hams

Now is the time to join the ranks of Amateur Radio operators. Along with traditional Morse Code operation, the Novice license now includes voice communication privileges and communication between home computers linked by radio.

Heath offers you all the support you need to get started. The courses described below provide the theory and background necessary to master the Novice, Technician General, Advanced or Extra class exams, along with FCC approved test questions as study aids. And, if you fail to pass the exams, we guarantee a full refund on presentation of your rejection notice and return of course materials. Try a new hobby that will bring you friends from around the world.

New Amateur Radio license is easier to get than ever

Study for your Amateur Radio license in one of two ways: Use the computer-aided instructional material with your personal computer or study from the instructional booklet. Material includes actual questions from the FCC pool and their correct answers. Heath and other manufacturer coupons included. Total value over $100.

HDP 1611 Novice Bookware.
Ship wt. 1 lb. **$19.95**
HDP 1612-G General Bookware.
Ship wt. 1 lb. **$24.95**
HDP 1612-T Technical Bookware.
Ship wt. 1 lb. **$19.95**
HDP 1613 Advanced Bookware.
Ship wt. 1 lb. **$19.95**
HDP 1614 Extra Bookware.
Ship wt. 1 lb. **$24.95**

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

Join the world of Amateur Radio and communicate one-on-one with interesting people from a variety of professions all over the world. This course is guaranteed to help you earn a Novice ticket or we'll refund the full purchase price. 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**

$AVER! **ERS-3701** Save on the Novice Course and CW Oscillator below. 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

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, your unit 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). 2⅝" H x 4⅛" W x 4⅜" D.

Kit HD-1416-A Ship wt. 1 lb. **$19.95**

Use your computer to study for amateur radio license exams

This computer software offers up-to-date FCC approved 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 software can be updated much more quickly than printed material. Our Novice ER-3701-A (at left) or General Class ER-3702-A 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 PCs.

HDP-1601 Novice program. Ship wt. 1 lb. **$39.95**
HDP-1602-T Technician program. Ship wt. 1 lb. **$34.95**
HDP-1602-G General program. Ship wt. 1 lb. **$34.95**
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 added General Class privileges – more frequencies to operate on, plus radio teletype, slow-scan TV, facsimile, and satellite activity. An impressive list of incentives adds up to more QSOs, QSLs, 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 exam. Extra code practice teaches from zero 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 CEUs. We guarantee you'll pass 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**

Credit card orders call TOLL-FREE
24 hours a day:
1-800-253-0570
Michigan residents call:
1-800-782-2702

Pocket Packet Radio

Packet radio is the fastest-growing segment of Amateur Radio today. With Heath's Pocket Packet TNC, both newcomers to Packet Radio and enthusiasts who want portability and small size will have the perfect TNC. The HK-21 is the latest and smallest TNC available. And, it's TNC-2 compatible, for both versions one and two of AX.25 protocol.

If your hand held transceiver, like most, uses a mini phone jack for speaker output and a sub-mini for microphone, in about 20 seconds you can connect your transceiver to the Pocket Packet unit at any time with the two shielded cables

supplied. To connect the unit to your base or mobile (VHF or UHF) transceiver, another cable is also supplied. Once you've wired it into the microphone input, speaker output and transceiver keying line, hookup takes only seconds.

The HK-21 even includes a built-in mini bulletin board so you and your friends can leave messages for each other right on the system. They access your station with a "Connect" request and automatically get a sign-on message welcoming them to your Bulletin Board (it uses your call!). Bulletin Board commands include the following: W(rite) writes a message to a specific call; R(ead) reads a message sent to your call; F(iles) lists the last 10 – or all – messages in the system, plus the time and date each message was left; M(ine) lists only messages left for you. Additional commands are H(elp) or ?, which lists all commands and their functions, plus instructions on how to write a message, K(ill) which kills a message addressed to you, and B(ye) which disconnects you from the bulletin board and also automatically disconnects your packet station from the user. The same commands work for you so you can leave messages for other stations.

The HK-21 requires a 9 to 13.8V supply @ 40 mA nominal current. You can connect it to your station 12 volt supply or order PS-2350 120 VAC Battery Eliminator on page 43.

The Optional HKA-21-1 battery pack fits inside the unit, powering it for hours. And it recharges from the 12 volt DC jack on the Pocket Packet unit. The Pocket Packet Radio comes with an industry-recognized Heathkit manual.

Assembled HK-21 Ship wt. 1 lb. **$219.95**
Accessory:
Assembled HKA-21-1 Optional battery pack. 1 lb. **$17.95**

Multi-mode operation with single unit TNC

The Pack-Kit Multi-Mode TNC gives you the latest in Packet Radio and takes the trouble out of getting on RTTY. It lets you work CW at speeds you never dreamed of, gets you on AMTOR and ASCII. And with the addition of an Epson or compatible graphics printer, you can even print weather facsimile pictures.

Computer technology combines with amateur radio so you can explore packet radio and all its applications, plus additional modes. Connect both your HF and VHF rigs at the same time and with the push of a button, switch between VHF Packet and copying a W1AW RTTY bulletin on 40 meters. Work Packet in both HF (300 baud) and VHF (up to 9600 baud). Above 1200 baud requires an external modem.

A unique "SIGNAL" command causes the Pack-Kit to determine correct RTTY, ASCII or AMTOR mode for the signal you're 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 mode. And front panel LEDs clearly indicate your present mode and system status for more efficient and simple operation.

The unit 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 to 9600 baud. What's more, no special soft-

ware is needed to operate the Pack-Kit TNC. Use with any modem communication package made to run on your computer or order "Ham-Pak" software (below) especially for Heath/Zenith or IBM PCs and compatibles. The HK-232 can also be used with computers or terminals using an RS-232 industry standard serial port.

The Pack-Kit has all the features demanded by active amateur radio operators. For 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 unit uses an eight-pole bandpass filter followed by a limiter discriminator with automatic threshold correction to copy signals that could baffle other units. Another high-performance feature, answer-back memory permits auto-answer 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 indicator.

The Heathkit Pack-Kit Multi-Mode TNC is an outstanding value in performance, quality and unique new features. Included is an easy-to-understand operational manual with hook-up connections for most popular HF and VHF radios.

Operates on 12 VDC at 750 mA with 10% ripple or less. 2½" H x 8¼" 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, IBM PCs and compatibles. Ship wt. 1 lb. **$19.95**

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

.3. 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 ¾ amp. Only a VTVM is required for receiver alignment. Has dimensions of 4⅝" H x 11½" W x 10½" D.

Kit SW-7800
Ship wt. 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 µV for 10 dB (S + N)/N; AM, less than 2.5 µV 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 ¾-ampere, externally.

Antenna Noise Bridge

.3. Reveal the cause of any mismatch between station transmitter and antenna. 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. Can also preset an antenna tuner for faster tune-ups, tune a quarter-wave transmission line and measure the value of unknown capacitors and inductors. Front panel LED indicates power on, front panel controls give direct readout of resistive and reactive characteristics of the antenna being tested. Rear panel external power jack and coaxial connectors for receiver and unknown antenna connections. Requires 9V battery or PS-2350 Power Supply (page 43). 2¼" H x 5⅛" W x 5" D.

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

Specifications: **Resistance:** approx. 0-200 Ω. **Capacitance:** ±60 pF. **Operating Range:** 1-30 MHz.

Active SWL Antenna

.3. 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. You can also 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. 43). 2¼" H x 5⅛" W x 5" D.

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

VLF Converter

.3. 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 (page 43) or any source of DC power, 8.5 to 14 volts. The VLF Converter measures only 5⅛" H x 5⅛" W x 2¼" D.

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

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Revolutionize your CW with the μMatic Memory Keyer

SKILL LEVEL 2 Add programmable excellence to all your CW. Patented "command strings" let you store text in buffers, select speed, weight, spacing or message repeat count for each, and link together in any sequence. 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 4⅛" 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**

Specifications: **Speed Range:** 1 to 99 wpm. **Character/Word Spacing:** Less than or equal to speed setting. **Number of Buffers:** 1 to 10. **Buffer Size:** 240 characters plus commands. **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. **Sidetone:** Approximately 300 to 1500 Hz, adjustable. **Power:** External transformer (optional) or 11 to 16 VDC @ 200 mA.
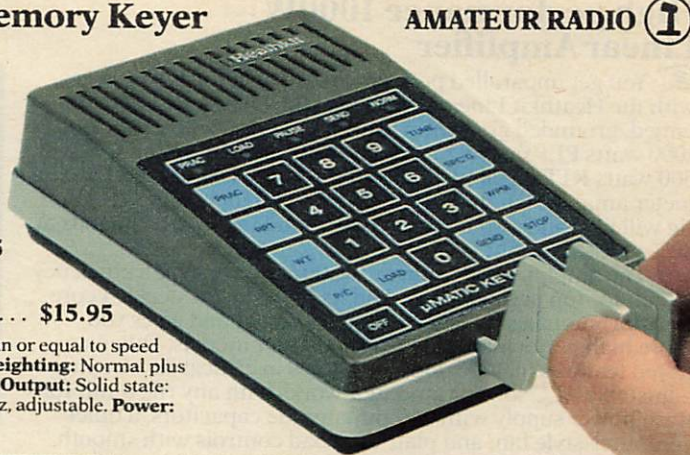
Deluxe Antenna Tuner

SKILL LEVEL 2 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 ensures 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 indispensible addition to your system. Measures 5¾" H x 14½" W x 13⅞" 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):** ±5% (AVG). **50 W (REF):** ±7.5% (AVG). **Insertion SWR:** Less than 1.1:1.

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 include 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 maximum, at rated output. **T/R Operation:** CW, full break-in. **RECEIVER: Sensitivity:** 0.2 μV for readable signal; 0.5 μV 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 8Ω.

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 2⅝" H x 5⅜" 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 2⅝" H x 5⅜" W x 7" D.

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

$AVER! **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.**

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

SKILL LEVEL 2 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**
Accessory: **Assembled PS-5012** 120 VAC Power Adapter Cube. Ship wt. 1 lb. **$15.95**

Close-up of HWS-4-XL display and keypad

HWS-2 with headphone accessory

HWS-2-XL

HWS-4

HWS-4-XL with microphone accessory

2 Meter and 70 CM Handheld Transceivers – in standard and deluxe models

Put more fun and enjoyment into mobile communications with these compact 2 Meter and 70CM transceivers. Besides power and easy one-handed operation, both standard and deluxe models offer many impressive features with options.

The HWS-2 2M and HWS-4 70CM standard transceivers have thumbwheel tuning, hi/low power operation, squelch, repeater ± offsets, and optional CTCSS and DTMF capabilities. The deluxe HWS-2-XL 2M and HWS-4-XL 70CM transceivers include 20 channel scanning, DTMF, CTCSS encode and decode, auto power off, an easy-to-read LCD display, 100 kHz channel stepping, signal meter, RF attenuator, programmable offsets, keypad operation, and battery saver. All models now include one HWA-110 rechargeable battery pack and one HWA-130 wall charger. Save $23.90 over separately priced models.

Assembled HWS-2 2 Meter Handheld Transceiver.
Ship wt. 2 lbs. **$209.95**
Assembled HWS-2-XL Deluxe 2 Meter Handheld Transceiver.
Ship wt. 2 lbs. **$329.95**
Assembled HWS-4 70 CM Handheld Transceiver.
Ship wt. 2 lbs. **$249.95**
Assembled HWS-4-XL Deluxe 70 CM Handheld Transceiver.
Ship wt. 2 lbs. **$349.95**

Accessories:

Assembled HWA-110 Small rechargeable NiCad battery pack for normal wattage output operation. Ship wt. 1 lb. . . **$39.95**
Assembled HWA-120 Large rechargeable NiCad battery pack for higher wattage HWS-2/4-XL output operation.
Ship wt. 1 lb. **$59.95**
Assembled HWA-125 Extended life rechargeable NiCad battery pack. Ship wt. 1 lb. **$65.95**
Assembled HWA-130 120 VAC wall charger. 1 lb. **$13.95**
Assembled HWA-140 120 VAC desktop quick-charge charger.
Ship wt. 2 lbs. **$39.95**

Assembled HWA-150 Mobile battery charger for non-operation battery recharging. Ship wt. 1 lb. **$13.95**
Assembled HWA-160 Mobile car battery adapter allows battery charging during operation. Ship wt. 1 lb. **$39.95**
Assembled HWA-170 Mobile bracket allows transceiver to be hung on car door. Ship wt. 1 lb. **$7.95**
Assembled HWA-180 Microphone speaker (pictured).
Ship wt. 1 lb. **$29.95**
Assembled HWA-190 Headphone (pictured) with push-to-talk switch. Ship wt. 1 lb. **$24.95**
Assembled HWA-200 Soft carrying case for easy handling of the HWS-2-XL and HWS-4-XL Transceivers in the field.
Ship wt. 1 lb. **$9.95**
Assembled HWA-210 Long size soft carrying case for use with HWS-2-XL and HWS-4-XL Transceivers using larger HWA-120/125 battery. Ship wt. 1 lb. **$11.95**
Assembled HWA-220 Continuous Tone Coded Squelch Signal (CTCSS) unit with programmable dip switches for any tone frequency. For use with HWS-2/4. Ship wt. 1 lb. . **$39.95**
Assembled HWA-230 Touch tone encoder for use with remote control function. For use with HWS-2/4.
Ship wt. 1 lb. **$24.95**
Assembled HWA-240 Carrying case for HWS-2 and HWS-4.
Ship wt. 1 lb. **$7.95**

Specifications: **GENERAL: Frequency:** 2/2XL: 144 – 147.995 MHz. 4: 440 – 449.995 MHz. 4XL: 438 – 449.995 MHz. **Emission Type:** FM. **Microphone Input Impedance:** 600 ohm. **Speaker Impedance:** 8 ohm. **Operating Voltage:** 2/4: 5.5 – 11 VDC. XLs: 5.5 – 16 VDC. **Antenna Impedance:** 50 ohm. **Power Supply:** 9 VDC (nom.) **Dimensions:** 2/4: 5.2" H x 2.4" W x 1.3" D. XLs: 6.3" H. **Weight:** 2/4: 14.3 ozs. XLs: 16.3 ozs. **TRANSMITTER: Output Power:** 2/4: 3 W (hi), 400 mW (lo). XLs: 5 W (hi), 400 mW (lo). **Spurious Signal:** −60 dB. **Max. Deviation:** ± 5 kHz. **Modulation:** Reactance. **Built-in Microphone:** Electret condenser type. **RECEIVER: Sensitivity:** 0.158 μV. **Squelch Sensitivity:** 0.1 μV. **Circuitry:** Double conversion superheterodyne. **Selectivity:** − 60 dB. **Audio Output:** 400 mW at 8 ohms.
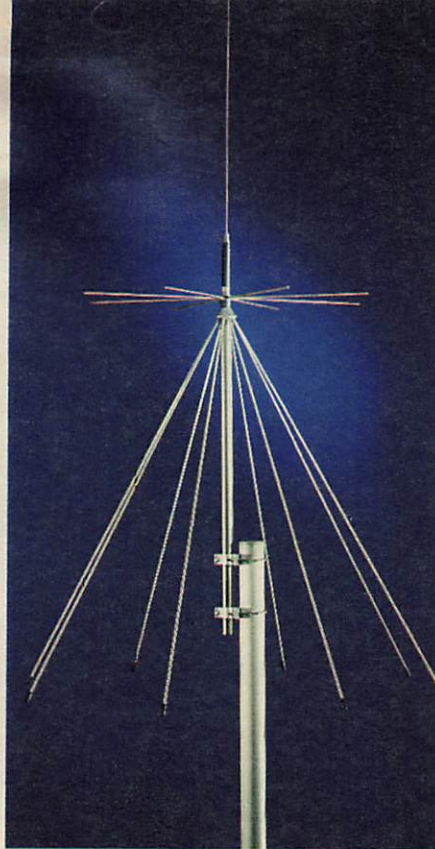
Cover more with this high performance broadband antenna

Skill Level 1 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. Antenna stands 5½' high.

Kit HA-2513
Ship wt. 6 lbs. **$69.95**

1.6-250 MHz Dip Meter

Skill Level 1 Use this multi-purpose Dip Meter to find approximate resonant and operating frequencies of either energized or de-energized circuits. It also 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.

Coaxial Switch

Skill Level 1 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**

Dual HF Wattmeter

Skill Level 1 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. 4⅛" H x 7½" W x 6⅜" D.

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

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

This outlet box is smart

Skill Level 1 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. 10 A capacity.

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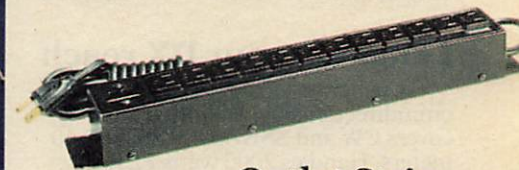
Outlet Strip

Skill Level 1 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. Has dimensions of 2¼" H x 15⅞" W x 2¼" D.

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

Station Speaker

Skill Level 1 The Heathkit SP-99 Station Speaker is a 3" communications receiver speaker housed in an attractive cabinet that's designed to match the latest Heathkit transceivers and receivers. This 8 ohm speaker has a frequency response of 200 to 5000 Hz and can handle 1.5 watts RMS. The Heathkit Station Speaker has dimensions of 8" H x 4½" W x 6¾" D.

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

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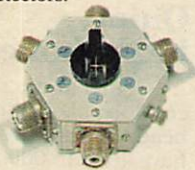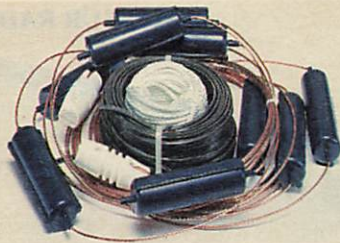
SWL Antenna

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**
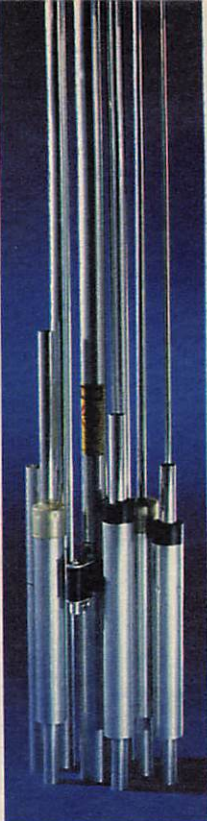
Fixed station mic

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 ⅝-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**
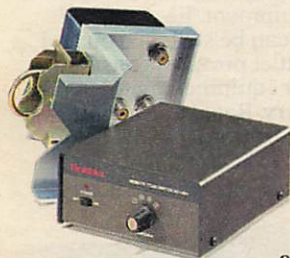
Remote Coax Switch

SKILL LEVEL 1 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: 2⅝″ H x 5½″ W x 7½″ D. Remote: 7⅜″ H x 8⅜″ W x 4½″ D.

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

Get remote control with decoder

SKILL LEVEL 1 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 you 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 33. 2⅛″ H x 7″ W x 5″ D.

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

Heath Cantenna Dummy Load

SKILL LEVEL 1 Eliminate unnecessary QRM during tune-up and minimize mistakes while performing 'hot' gear maintenance or alignment. Handles 1 kW of RF with VSWRs less than 1.5:1 up to 450 MHz. Requires 1 gallon mineral or transformer oil.

Kit HN-31-A Ship wt. 3 lbs. . . **$24.95**

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, 2¼″ speakers, individual volume controls, 10′ cord.

Assembled HDP-1396
2 lbs. **$14.95**

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# Heath test instruments – fully assembled or easy-to-build kits

Heath Company is known worldwide for its broad range of reliable and high performance test instruments. From computer-based instruments to simple meters, Heath has the test or measurement tool you need for professional applications such as research and development, production line testing, school electronics labs, industrial maintenance and field service.

Heath supports each instrument with an information-packed manual that comes with each instrument. Plus technical help is only a phone call away. Direct line phone numbers are listed in each manual and on page 55 of this catalog.

Heath instrument kits are designed so that they can be built by hobbyists with little or no experience. And they carry a 1-year limited warranty. Preview a manual and see for yourself. Ordering instructions are found on page 55.

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

SKILL 3. Dual trace capability, wide 25 MHz bandwidth with ± 3% accuracy, 16 ns or less rise time, and low 5mV/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 it's 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%. **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 µs/cm. Positions: 19 steps in a 1-2-5 sequence. Variable: Continuous between ranges to approximately 300 ms/cm. Accuracy: Within 3%. Magnifier: X5. **B Times Base:** Ranges: 0.5 ms/cm to 0.1 µs/cm. Positions: 12 steps in a 1-2-5 sequence. Accuracy: Within 3%. **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: ± 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.
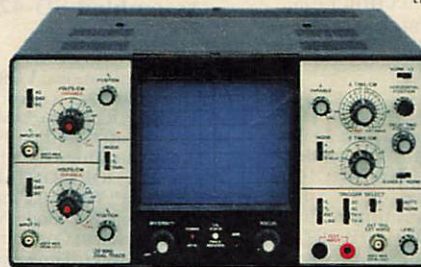
## A hobbyist's dual trace 10 MHz oscilloscope with lab-grade accuracy

SKILL 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. . . . . . *Was* $379.00 *Now* **$329.95**

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 12⅞" W x 19¼" D. **Weight:** 22 lbs.
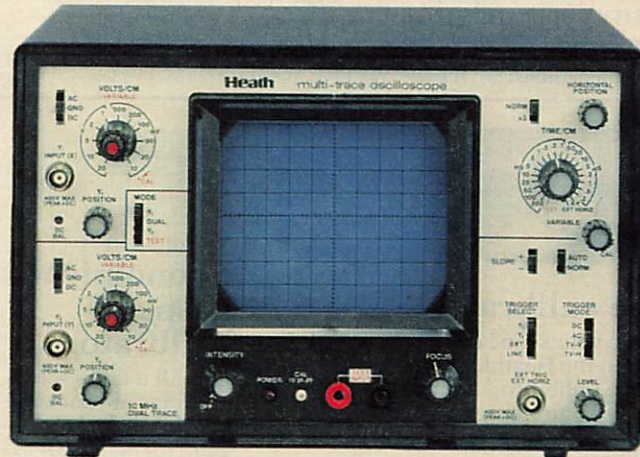
Heathkit Component Tracer simplifies troubleshooting

SKILL 2. 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 track down faulty components in problem equipment.

This dual trace 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. **Dimensions:** 4" H x 10" W x 12½" D. **Weight:** 8½ lbs.

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. This is a professional quality scope designed for use by technicians, hobbyists, engineers and anyone else requiring stable and reliable information that only a scope can supply.

Assembled SO-4226
Ship wt. 22 lbs. . . . . *Was* $549.95 *Now* **$479.95**

Specifications: **VERTICAL DEFLECTION: Deflection Factor:** 5 mV to 5 V/div ± 3%; 10 steps in 1-2-5 sequence with variable control. **Bandwidth (at −3 dB):** DC: DC to 25 MHz. AC: 10 Hz to 25 MHz. **Rise Time:** Approx. 14 ns. **Overshoot:** Less than 3%. **Input Impedance:** 1 MΩ shunted by 25 ± 3 pF. **Maximum Input:** 400 V P-P, or 200 V (DC + AC peak). **Operating Modes:** CH1, CH2, DUAL and ADD. **Chop Frequency:** Approx. 250 kHz. **HORIZONTAL DEFLECTION: Sweep Mode:** AUTO, NORMAL and SINGLE. **Sweep Time:** 0.2 μs to 0.5 s/div; 20 steps in 1-2-5 sequence with variable control and X-Y mode. **Magnification:** 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. **INTENSITY MODULATION (Z-axis): Input Voltage:** 3 V P-P or higher (bright at negative-going input). **GENERAL: Calibration Voltage:** 2 V P-P ± 2%, 1 kHz square wave (positive-going). **Power:** 100/117/220/240 VAC; 50/60 Hz. **Dimensions:** 6½" H x 12½" W x 17" D. **Weight:** Approx. 15½ lbs.

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. . . . . *Was* $799.95 *Now* **$749.95**

Specifications: **VERTICAL DEFLECTION: Factor:** 5 mV to 5 V/div ± 3%; 10 steps in 1-2-5 sequence with variable control. **Magnify:** X5. **Bandwidth (at −3 dB):** DC: DC to 50 MHz. AC: 10 Hz to 50 MHz. **Rise Time:** Approx. 7.0 ns. **Overshoot:** Less than 3%. **Max. Input:** 400 V P-P, or 200 V (DC + AC peak). **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 μs 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 μs to 9.5 ms/div. **Sweep Time Accuracy:** 3%. **Delay Time Accuracy:** 4%. **Delay Jitter:** 0.0001 or less. **X-Y Sensitivity:** Same as CH1 vertical-axis. **Frequency Response:** DC to 2MHz (−3 dB). **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. **INTENSITY MODULATION (Z-axis): Input Voltage:** 3 V P-P or higher (bright at negative-going input). **GENERAL: Calibration Voltage:** 2 V P-P + 2%, 1 kHz square wave (positive-going). **Power:** 100/117/220/240 VAC. **Dimensions:** 6½" H x 12½" W x 17" D.

Scope calibrator

SKILL LEVEL 2 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.

Kit IG-4244 Ship wt. 6 lbs. . . . **$179.95**

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 1 V peak. 10 ns – 100 mV to 0.5 V peak. **Rise Time:** <1 ns. **VOLTAGE OUTPUT SIGNAL: Ranges:** 1 mV to 100 V peak square wave in a 1-2-5 sequence. **Accuracy:** Within 1% into a ≥1 MΩ load when calibrated with an external voltmeter. **Rise Time:** <5 μs. **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.

Economical scope calibrator

SKILL LEVEL 2 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 μs square wave in a 1-2-5 sequence. **Accuracy:** 0.01%. **Amplitude:** Approx. 200 mV peak. **Rise Time:** ≤4 ns. **Overshoot:** ≤3%. **Output:** 50Ω terminated cable. **VOLTAGE SIGNAL: Ranges:** 1 mV to 100 V peak square wave. **Accuracy:** Within 2%. **Rise Time:** ≤2 μs. **Frequency:** DC, 2 Hz to 10 kHz in a 1-2-5 sequence. **GENERAL: Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 2¾" H x 9⅛" W x 4¼" D.
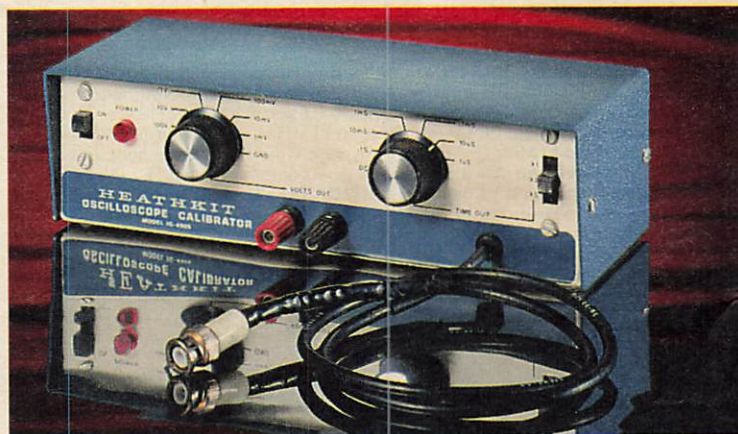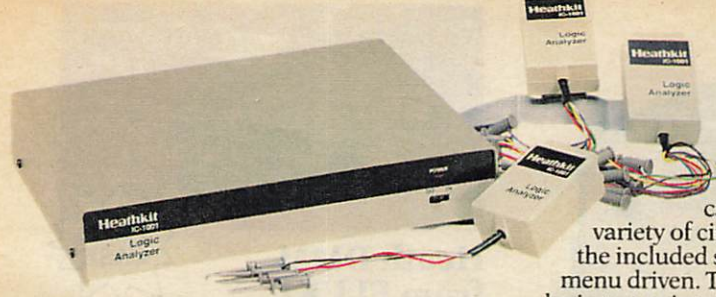
A versatile logic analyzer for PCs

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. 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. Software is included for use with PC compatible computers equipped with an RS 232 card, color graphics card, single 5¼" disk drive and 128K RAM (min.), an HCA-85 cable (page 98) and MS-DOS (Ver. 2.0 or later). The IC-1001 is also usable with terminals or computers running terminal emulation software. Powered by an included 120 VAC wall cube. 1¾" H x 9¼" W x 8½" D.

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

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 a 3½-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**

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 ± DC voltages from 1.5 volts to 1500 volts within ± 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 Ω to 1000 MΩ in seven ranges. A zero center and dB scale add versatility.

In less than three evenings you can put this 11 MΩ 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. **$129.95**

Specifications: **DC VOLTMETER: Ranges:** 0-1.5, 5, 15, 50, 150, 500, 1500 volts full scale. **Input Resistance:** 11 megohms on all ranges. **Accuracy:** ± 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):** ± 1 dB 25 Hz to 1 MHz (600Ω source, referred to 60 cps). **Accuracy:** ± 5% of full scale. **Input Impedance:** 1 megohm shunted by 40 μμF measured at input terminals (200 μμF at probe tip). **OHMMETER: Ranges:** Scale with 10Ω center X1, X10, X100, X1000, X10K, X100K, X1 Meg. Measures 0.1Ω to 1000 megohms with internal battery. **POWER:** 120/240 VAC, 50/60 Hz. **DIMENSIONS:** 5" H x 12¾" W x 4¾" D. **WEIGHT:** 5 lbs.

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 3½ 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.   *Was* $69.95 *Now* **$49.95**

Specifications: **AC VOLTAGE: Ranges:** 750 V, 200 V. **Accuracy:** ±(1.0% of reading + 3 digits) from 45 Hz to 400 Hz. **AC CURRENT: Ranges:** 200 A, 300 A. **Accuracy (50/60 Hz):** ±(2.0% of reading + 1 digit). **RESISTANCE: Range:** 2000 ohms. **Accuracy:** ±(1.0% of reading + 1 digit). **Other Features:** Automatic polarity, over range indication, automatic zero, low battery indication. **Dimensions:** 1" H x 2½" W x 7⅜" L.

A rugged voltmeter

It's compact, lightweight, battery-powered, easy to operate and can be put quickly together in one evening.

The IM-5217 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 range and beyond. And the ohmmeter ranges provide a 1½ volt test voltage that's useful in checking semiconductors.

Kit IM-5217 Ship wt. 4 lbs. **$49.95**
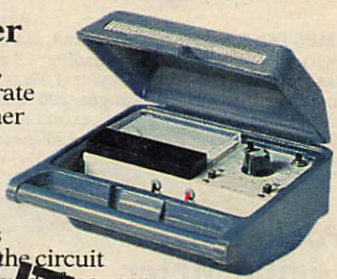
Specifications: **DC VOLTS: Ranges:** 0-1.5, 0-15, 0-500 volts full scale. **Input Resistance:** 10 megohms on all ranges. **Accuracy:** ± 3% of full scale. **AC VOLTS: Ranges:** 0-1.7, 0-15, 0-150, 0-500 volts full scale. **Input Resistance:** 1 megohm on all ranges. **Accuracy:** ± 5% of full scale. **OHMS: Ranges:** X1, X100, X10K, X1M; 10Ω center scale. **Power:** One 1.5 volt "C" battery and two 9 volt transistor batteries (not included). **Dimensions:** 5⅜" H x 9⅜" W x 9" D.

SOLD OUT

39

Economical and portable 3½-digit LED full-function digital multimeter

This push-button ranging meter features diode and internal battery test, blanking, polarity and overrange indicators, built-in battery charger, and auto decimal point location. Input protected and comes with test leads.

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

Specifications: **VOLTAGE RANGES: DC:** 2V, 20V, 200V, 1000V. **Basic Accuracy:** ±(0.5% of reading +1 count). **AC:** 2V, 20V, 200V, 750V. **Basic Accuracy:** ±(1.0% of reading +3 counts). **Frequency Response:** 40 Hz to 1 kHz, ±0.5%. **Input Impedance:** 10 megohms. **CURRENT RANGES:** 2 mA, 20 mA, 200 mA, 2000 mA, 10 A. **Basic Accuracy DC:** ±(1.5% of reading +1 count). **AC:** ±(2.0% of reading +1 count). **OHMS RANGES:** 2 kΩ, 20 kΩ, 200 kΩ, 2000 kΩ, 20 MΩ. **BASIC ACCURACY:** ±(0.25% of reading +1 count). **Power:** Heath PS-2404 120 VAC Adaptor (p. 43) or six 1.5 volt batteries. **Dimensions:** 3″ H x 8½″ W x 11″ D. **Weight:** 2¾ lbs.

3½-digit DMM with capacitance

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, 2V, 20V, 200V, 1000V. **Resolution:** 100 μV. **Accuracy:** ±(0.5% of reading +1 digit). **VOLTS AC: Ranges:** 200 mV, 2V, 20V, 200V, 750V. **Resolution:** 100 μV. **Accuracy:** ±(1.25% of reading +4 digits). **AMPS DC: Ranges:** 200 μA, 20 mA, 200 mA, 10 A. **Resolution:** 0.1 μA. **Accuracy:** ±(1.0% of reading +1 digit), except for ±(2.0% of reading +3 digits) on 10 A range. **AMPS AC: Ranges:** 20 mA, 200 mA, 10 A. **Resolution:** 10 μA. **Accuracy:** ±(1.5% of reading +3 digits), except for ±(2.5% of reading +4 digits) on 10 A ranges. **OHMS: Ranges:** 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ, 20 MΩ. **Resolution:** 0.1Ω. **Accuracy:** ±(0.75% of reading +1 digit), except for 200Ω and 20 MΩ ranges. **CAPACITANCE: Ranges:** 2 nF, 20 nF, 200 nF, 2 μF, 20 μF. **Resolution:** 1 pF. **Accuracy:** ±(2.0% of reading +4 digits). **Power:** One 9 V battery (not included). **Dimensions:** 7″ H x 3⅝″ W x 1¾″ D. **Weight:** 11.9 ozs.

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 3½ digit LCD display that shows readings up to 1999, an audible continuity checker and a diode test. Overload protected on all ranges. Automatically warns of low battery voltage.

Assembled SM-2310 Ship wt. 1 lb. . *Was* $49.95 *Now* **$39.95**

Specifications: **DC VOLTS: Ranges:** 200 mV, 2.0 V, 20 V, 200 V, 1000 V. **Resolution:** 0.1 mV. **Basic Accuracy:** ±0.5%. **DC CURRENT: Ranges:** 200 μA, 2.0 mA, 20 mA, 200 mA, 2 A. **Resolution:** 0.1 μA. **Basic Accuracy:** ±0.75%. **AC VOLTAGE: Ranges:** 200 V, 750 V. **Resolution:** 100 mV. **Basic Accuracy:** ±1.2%. **RESISTANCE: Ranges:** 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ. **Power:** Single 9-volt transistor battery (included). **Dimensions:** 1″ H x 2¾″ W x 5″ L.

Heath DMM from FLUKE

FREE CASE

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, 3.2V, 32V, 320V, 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 it's practically goof proof. The 3½ digit LCD automatically shows the reading in the correct range up to a maximum 1999 display. Has a built-in continuity checker with buzzer alarm. 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:** 200Ω to 2000 kΩ. **Accuracy:** ±(2.0% reading ±2 digits). **CONTINUITY CHECK: Range:** 200Ω. **CONTINUITY BEEPER:** <200Ω ±10Ω. **POWER:** Two LR-44 batteries (included). **DIMENSIONS:** 4¼″ H x 2¼″ W x ⅜″ D.

40

A versatile universal counter

Skill 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 in four evenings. 4¼" H x 10" W x 12½" D.

Kit IM-2420 Ship wt. 9 lbs. **$289.95**
Assembled SM-2420 Ship wt. 9 lbs. **$350.00**
Accessory:
Assembled SMA-2400-1 Telescopic antenna.
Ship wt. 1 lb. **$9.95**

Specifications: **FREQUENCY MEASUREMENT: Range:** Input A, 5 Hz to 512 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 10^8 **OSCILLATOR: Frequency:** 10 MHz. **Crystal Aging Rate:** <1 PPM/yr. **Stability:** ±0.2 PPM, 0° to 40°C. **GENERAL: Power:** 120/240 VAC, 50/60 Hz.

An accurate digital frequency counter in everyone's price range

Skill 2. 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 ± 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 MΩ shunted by ≤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:** ±10 PPM from 0°C to 40°C. **Power:** 120/240 VAC, 50/60 Hz. **Dimensions:** 3⅜" H x 7¼" W x 9½" D. **Weight:** 5 lbs.

512 MHz frequency counter

Skill 2. 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.

Kit IM-2400 Ship wt. 3 lbs. **$149.95**
Accessories:
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: Sensitivity:** 25 mV RMS guaranteed (10 mV RMS typical). **Input Protection:** 150 V RMS to 100 kHz derated to 10 V RMS at 50 MHz on low range, 5 V RMS on high range. **GENERAL: Gate Time:** 1 second or 0.1 second (switch selected). **Power:** Five 1.2 volt nickel-cadmium batteries (included) or external battery charger/eliminator. **Dimensions:** 1⅝" H x 3⅜" W x 8⅜" L.

Credit card orders call TOLL-FREE 24 hours a day:

1-800-253-0570

Michigan residents call:
1-800-782-2702

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All-Purpose 2 MHz Swept Function and Pulse Generator (NEW)

The SG-1274 Swept Function Generator is a general purpose signal source with a broad range of service, design, hobbyist and research applications. Outputs include sine, square, triangle, pulse and ramp signals. Frequency range extends from 0.02 Hz to 2 MHz in 7 pushbutton ranges. Other features include variable and fixed attenuators, duty cycle control, variable DC offset control, signal inversion, internal and external sweep and TTL pulse outputs. The compact style cabinet saves space on your workbench and can be stacked to save you even more room.

Assembled SG-1274 Ship wt. 6 lbs. $199.95

Specifications: **Waveform:** Sine, Square, Triangle, Pulse. **Frequency:** 0.02 Hz-2 MHz in 7 ranges. **Scale Error:** ±5% of full scale. **Output Impedance:** 50 ohms ±10%. **Output:** 5 mV P-P (min.) to 20 V P-P (max.) continuously variable into an open circuit. **Attenuator:** 0 dB-20 dB. **DC Level:** +10 V to −10 V (open), continuously variable with zero offset SW. **Duty Cycle:** 20%-80% continuously variable with 50−50 calibrated SW. **Total Harmonic Distortion:** <1% from 10 Hz to 200 kHz (of sine wave). **Input Impedance:** 10 Ω ±10%. **Square Wave Rise/Fall Time:** <100 ns. **Pulse:** >3 V P-P (open). Rise/Fall Time <25 ns. Sink: 20 TTL. **VCF:** 0 to ±10 V. Control frequency to 100:1 min. Sweep. **SWEEP CHARACTERISTICS: Internal:** Linear. **Sweep Rate:** 0.5 Hz (2 sec. period) to 50 Hz (20 ms period, continuously variable. **Sweep Width:** Variable from 1:1 to 100:1. **Power:** 100/120/220/240 VAC (±10%), 50/60 Hz. **Dimensions:** 2½" H x 9½" W x 7½" L (6.4 x 24 x 19 cm) **Weight:** 3⅛ lbs. (1.4 kgs).

Sine and Square Wave Generator

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:** 5⅛" H x 13¼" W x 7" D. **Weight:** 7 lbs.

Noise Generator Kit

SKILL LEVEL 1 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:** 2⅝" H x 4⅛" W x 4⅛" D. **Weight:** 11 ounces with battery.

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Digital L/C Bridge

SKILL LEVEL 2. 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. **$199.95**

Specifications: **INDUCTANCE: Ranges:** 200 μH to 2000 H in 8 decade steps. **Accuracy (±4 counts):** ± [0.5% (L) + 1.5% (L) x D + 0.5 μH] for readings from 10 to 2000 counts when the Bridge is calibrated using laboratory standards. **CAPACITANCE: Ranges:** 200 pF to 2000 μF, 8 decades. **Accuracy (±2 counts):** ±[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 μF = 1000 on 2000 μF range. **Accuracy (±20 counts:)** ±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 μF charged to 50 VDC and by an internal 1-ampere fuse. **Power:** 120 VAC, 60 Hz. **Dimensions:** 3¾" H x 10" W x 12½" D. **Weight:** 6½ lbs.

NEW 3½-digit Handheld LCR Meter

You get more ranges to cover more capacitors, inductors and resistors with this compact, digital LCR meter. And you get the accuracy you would expect from a full-size bench model. The SM-2255 even takes the dissipation factor into account, like our L/C Bridge to the left. It even displays dissipation factor of the component under test like our IT-2240 L/C Bridge.

The SM-2255 features an easy-to-read 3½-digit LCD display and fast rotary switch range selection plus a compact design. The LCR meter comes with test leads, 9 volt battery, spare fuse and an operator's manual.

Assembled SM-2255 Ship wt. 2 lbs. **$159.95**

Specifications: **CAPACITANCE: Ranges:** 200 pF, 2 nF, 20 nF, 200 nF, 2 μF, 20 μF, 200 μF, 2000 μF. **Resolution:** 0.1 pF, 1 pF, 10 pF, 100 pF, 1 nF, 10 nF, 100 nF, 1000 nF. **Accuracy:** 200 pF range: ±(2% rdg +1 dgt), ±2% rdg ±(2 + 200/Cp)dgt – (D). 2 nF to 2 μF ranges: ±(1% rdg +1 dgt), ±1% rdg ±(2 + 300/Cp)dgt – (D). 20 μF and 200 μF ranges: ±(25 rdg + 3 dgt), ±2% rdg ±(2 + 300/Cp)dgt – (D). 2000 μF range: ±(3% rdg + 3 dgt), ±3% rdg ±(2 +300/Cp)dgt – (D). **INDUCTANCE: Ranges:** 200 μH, 2 mH, 20 mH, 200 mH, 2 H, 20 H, 200 H. **Resolution:** 0.1 μH, 1.0 μH, 10 μH, 100 μH, 1.0 mH, 10 mH, 100 mH. **Accuracy:** 200 μH range: ±(2% rdg +1 dgt), ±25 rdg ±(3 +200/Ls)dgt – (D). 2 mH to 2 H ranges: ±(1% rdg +1 dgt), ±1% rdg ±(3 +200/Ls)dgt – (D). 20 H range: ±(2% rdg +1 dgt), ±2% rdg ±(3 + 200/Ls)dgt – (D). 200 H range: ±(3% rdg +1 dgt), ±3% rdg ±(3 + 200/Ls)dgt – (D). **RESISTANCE: Ranges:** 20 Ω, 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ, 20 MΩ. **Resolution:** 0.01 Ω, 0.1 Ω, 1.0 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ. **Accuracy:** 20 Ω range: ±(2% rdg + 2 dgt). 200 Ω to 2 MΩ ranges: ±0.5% rdg +1 dgt). 20 MΩ range: ±(3% rdg +1 dgt). **GENERAL: Power:** Single 9 volt battery (included). **Dimensions:** 6⅞" H x 3½ W x 1⅝" D.

Audio Spectrum Analyzer

SKILL LEVEL 3. Use this microprocessor-controlled, ½ 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**

$AVER! 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 dBSPL Range):** 0 dB = 350 mV RMS ±10% **Power:** 6 "C" batteries (not included). **Dimensions:** 4½" H x 9¼" W x 4" D.

Rack Mount for Spectrum Analyzer

SKILL LEVEL 1. Install the AD-1308 Spectrum Analyzer (at left) 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**

$AVER! Save 50% off the price of the Rack Mount by ordering it at the same time you order the ADS-1308-1 Noise Generator and Spectrum Analyzer (at left).

Regulated high voltage power supply

Skill Level 2. 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.

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 13⅜″ W x 11¼″ D. **Weight:** 16 lbs.

Versatile RLC Bridge

Skill Level 1. A general-purpose instrument from the 5280 test series. Use it to check the values of unknown or obliterated 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. . . . **$69.95**

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 45). **Dimensions:** 5¾″ H x 11″ W x 7¾″ D. **Weight:** 3½ lbs.

Low-cost RF Oscillator

Skill Level 1. 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. . . . **$79.95**

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 45). **Dimensions:** 5¾″ H x 11″ W x 7¾″ D. **Weight:** 3¼ lbs.

Our most economical power supply

Skill Level 3. In less than three and a half hours you can put together a truly handy power supply (left of scope in picture 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:** 4⅜″ H x 5½″ W x 5¾″ D. **Weight:** 3¼ lbs.

Know your test equipment inside and out by building it yourself

Triple output DC supply

SKILL LEVEL 2 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 almost 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. Supplies may be connected in series for up to 45 volts DC.

Kit IP-2718 Ship wt. 12 lbs. **$119.95**
Assembled SP-2718 Ship wt. 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 10¾" W x 9" D. **Weight:** 10 lbs.

Audio Generator

SKILL LEVEL 1 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 and is stackable to help you lay out a neat test center arrangement with other instruments in the 5280 test instrument series.

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 (below). **Dimensions:** 11" H x 5¾" W x 7¾" D. **Weight:** 3½ lbs.

Signal Tracer

SKILL LEVEL 1 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. 5 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 1 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**

NEW

250 MHz scope probes

A set of two modular X10 probes, switchable X1/X10, with a bandwidth of 250 MHz. Packaged with accessory tips.

Assembled P-250-2
Ship wt. 1 lb. **$99.95**

NEW

350 MHz scope probes

A set of two modular X10 probes with a bandwidth of 350 MHz. Packaged with a full complement of accessory tips.

Assembled P-350-2
Ship wt. 1 lb. **$139.95**

Match a probe to your scope's capability

Scope Bandwidth (MHz)	PKW-105 or IOA-3220-1 100 MHz	P-250-2 250 MHz	P-350-2 350 MHz	
25	24.3	24.9	24.9	Approx. Bandwidth of Scope and Probe
50	44.7	49.0	49.5	
100	70.7	92.8	96.2	
200	89.4	156.2	173.6	

Scope Test Probe Chart

A good probe preserves the characteristics of the incoming signal, presents minimal loading of the circuit under test and is convenient to use. Heath probes compare favorably on all these points with brands costing up to twice as much. The chart above shows approximate total bandwidth (scope and probe) for different combinations of oscilloscopes and probes.

> **We recommend**, for oscilloscopes with bandwidths of 35 MHz or less, the PKW-105 or the IOA-3220-1 probe set. If your oscilloscope is in the 50 to 100 MHz bandwidth range, we advise using the Heath 250 MHz P-250-2 two probe set. And for oscilloscopes with bandwidths in the 150 to 200 MHz range, we believe you'll be pleased with the results obtained while using the 350 MHz P-350-2 set of two probes. These solid performers are right at home in the most demanding situations and offer precision performance.

Deluxe 10:1 and direct 1:1 combination probe

A flexible probe ideal for all frequency counter 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. **$17.95**
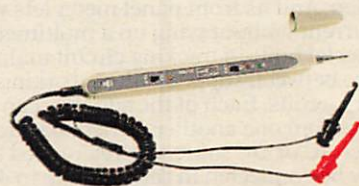
Digital Pulser Probe

Inject your own substitute logic pulses into circuits for quicker and easier evaluation of problems. This slim probe can generate square waves with 10 μs 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.
Was $39.95 . . . . *Now* **$29.95**

Specifications: **Sync Input Impedance:** 1 megohm. **Pulse Width in Pulser Output:** 10 μs at 100 mA load. **Pulse Repetition Rate:** 0.5 and 400 PPS. **Output Current:** Pulse Mode: 100 mA sink or source maximum. 90% Pulse Mode: 20 mA sink or source maximum. **Supply Voltage:** 5 to 15 volts. **Dimensions:** 5/8" H x 3/4" W x 7 3/8" L.

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. **$17.95**
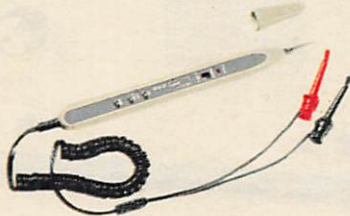
TTL/CMOS Logic Probe

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. The slim styling of this probe makes it comfortable and easy to hold. Quickly evaluate circuits and isolate faulty components with this versatile probe. The tip of the probe is protected to ± 50 VDC or 220 VDC/AC for 15 seconds. A yellow LED pulses with the monitored signal while a red and a green LED indicate His and Los.

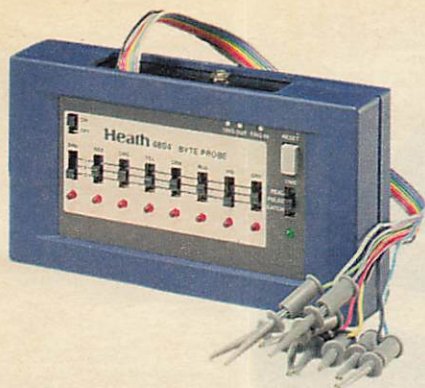**Assembled ST-7420** Ship wt. 1 lb. *Was* $39.95 *Now* **$29.95**

Specifications: **Input Impedance:** 1 Megohm. **LOGIC THRESHOLDS: TTL:** Low, 0.8V ± 0.2V DC; High, 2.3V ± 0.2V. **CMOS:** Low, 30% of circuit Vcc; High, 70% of circuit Vcc. **GENERAL: Controls:** Threshold select (TTL or CMOS), Pulse/Memory. **Pulse LED (Yellow) Flashing Time:** 500ms. **Power Supply Protection:** ± 20V. **Supply Voltage Range:** 5V-15V. **Dimensions:** 5/8" H x 3/4" W x 7 3/8" L.

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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. Has dimensions of 1⅜" H x 6" W x 3⅜" D.

Kit ID-4804 Ship wt. 2 lbs. **$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 45).
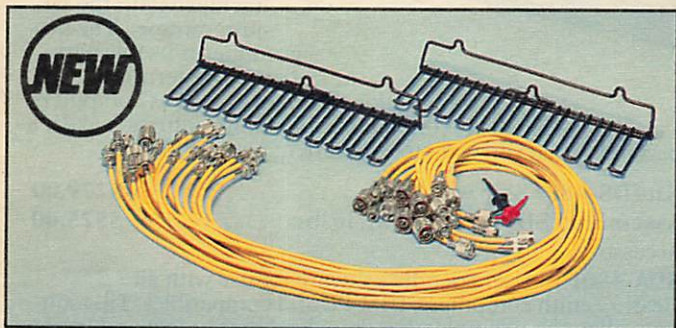
Coax Adapter Cables

Solve frustrating coax connection problems with this convenient adapter cable assortment. Connect BNC to BNC, BNC female, UHF, Mini-UHF, N, TNC, or hook clips. Connect N to UHF, Mini-UHF, N, TNC, or Mini-UHF female. Connect UHF to UHF, Mini-UHF or TNC. Connect TNC to TNC, Mini-UHF. Twenty cables in all to help you make almost any connection. Two handy storage racks keep your cables neatly organized.

Assembled TPI-5000 Ship wt. 5 lbs. **$119.95**

Deluxe connector adapter kit

Make 108 different coaxial connector adapters with this deluxe kit. Special "in-between" fittings allow you to assemble your own adapters in seconds. Disassemble them when you're finished with your project for use next time. Gold plated pins and Teflon insulation help make this kit a premium quality problem solver, replacing a drawer full of adapters – some of which would cost you $20 apiece. Kit contains male and female N, BNC, UHF, SMA, TNC and Mini-UHF connectors.

Assembled HCA-3000 Ship wt. 2 lbs. **$149.95**

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. An additional detachable ground clip is included for high frequency operation.

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:** 9¼" L x 1" Diameter. **Weight:** 2½ ounces.

All-in-one 40 kV probe

Check high voltages commonly found in televisions, computer terminals and oscilloscopes. With this one probe you can measure voltages up to 40,000 in any negative ground circuit. And all measurement's readings have a full scale accuracy of ±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. 1½" H x 1⅞" W x 15" L.

CAUTION: We value you as a friend. Please follow all safety practices when measuring high voltages.

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 the kit programmer. The programmer is usable with terminals using terminal emulation software as well as computers. Ten distinct functions and other features make it a best buy when you want to experiment with EPROMS.

Kit IDS-4801 Ship wt. 14 lbs. **$279.00**
Assembled SD-4801 Ship wt. 10 lbs. **$525.00**
Accessory:

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:** 4¾" H x 15¾" W x 10¾" D. **Weight:** 6 lbs.

EPROM Eraser

Here is a fast and easy one-evening kit that saves you some of your hard earned dollars for other worthwhile projects. The ID-4803 EPROM Eraser cuts memory device costs by letting you use the EPROMs again and again. You can even salvage some EPROMs from certain types of discarded equipment.

The EPROM Eraser is easy to build using ordinary kitbuilding tools. And it is even easier to operate. Just place your EPROMs on the tray (the tray can hold up to seven ICs) and insert it into the eraser. A safety interlock system prevents accidental exposure to ultraviolet rays if opened during the erasing process.

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. **Typical Tube Life:** 3000 hours. **Power:** 120 VAC, 60 Hz. **Dimensions:** 2½" H x 3¼" W x 13¼" L.

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A CRT Tester for every TV shop

Increase your profits by cleaning and rejuvenating virtually any TV CRT that comes into your shop with our CRT Tester and Rejuvenator. Use it on current color and B/W television picture tubes, even in-line gun tubes.

From the front panel precisely set CRT heater voltages. Each gun is individually controlled and monitored on its own grid current meter. Also check for shorts and gassy tubes. After rejuvenation, a separate cleaning process is applied to the guns to ensure proper TV tube operation. A special push-button provides a good indication of tube life expectancy.

Kit IT-5230 Ship wt. 9 lbs. **$169.95**

Accessory:

Kit ITA-5230-1 CRT Socket Adapter 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, 5060 Hz. **Test Cable:** 4 foot, heavy duty. **Dimensions:** 5½" H x 13½" W x 10" D.

Semiconductor checker

Use this portable tester and see the actual operating characteristics of transistors, diodes, FETs, SCRs, triacs, and UJTs. 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 Ieb_2s, Ib_2b_1s and Emitter Current (out-of-circuit). **Power:** Two 1.5 volt D batteries (not included).

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: **Resistors:** Precision, ½% accuracy, 1 watt. **Max Current:** X1 = 1000 mA, X10K = 300 mA, X100 = 100 mA, X1K = 30 mA, X10K = 10 mA, X100K = 3 mA. **Dimensions:** 5" H x 7½" W x 6⅝" D.

Help is only a phone call away

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 55 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 our 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.

NEW
50 MHz dual trace digital storage scope

High-speed, precision diagnostics using a PC-based instrument are now more affordable with the SDS-5000 Digital Storage Oscilloscope. Designed to lighten the engineer's and scientist's heavy workload, the SDS-5000 provides power, speed, great analytical capabilities and many performance characteristics normally found only on systems costing much more. The scope comes with menu-driven software and can be hard at work for you within minutes.

Operation is easy. All scope selections are made from on-screen menus, each with its own help menu. After the data is collected it can be manipulated on the computer screen, stored for future analysis or printed for a report.

And the software allows you to do much more. Examine both pre-trigger and post-trigger events. Zoom in and see waveforms magnified up to 8 times vertically and 512 times horizontally. Compare two live channels, or a live and a stored channel with addition and subtraction functions. Use smoothing and exponential averaging to reduce channel noise. Capture the envelope of a signal. You can even overlay waveforms.

The SDS-5000 Digital Scope requires an IBM PC or compatible computer equipped with two open expansion slots. EGA or CGA video capability and 512K RAM. MS-DOS Version 2.0 or later is also required. When used in a computer, the included external power supply may be required. In addition, the SDS-5000 can be used in the SW-3020 Expansion Chassis of the Heath/Zenith Computer Based Instrument System.

Assembled SDS-5000 Ship wt. 9 lbs. **$1995.00**
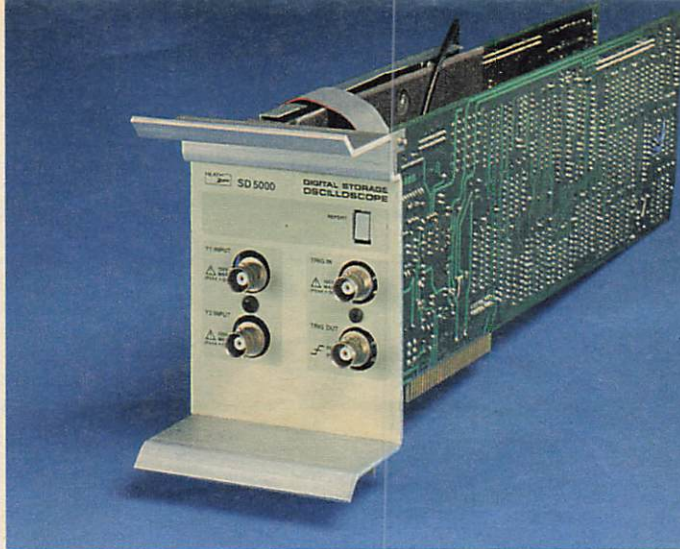
Specifications: **VERTICAL: Bandwidth:** 0 to 50 MHz with DC coupling. 10 Hz to 50 MHz with AC coupling. **Risetime:** <7 ns. **Overshoot:** <5%. **Attenuator:** 5mV/div to 5 v/div in 10 step 1, 2, 5 sequence. **Resolution:** 8 bits. **Offset:** ±1.5 times range (min). **Input Impedance:** 1 megohm shunted by 40 pF. **Max Input:** 125 volts peak combined AC and DC. **TIME BASE: Range:** 20,000 ns/div to 10 ns/div. **TRIGGER: Source:** CH1, CH2 or external. **Coupling:** AC, DC, positive or negative slope. **DIGITIZER: A/D Resolution:** 8 bits. **Type:** Flash converter, one per channel. **Record Length:** Real Time: 4096 standard (16,384 optional). Equivalent Time: 512. **GENERAL: Dimensions:** Two IBM PC standard cards.

IC-4802

ID-4850

Specifications: **VERTICAL: Deflection Factor:** Sensitivity: 5 mV/div to 5 V/div; 10 steps in a 1-2-5 sequence. **Vertical Response:** 5 mV to 5 volts/div. **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 μs/div in a 1-2-5 sequence. **Sampling Rate:** 100 kHz. **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:** 4½" H x 12½" L x 10" W. **Weight:** 8 lbs.
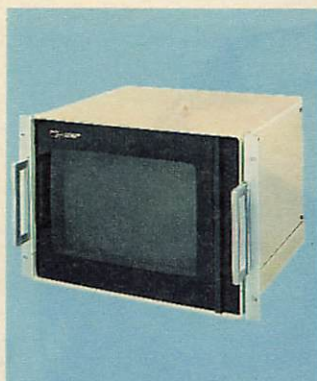
Turn your personal computer or scope into a 50 MHz digital storage scope

The IC-4802 Computer Oscilloscope turns a PC into a powerful dual trace 50 MHz digital storage oscilloscope. All scope functions are controlled from the computer keyboard. Display one or two channels on a graphic 8 x 10 cm/division graticule. On-screen menus show all scope functions. Automatically obtain readouts of voltage, time and frequency at any point on a waveform. Even store waveforms on a floppy disk for later analysis or comparison. You'll need a null-modem cable to connect the IC-4802 to your Heath/Zenith, IBM PC or compatible computer equipped with an RS-232 port, color graphics card, 5¼" disk drive, 128K RAM and using MS-DOS Version 2 or later. GW-BASIC required only for customizing.

The ID-4850 Digital Memory Oscilloscope enables you to upgrade a low-bandwidth, single channel bench scope into a powerful dual trace 50 MHz storage instrument capable of displaying fast digital pulses. All operations are controlled from the clearly marked front panel. All scope settings are plainly identified by bright LED indicators. 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). Two BNC to BNC coaxial cables are also needed.

Kit IC-4802 Computer Oscilloscope.
Ship wt. 10 lbs. . . . . *Was* $399.95 *Now* **$349.95**
Assembled SC-4802 Fully assembled and calibrated
IC-4802. Ship wt. 11 lbs. **$575.00**
Kit ID-4850 Digital Memory Oscilloscope.
Ship wt. 11 lbs. . . . . *Was* $499.95 *Now* **$439.95**
Assembled SD-4850 Fully assembled and calibrated
ID-4850. Ship wt. 11 lbs. **$750.00**

VIOS SOFTWARE

Wide assortment of modules

SW-3010 Industrial
Color EGA Monitor

SWS-3000 Industrial
AT Computer

Heath/Zenith Computer-Based Instruments for low cost and powerful ATE applications

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. Now you can perform test and measurement tasks easily, quickly and cost-effectively with affordable instruments that are versatile, reliable and accurate.

The Heath/Zenith SW-3020 Computer Based Instrument System is a fully integrated, computer controlled testing and data acquisition system. The System with its array of modular, lab-grade digital and analog test and measurement instruments, can be either rack mounted or placed on an engineering work station. A separate expansion chassis with its own power supply houses a wide range of modules including a: programmable triple power supply, low distortion oscillator, function generator, digital multimeter, universal counter, and a IEEE 488 general purpose interface bus (GPIB) module. New digital word generator and digital word analyzer modules are now available and also plug into the expansion chassis.

And under the Versatile Instrument Operating Software (VIOS) umbrella, all instruments are controlled from an IBM PC AT compatible computer such as the SWS-3000. All instruments are integrated through the software, creating a menu-driven operating environment that is operated by simple, single key strokes. All prompts and messages appear in clear, easily understood English, and each major function includes a help/learn selection which allows immediate system access for even the novice user.

Industrial computer and monitor

An environmentally protected and fully-featured Heath/Zenith Advanced AT Computer is specifically designed to use in a working environment. The computer is equipped with a 20 megabyte hard disk drive, 1.2MB floppy disk drive, 512K RAM, serial and parallel ports, 6 open expansion slots, and EGA/31 kHz VGA graphics capability. The computer can also be rack mounted, conforms to standard 19" rack dimensions. Operates on 98-132/180-264 VAC, at 50/60 Hz, 200 watts. Has dimensions of 17½" x 19½" x 6."

A matching 13" EGA color Industrial Monitor is also perfect for working environments. Features 16 colors at 15.75 kHz CGA or 64 colors at 21.85 kHz EGA. Uses 98-132/208-262 VAC, 48-62 Hz. Has dimensions of 18½" x 16¾" x 12½" and can also be rack mounted.

Assembled SWS-3000 Industrial Heath/Zenith AT Personal Computer and MS-DOS. Ship wt. 52 lbs. **$4500.00**

Assembled SW-3010 Industrial Monitor.
Ship wt. 39 lbs. **$1200.00**

16- and 32-bit logic analyzers

Connecting either of these powerful test instruments to your IBM PC or compatible adds high performance and versatile test capacity without sacrificing computer capabilities. The analyzers sample data at a 50 MHz rate and store 4000 bits/channel in two separate data buffers.

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**

$AVER! Special system value includes a Z-159 Computer, ZMM-1470-G Monitor and the STS-4800.
Assembled SS-4800 Ship wt. 78 lbs. **$4150.00**

$AVER! Special system value includes a Z-159 Computer, ZMM-1470-G Monitor and the STS-4750.
Assembled SS-4750 Ship wt. 75 lbs. **$3350.00**

Heath/Zenith Computer Based Instruments Group now offers a complete line of assembled computer-based instruments for commercial use only. To receive a colorful 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. 51

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 2½" thick. For 120 VAC use. UL approved. Color may vary.

Assembled GDP-200 Ship wt. 7 lbs. **$89.95**
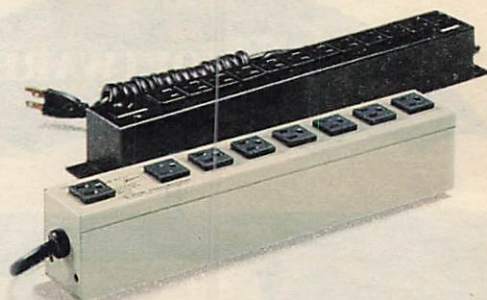
AC outlet box

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. 10A capacity.

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. Surge protection, 10A capacity. 2¼" H x 14½" L x 2¾" D.

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

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**
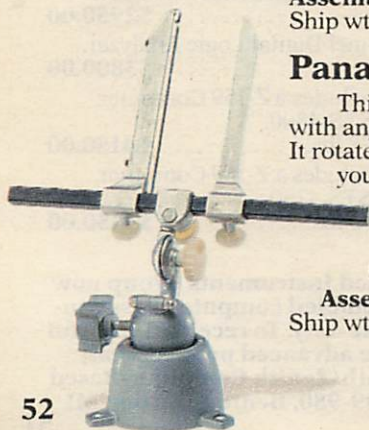
Headband Magnifier

This comfortable fitting magnifier with adjustable headband frees both your hands for work. Shatter and scratch resistant lenses magnify 2½ times. Works well with eyeglasses.

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

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 2½". 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**

1. Find your zone number using the Zone Chart at the right.
2. Locate the shipping weight of the item in the first column of the Rate Chart.
3. Determine the shipping charge for the area.

ZONE CHART

Your zone is indicated by the first three digits of your ZIP Code.

Zip Code Prefixes	UPS Zone	Zip Code Prefixes	UPS Zone	Zip Code Prefixes	UPS Zone	Zip Code Prefixes	UPS Zone	Zip Code Prefixes	UPS Zone	Zip Code Prefixes	UPS Zone
004-005	5	200-232	4	342-346	5	470-472	3	600-609	2	820	5
010-069	5	233-237	5	349	6	473	2	610-619	3	821	6
070-083	4	238-259	4	350-353	5	474-475	3	620-623	3	822	5
084	5	260-261	3	354	5	476-477	4	624-628	3	823-826	6
085-089	4	262-278	4	355-359	4	478	3	629-668	4	827	5
		279	5	360-361	5	479-496	2	669-679	4	828-832	6
100-104	4	280-283	4	362	4	497-499	3	680-687	4	833	7
105-108	5	284-285	5	363-369	5	500-516	4	688-699	6	834	6
109-113	4	286-289	4	370-386	4					835-838	7
114-115	5	290-292	5	387	5	520-524	3	700-722	5	840-847	6
116	5	293	4	388	4	525	4	723-727	5	850-864	7
117-119	5	294-295	5	389-397	5	526-528	3	728-732	5	865-885	6
120-123	5	296-297	4	399	4	530-534	2	733	6	889-898	7
124-126	5	298-299	5			535-539	3	734-768	5		
127-128	4			400-406	3	540	5	769	6	900-921	8
129	5	300-303	4	407-409	4	541-546	4	770-778	6	922-925	7
130-149	4	304	5	410-412	3	547-548	4	779-789	6	926-934	8
150-153	3	305-307	4	413-426	4	549	5	790-792	5	935	7
154-160	4	308-310	5	427-432	5	550-566	4	793-799	6	936-960	8
161	3	311	5	433-436	2	567	5	800-802	6	961	7
162-163	4	312-329	5	437-457	3	570-572	5	803-805	7	970-976	8
164-165	5	330-334	6	458	4	573-588	5	806-807	5	977-984	7
166-199	4	335-338	5	459-462	3	590-597	6	808-816	6	985-986	8
		339	6	463-469	2	598-599	7			988-994	8

The following notice is required by the Fair Credit Billing Act:

IN CASE OF ERRORS OR INQUIRIES ABOUT YOUR BILL

The Federal Truth in Lending Act requires prompt correction of billing mistakes.

1. If you want to preserve your rights under the Act, here's what to do if you think your bill is wrong or if you need more information about an item on your bill:

   a. Do not write on the bill. On a separate sheet of paper write (you may telephone your inquiry but *doing so will not preserve your rights under this law*) the following:

   i. Your name and account number (if any).

   ii. A description of the error and an explanation (to the extent you can explain) why you believe it is in error.

   If you only need more information, explain the item you are not sure about and, if you wish, ask for evidence of the charge such as a copy of the charge slip. Do not send in your copy of a sales slip or other document unless you have a duplicate copy for your records.

   iii. The dollar amount of the suspected error.

   iv. Any other information (such as your address) which you think will help the creditor to identify you or the reason for your complaint or inquiry.

   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.

RATE CHART

Heath Shipping and Handling Charges, mailable 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 14 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.

Shpg. wt.	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	UPS 2nd DAY AIR SERVICE Zone 12	Zone 14
1	$1.34	$1.45	$1.60	$1.67	$1.74	$1.83	$1.91	$3.00	$5.00
2	1.36	1.47	1.79	1.90	2.05	2.20	2.37	4.00	6.50
3	1.44	1.60	1.94	2.11	2.32	2.55	2.78	5.00	7.50
4	1.53	1.72	2.11	2.31	2.60	2.89	3.20	6.00	9.00
5	1.62	1.83	2.22	2.46	2.81	3.17	3.54	6.50	10.00
6	1.71	1.92	2.33	2.63	3.02	3.44	3.88	7.50	11.50
7	1.80	2.04	2.49	2.83	3.29	3.78	4.28	8.50	12.50
8	1.89	2.16	2.67	3.05	3.58	4.12	4.70	9.50	14.00
9	1.98	2.29	2.84	3.26	3.86	4.47	5.12	10.50	15.00
10	2.07	2.41	3.00	3.47	4.13	4.82	5.53	11.50	16.50
11	2.16	2.55	3.17	3.70	4.41	5.17	5.96	12.50	17.50
12	2.25	2.68	3.34	3.91	4.70	5.51	6.38	13.50	19.50
13	2.34	2.80	3.51	4.13	4.98	5.87	6.80	14.50	19.50
14	2.43	2.93	3.69	4.34	5.26	6.21	7.22	15.50	20.50
15	2.52	3.05	3.85	4.56	5.53	6.57	7.64	16.50	22.00
16	2.61	3.18	4.02	4.78	5.82	6.91	8.06	17.50	23.00
17	2.70	3.31	4.19	4.99	6.10	7.26	8.48	18.50	24.00
18	2.79	3.43	4.36	5.21	6.38	7.61	8.90	19.50	25.00
19	2.88	3.57	4.53	5.42	6.67	7.96	9.32	20.00	26.00
20	2.97	3.69	4.70	5.64	6.94	8.30	9.74	21.00	27.50
21	3.06	3.82	4.87	5.86	7.22	8.66	10.16	22.00	28.50
22	3.15	3.95	5.04	6.07	7.50	9.00	10.58	23.00	29.50
23	3.24	4.07	5.21	6.29	7.79	9.35	11.00	24.00	31.00
24	3.33	4.20	5.38	6.50	8.07	9.70	11.42	25.00	32.00
25	3.42	4.32	5.54	6.72	8.34	10.05	11.84	26.00	33.00
26	3.51	4.45	5.72	6.94	8.63	10.39	12.26	27.00	34.00
27	3.60	4.59	5.89	7.15	8.91	10.75	12.69	28.00	35.00
28	3.69	4.71	6.06	7.37	9.19	11.09	13.10	29.00	36.00
29	3.78	4.84	6.23	7.59	9.47	11.44	13.52	30.00	37.00
30	3.87	4.96	6.39	7.80	9.75	11.79	13.94	31.00	38.00
31	3.95	5.13	6.62	8.09	10.11	12.24	14.48	32.00	39.00
32	4.03	5.30	6.84	8.35	10.47	12.67	15.01	33.00	40.00
33	4.11	5.42	7.01	8.58	10.75	13.03	15.43	34.00	41.00
34	4.19	5.56	7.19	8.79	11.04	13.38	15.86	35.00	42.00
35	4.27	5.68	7.35	9.01	11.32	13.74	16.28	36.00	43.00
36	4.35	5.81	7.52	9.24	11.60	14.08	16.71	36.50	44.00
37	4.43	5.95	7.70	9.45	11.89	14.44	17.14	37.50	45.00
38	4.51	6.07	7.87	9.68	12.18	14.79	17.56	38.50	45.00
39	4.59	6.20	8.05	9.89	12.46	15.15	17.99	39.50	46.00
40	4.67	6.32	8.21	10.11	12.75	15.50	18.41	40.50	46.50
41	4.75	6.46	8.38	10.33	13.03	15.86	18.84	41.50	47.00
42	4.83	6.59	8.56	10.55	13.31	16.21	19.27	42.50	47.50
43	4.91	6.71	8.73	10.77	13.60	16.56	19.69	43.50	48.00
44	4.99	6.85	8.91	10.99	13.89	16.91	20.12	44.50	49.00
45	5.07	6.97	9.07	11.20	14.17	17.27	20.54	45.50	49.50
46	5.15	7.10	9.25	11.43	14.45	17.62	20.97	46.50	50.50
47	5.23	7.24	9.42	11.65	14.74	17.98	21.40	47.50	51.50
48	5.31	7.36	9.59	11.87	15.03	18.33	21.82	48.50	52.50
49	5.39	7.49	9.77	12.08	15.31	18.69	22.25	49.50	53.50
50	5.47	7.62	9.93	12.30	15.59	19.03	22.67	50.50	54.50
Add'l lbs.	.03 lb.	.04 lb.	.05 lb.	.06 lb.	.07 lb.	.10 lb.	.11 lb.	.23 lb.	.35 lb.

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

SPECIAL SHIPPING AND HANDLING:

- MOTOR FREIGHT ITEMS – Items indicated Motor Freight exceed weight or size limitations of UPS or Parcel Post. 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 130" in length and girth.
- SAM – Parcel must weigh less than 15 lbs. and not exceed 130" in length and girth. Check with your local postmaster for exceptions to certain APO or FPO numbers.

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
- Systems Designers
- Inventory/Production Control Specialists
- Retail Management/Outside Sales
- Circuit Board Designers
- Continuing Engineer
- Production Supervisors
- Computer Technicians
- QA Engineers
- Test Engineers
- Buyers
- Project Managers
- Accountants

To find out more, call or send your resume and salary requirements to Mr. Jim Szekendi, Heath Company, Dept. HS88, Hilltop Rd., St. Joseph, MI 49085, (616) 982-3504.

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 call TOLL-FREE 24 hours a day **1-800-253-0570**
Michigan call TOLL-FREE 24 hours a day **1-800-782-2702**
Replacement Parts Orders: (please have Heath part number available when you call) **616-982-3571**
Order information, delayed shipments, etc. **616-982-3275**
Dealer Sales **616-982-3313**
Overseas Orders: International Division **616-982-3512**
Computer Sales Information **616-982-3285**
General Office (non-order calls) **616-982-3200**
Technical Assistance (8:00 A.M. to 4:30 P.M. Eastern Time, Weekdays only):
- Educational Products **616-982-3980**
- Amateur Radio **616-982-3296**
- Test Equipment, Weather Instruments, Clocks **616-982-3315**
- Television **616-982-3307**
- Home Products, Stereo, Security, Telephone, Marine, Automotive **616-982-3496**
- Computers: 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, MasterCard or American Express credit card (min. purchase $10). Call toll-free 24 hours a day. Michigan orders call TOLL-FREE 1-800-782-2702. If you want the quickest handling and service possible, just fill out our order form between pages 54 and 55 before you call.

BY MAIL:

Please follow these simple steps so we can handle your order quickly:
- Use the handy order form between pages 54 and 55.
- 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 54.
- Please use separate sheet to order parts, manuals or for any correspondence.

TERMS:

charg-a-kit

- 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, Visa and American Express 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.

Heathkit® Heath Company, Benton Harbor, MI 49022

ORDER FORM AGREEMENT

Note: When using Revolving Charge, please write account number here to speed processing. Be sure to date and sign the agreement on back. *AA ☐☐☐

Bill to: (Always use same name) **211-210**

Name _____

Apt./Lot/Bldg. _____

Street Address _____

City _____ State ____ Zip ____

If address is incorrect, please correct here.

Name _____

Apt./Lot/Bldg. _____

Street Address _____

City _____ State ____ Zip ____

Ship to: (If different than bill to)

Name _____

Apt./Lot/Bldg. _____

Street Address _____

City _____ State ____ Zip ____

Please do not write in this space

TO SPEED YOUR ORDER CALL TOLL-FREE 24 HOURS A DAY

1-800-253-0570

IN MICHIGAN: 1-800-782-2702

When ordering by phone...

Please provide the operator with the six-digit code (211-210) that appears near your name and address.

Please give daytime phone number

(Area) ☐☐☐ (Number) ☐☐☐☐☐☐☐

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OB-155

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Semi-Conductor Devices ⑤⑨ ①	Micro-processor Technology	Micro-Processors ⑥④ ④	Micro-Processor Interfacing ⑥④ ④	Advanced Micro-Processors ⑥⑥ ④				
Electronic Circuits ⑥⓪ ①	Robotics Technology	Intelligent Machines ⑦① ⑨	Electronics For Automation ⑦① ⑨	Programming And Interfacing ⑦① ⑨	Industrial Robotics & Automation ⑦② ⑩	Robotics & Industrial Electronics ⑥⑨ ⑧	Advanced Programming ⑥⑨ ⑧	Robotics Applications ⑥⑨ ⑧
Test Equipment ⑥⓪ ①	Computers/ Programming	MS-DOS ⑦⑧ ⑤	Computer Graphics ⑦⑨	Communications & Networking ⑥② ⑦	Macro-86 Assembly Language ⑦⑧	Macro-86 Algorithms ⑦⑧	CAD/CAM ⑦⑨	Micro-Computer Professor ⑦⑦	Artificial Intelligence ⑦⑦
Electronic Communications ⑥① ①	Industrial & Hobby	Soldering ⑦③	Printed Circuit Boards ⑦③	Concepts Of Electricity ⑦③	Concepts Of Electronics ⑦③	Linear Circuits ⑦③		
Digital Techniques ⑥② ②	Video Programs	Digital Techniques ⑥②	Micro-Processors ⑥④	Soldering ⑦③				

Key to Course Symbols

① Analog Trainer	⑥ Laser Trainer
② Digital Trainer	⑦ Design Trainer
③ Breadboard Trainer	⑧ Robotics Trainer
④ Microprocessor Trainer	⑨ Automation Trainer
⑤ Learning Computer	⑩ Industrial Robotics Trainer

○ See this page number for detailed course information.
– Linking line indicates a suggested sequence for taking the courses.

Entry-level electronics courses
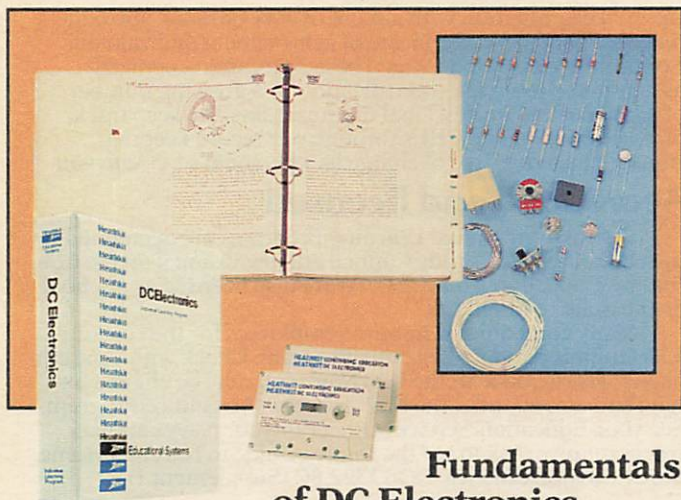
Fundamentals of DC Electronics

This is the first course in our Fundamentals of Electronics Series. Requiring no electronics background, this comprehensive course goes beyond the whats to the whys and the hows of DC electronics. You'll learn how to solve basic electronic problems involving current, voltage, resistance and power. You'll learn to define, measure, and work with current, voltage, resistance and power. You'll also learn about the construction, operation and purpose of a variety of electronic devices such as resistors, capacitors, inductors, meter movements, switches, solenoids, relays, motors, generators and more.

As a bridge from the theoretical to the practical, we teach you a variety of skills. You'll construct DC circuits and draw schematic diagrams using a wiring diagram as a guide. From there, you'll use a multimeter to measure current, voltage and resistance. Your learning experience will also include building and experimenting with basic DC circuits.

You'll build and conduct twenty-one fascinating hands-on experiments with a wide variety of electronic circuits including series, parallel, series-parallel and bridge circuits. To complete these experiments, you'll need the ET-3600 (page 59) or ET-3100-B Analog Trainer, a multimeter and an oscilloscope.

The DC Electronics course comes with a big 554-page textbook, final exam, and parts package with resistors, thermistors, capacitors, an LDR, a control, and more.

Pass the optional exam and earn 2.0 CEUs (see page 57).

EE-3101-A Ship wt. 6 lbs. **$49.95**

Accessory:

EEA-3101-A Optional Audio-Visual Package with two lecture audio tapes and a 123-page illustration booklet with over 230 illustrations. Ship wt. 2 lbs. **$19.95**

$AVER! Get both EE-3101-A and the ET-3600 Analog Trainer and save $40 over buying each separately.

EES-3101-C Ship wt. 12 lbs. **$129.90**

$AVER! Get EE-3101-A, EE-3102-A AC Course, EE-3103-A Semiconductor Course, EE-3104-A Electronic Ckts. Course and the ET-3600 Analog Trainer and save $60 over buying each separately. A complete electronics course for less.

EES-3101-D Ship wt. 32 lbs. **$299.75**
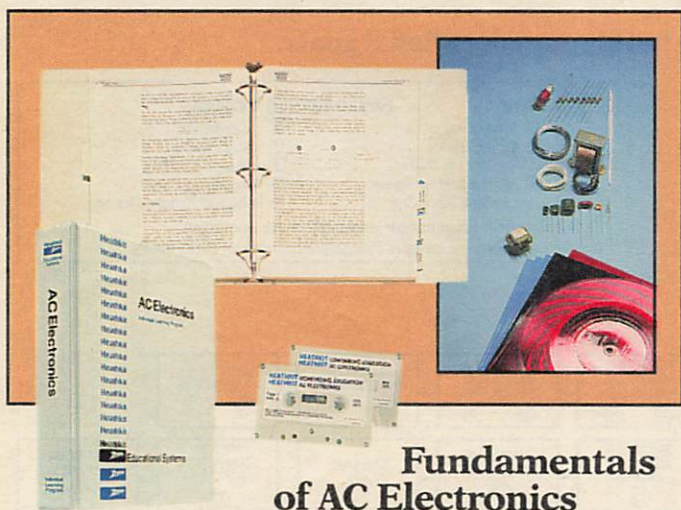
Fundamentals of AC Electronics

Requiring successful completion of EE-3101-A DC Electronics (above), this course gives you a broad foundation in the theory and application of alternating current. You'll learn about the differences between AC and DC and reference ground and earth ground. Plus you'll develop an understanding of capacitance, inductance, impedance and how their related

devices are formed. You'll also study motors, generators, servo-systems, and syncro-systems, service drops, and home safety devices.

You'll analyze both AC sine waves and a variety of AC circuits. You'll determine transformer turns ratios and perform important calculations involving impedance, current, voltage, and power ratios. You'll learn how to convert to power from quantities like horsepower, watts and current, and draw a block diagram complete with current requirements for the electrical loads in your home.

The nine interesting experiments range from measuring AC voltages to designing a resistive load. To perform these experiments, you'll need the ET-3600 (page 59) or ET-3100-B Analog Trainer, a multimeter and an oscilloscope.

With this course, you'll get a 547-page textbook in a heavy-duty three-ring binder, final examination, and experiments parts package with resistors, capacitors, an inductor, an audio transformer, a lamp and an alignment tool.

With a 70% or better score on the optional final exam you'll earn 1.5 Continuing Education Units (see page 57).

EE-3102-A Ship wt. 7 lbs. **$59.95**

Accessory:

EEA-3102-A Optional Audio-Visual Package with two lecture audio tapes and a 123-page illustration booklet with over 230 illustrations. Ship wt. 2 lbs. **$19.95**

DC circuits and use semiconductors in practical circuits. You'll also familiarize yourself with semiconductor schematic symbols and packages, devices, and transistors, plus linear and digital components, semiconductor construction, and semiconductor device operation.

To get the most out of this course, you need to have completed the EE-3101-A DC Electronics and EE-3102-A AC Electronics courses (see page 58).

We also recommend the optional 12 practical experiments to give you a working knowledge of semiconductor devices. With them you'll get a chance to test semiconductor devices, combine solid-state components, and observe first-hand the characteristics of a variety of amplifiers. Plus much more. A multimeter and the ET-3600 (below) or ET-3100-B Analog Trainer are essential in bringing these experiments to life.

A 486-page textbook in a heavy-duty three-ring binder, final examination, and experiments parts package are included with this course. The parts package includes resistors, capacitors, diodes, transistors, an LED, a lamp and an IC.

What's more, on successful completion of Semiconductor Devices, you'll earn 3.0 Continuing Education Units (see page 57 for more information about CEUs).

Semiconductor Devices Course

Semiconductors are the backbone of modern electronics. And this course is an excellent way to build your knowledge of this technology. As part of your hands-on experience, you'll rapidly learn how to handle semiconductor components properly and test semiconductor devices. You'll even analyze

EE-3103-A Ship wt. 6 lbs. **$59.95**

Accessory:

EEA-3103-A Optional Audio-Visual Package with two lecture audio tapes and a 123-page illustration booklet with over 230 illustrations. Ship wt. 2 lbs. **$19.95**

ET-3600 Analog Trainer

Shown with optional Backpack

Analog Trainer

The new ET-3600 Analog Trainer is a versatile experimental tool for successful hands-on learning. It's used in experiments from the DC, AC, Semiconductor Devices, Electronic Circuits, Electronic Communications, Concepts of Electronics and Test Equipment courses (pages 58-61 and 78). The ET-3600 is specially-made to let you design, build, analyze, test and modify practical electronic circuits.

This dynamic new trainer, which replaces our ET-3100-B Analog Trainer, is flexible, expandable and rugged. And it's more convenient and more powerful than its predecessor.

The ET-3600 has variable, regulated positive and negative 15V DC power supplies with both short-circuit and overload protection. It also has 15 and 30 volt AC voltage sources and a 200 Hz to 20 kHz frequency generator, with sine wave and square wave outputs. The Analog Trainer has solderless breadboard sockets for circuit building and also includes built-in 1 kilohm and 100 kilohm potentiometers.

A key feature of this remarkable new trainer is the removable solderless breadboard – one-third larger than on the ET-3100. It accepts up to #20 solid wire and the leads of almost any standard electronic component.

In addition, the power supply is protected against short circuits and overloads. Most internal components are mounted on two easily accessible circuit boards and connector blocks are recessed for extra durability.

Besides all this, the ET-3600 has a built-in connector that accommodates the ET-3567 Backpack Accessory (p. 61). The result: extended versatility for even more simple and reliable bench testing – all without acquiring further test equipment. The experiment circuit boards for our courses slide right into the Backpack.

The Analog Trainer is light weight and easy to assemble. It operates at 120 VAC, 60 Hz. 4¼"H x 12"W x 11⅜"D.

Kit ET-3600 Ship wt. 6 lbs. **$119.95**
Assembled ETW-3600 Ship wt. 6 lbs. **$199.95**

Accessory:
Assembled ETA-3600-1 Extra breadboard block.
Ship wt. 1 lb. **$19.95**

59
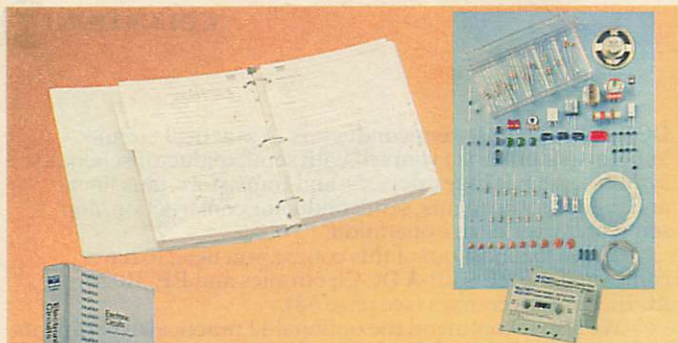
Electronic Circuits Course

This course will give you a new perspective on the electronic products you use every day. In seven carefully designed units you'll learn about a variety of essentials, from concepts like bias, oscillation, amplitude, and frequency modulation to circuits like amplifiers, comparators, active filters, and pulse shapers.

And because doing is a better way to learn, we also give you a chance to analyze and design simple circuits like inverting and noninverting amplifiers. You'll even use a multimeter, oscilloscope, and other test equipment to analyze the operation of electronic circuits – an excellent opportunity to put your newly-acquired electronic circuit theory into practice!

From there, you'll plunge right into the nuts and bolts of circuit design as you construct transistor and integrated circuit amplifiers, oscillators, active filters, and more.

With the ET-3600 (on page 59) or ET-3100-B Analog Trainer, a multimeter, and an oscilloscope you'll be able to perform 19 fascinating experiments, such as: Thermal Stability, Unregulated Power Supplies, The Wien-Bridge Oscillator, Driven Rectangular Wave-shaping Circuits, and Ramp Generators.

This wide-ranging course builds on knowledge gained in EE-3101A DC Electronics, EE-3102A AC Electronics, EE-3103A Semiconductor Devices (on pages 58-59).

Everything is provided: a 714-page self-instruction text and over 100 parts, including 34 resistors, 2 controls, 26 capacitors, 3 inductors, 8 diodes, 9 transistors, 2 ICs, an audio transformer, a stabistor, a speaker, a lamp, a crystal, and an alignment tool.

Listen to the audio tapes while you're driving your car. They bring the subject to life and provide instruction at times when you can't study the conventional way.

Pass the final exam and you'll receive 4.0 Continuing Education Units (CEUs explained on page 57).

EE-3104-A Ship wt. 7 lbs. **$69.95**

Accessory:

EEA-3104-A Audio-Visual Package. Ship wt. 2 lbs. **$19.95**
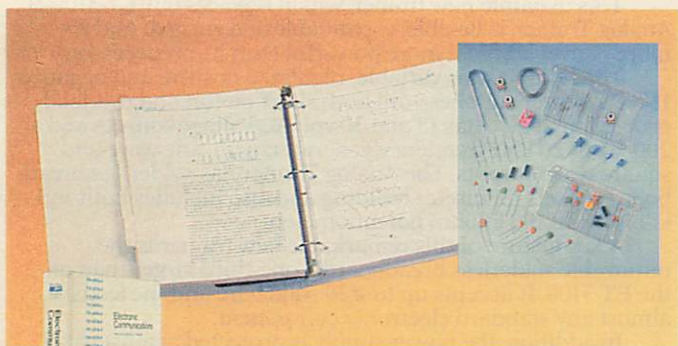
Electronic Test Equipment Course

This course is ideal if you want to become proficient with bench and field test equipment and learn how to properly make measurements using digital and analog meters, voltmeters, ammeters, ohmmeters, and oscilloscopes.

Going beyond the basics, you'll study in depth the oscilloscope, oscilloscope circuits, the cathode ray tube, and concepts like sensitivity, delayed sweep and dual trace. You'll also gain a solid understanding of the curve tracer, basic spectrum analyzer, logic tester, digital logic probe, transistor tester, audio generator, RF generator and function generator.

For the everyday use of test equipment, you should also know how to handle all situations that can arise. That's why we teach you to recognize sources of error in electronic counter readings, increase the frequency range of electronic counters, and design and construct RF impedance matching pads. You'll also check output frequency and amplitude calibration of a signal generator. You'll even check the bandwidth, vertical gain and time base calibration of your oscilloscope.

To get the most out of this course, we recommend performing the 15 exciting experiments. You'll need the following equipment: a digital multimeter, an analog meter, oscilloscope, frequency generator and frequency counter. This course also uses the ET-3600 on page 59, or the ET-3100-B Trainer. Plus you must have a previous knowledge of material in the EE-3101-A thru EE-3104-A and EE-3201-A courses (pages 58-62).

The 822-page text is a comprehensive study of test instruments. It starts with Analog Meters and from there leads you through Digital Meters, Oscilloscopes, Frequency Measurement, Frequency Generation, Special and Measuring Instruments. Our parts package includes resistors, capacitors, diodes, and all the components required for the included experiments. And if you want reinforcement of what you've learned, there's nothing better than our Audio Visual Package. It's learning you can take with you anywhere, anytime. And it even teaches you pronunciation of important terms.

Electronic Test Equipment is well worth the 6.0 CEUs (see page 57) earned when you pass the final exam.

EE-3105-A Ship wt. 9 lbs. **$69.95**

Accessory:

EEA-3105-A Audio-Visual Package. Ship wt. 2 lbs. **$19.95**
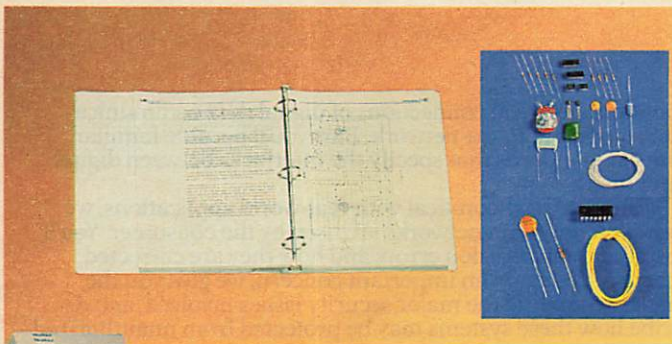
Electronics Communications Course

A detailed look at the principles of electronic communication and the way in which communication systems are formed. Electronics Communications explores the technologies of transmitters and antennas, frequency and time division multiplexing, transmission lines, electromagnetic radiation and propagation.

Our comprehensive text covers a variety of interesting topics, including amplitude, angle, and pulse modulation. And in addition to our 472-page textbook, we give you a chance to build an AM transmitter, balanced modulator, AM detector, FM transmitter and an FM receiver. You can also purchase our Audio-Visual Package as an excellent supplement. It's perfect for learning when you're on the go.

To perform the 7 exciting experiments included with this course you need the ET-3600 (page 59), or ET-3100-B Trainer, a multimeter, and an oscilloscope. We also recommend that you complete the EE-3101-A thru EE-3104-A courses (pages 58-60) before taking Electronics Communications.

Pass the final exam and earn 2.0 Continuing Education Units (see page 57 about CEUs).

EE-3106-A Ship wt. 7 lbs. **$64.95**

Accessory:

EEA-3106-A Audio-Visual Package. Ship wt. 2 lbs. **$19.95**

Trainer Accessory Backpack

🔹 **SKILL LEVEL 2** Stop wasting your valuable experiment time breadboarding – use it to learn, with the Accessory Backpack. The ET-3567 gives you access to the pre-wired Heathkit/Zenith experiment modules you can purchase with your courses. With it, you'll be able to do even more experimenting and designing of electronic circuits.

The ET-3567 mounts directly to the new ET-3600 and ET-3700 (pages 59 and 63) Trainers. The Backpack includes programmable, positive and negative 1.2 to 15 volt DC power supplies for powering analog, linear and CMOS circuits. It also has 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 3½ digit LCD display with automatic polarity sensing. And to make your experimenting even more productive, we've built a quality loudspeaker into the Backpack.

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. Accessory Backpack has dimensions of 14"H x 12"W x 4"D.

Kit ET-3567 Ship wt. 6 lbs. **$119.95**
Assembled ETW-3567 Ship wt. 6 lbs. **$199.95**

Breadboard Experiment Module

The ETB-3300 is ideal for designing and experimenting with prototype circuits that extend beyond the physical capacities of the ET-3600 and ET-3700 circuit design trainers. This module slides into the ETW-3567 Accessory Backpack (at left) to add more breadboarding capabilities to your ET-3600 or ET-3700 Trainer (pages 59 and 63). The solderless sockets in the three large 640-hole breadboards accept solid wire up to #20 and the leads of most common electronic components. The ETB-3300 also gives you access to +5 volt DC power supplies, variable positive and negative 1.2 to 12 volt DC power supplies and the internal trainer speaker.

Assembled ETB-3300 Ship wt. 2 lbs. **$99.95**

Digital technology

Data Communications and Networks Course

This course describes the concepts, terminology, equipment and techniques that make up today's data communications systems. Centered on computer communications, Data Communications and Networks highlights digital and analog signaling techniques, terminals and codes, modulation and multiplexing, and transmission media telephone networks. You'll also get an overview of current digital data networks, communication protocols, and phone circuits, as well as communication channels for both analog and digital transmissions.

From there you'll see the big picture as we detail the telephone system's use in data communications. You'll learn about the electrical connections of digital data communication equipment to the network. Plus you'll become familiar with the standards that specify the interfaces between digital equipment.

Uniting the theoretical with real-world applications, we show you how data networks are used by the consumer. You'll also study transmission errors and how they are corrected. Because security is an important concern, we give you the chance to analyze the major security issues involved, and describe how these systems may be protected from unauthorized access.

The text starts with a review of electronic communications principles, then builds on the foundation through our step-by-step, integrative learning method. To perform the included course experiments, you'll use everything from capacitors, resistors, transistors and integrated circuits to male and female connectors and telephone cables – which are also included.

To better understand this course you should have already completed course EE-3201-A Digital Techniques (page 63), EE-3102-A AC Electronics and EE-3101-A DC Electronics (on page 58) or have an equivalent knowledge. To perform the 11 experiments included with the course you'll need the ET-1000 Circuit Design Trainer below, a multimeter and a dual trace oscilloscope. With these instruments you'll get valuable hands-on experience in working with real-world data communications circuits like those used in coding, serial data transmission, modulation, sampling and multiplexing.

Pass the optional final exam and earn 7.0 Continuing Education Units (see page 57).

EE-8090 Ship wt. 11 lbs. **$99.95**

Analog/Digital Circuit Design Trainer

Our solderless double Breadboard Trainer is a regular minilab for learning the basic techniques of circuit design. With it you'll get practical hands-on experience designing, building and testing prototype circuits. Use the ETW-1000 to perform experiments in passive, transistor, analog and digital circuit design. And after designing and building your own circuits, use the Design Trainer to troubleshoot your designs.

The ET-1000 includes a built-in function generator for producing sine, square, triangle and pulse waveforms from 1 Hz to 100 kHz in five switch-selectable ranges. Pulse widths for each of the ranges are 2 milliseconds, 200, 20, and 2 microseconds, and 200 nanoseconds, respectively.

The Trainer also has variable and regulated positive and negative DC power supplies. Output voltages are +5 volts DC @ 1A and + and −12 volts DC @ 500 mA, all regulated. Other voltages include +1.2 to +20 volts DC @ 150-500 mA and −1.2 to −20 volts DC @ 150-500 mA, both variable and regulated, plus 15 and 30 VAC from a 60 Hz center-tapped transformer.

For load regulation, there's a +5 volts DC supply with better than ±2%, +12 and −12 volts DC better than ±1%, variable +20 and −20 volt DC supplies better than ±2%. All power supplies are short-circuit and overload protected.

Double breadboards have solderless sockets for quick, easy circuit assembly and testing. Purchase an optional removable breadboard for greater flexibility. Connector blocks allow solderless connections between parts and wires, and a logic probe detects and indicates LOW and HIGH logic levels.

Other features include two "no bounce" logic switches with complementary +5 and +0.2 volts DC output states, variable

Eight logic indicators

Hi/low logic probe

Analog/Digital Circuit Design Trainer

Variable and fixed DC power supplies

Sine, square, triangle generator

Large removable breadboard with solderless sockets

1K and 100K ohm resistors, eight switches for selecting logic LOWs or HIGHs, and eight LED logic-state indicators.

The Analog/Digital Circuit Design Trainer is listed by Underwriters' Laboratory (UL) and certified by the Canadian Standards Association (CSA), which means it meets all product safety requirements. And it's a compact 4¾"H x 15¾"W x 10¾"D. Weighs only 8.4 lbs. Uses 105-130 volts or 210-260 volts RMS at 50/60 Hz.

Kit ET-1000 Ship wt. 14 lbs. **$219.95**
Assembled ETW-1000 Ship wt. 13 lbs. **$324.95**
Accessory:
ET-1000-1 Extra Removable Breadboard.
Ship wt. 1 lb. **$29.95**
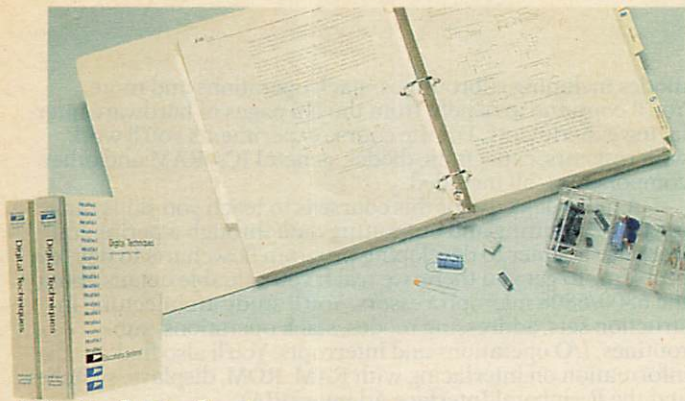
Digital Techniques course

Feel like an expert in digital circuitry. With this course you'll learn the fundamentals and theory of digital logic – including number systems, the design and application of modern digital circuitry and the skills necessary for designing both combinational and sequential logic circuits for virtually any modern application. You'll also become familiar with Boolean algebra, flip-flops and registers, sequential logic circuitry, digital design and much more.

We include electronic components for performing all experiments. A multimeter and dual trace oscilloscope are suggested. Our DC, AC, Semiconductors and Electronic Circuits courses will give you the necessary basic electronics background needed for successful completion of the course. Final exam is worth 4 CEUs.

EE-3201-A Ship wt. 7 lbs. **$99.95**

Accessories:

EEA-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**

$AVER! Get both EE-3201-A and the ET-3700 Digital Trainer and save $50 over buying each separately.

EES-3201-C Ship wt. 17 lbs. **$169.90**

A trainer for digital techniques

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. Use it to experiment with the EE-3201-A Digital Techniques Course.

The ET-3700 Trainer is designed to accept the new ET-3567 Backpack Accessory (p. 61). The Backpack extends the capabilities of your Digital Trainer and allows you to experiment with optional experiment modules (p. 61 and at 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 accommo-

Digital Circuits Experiment Module

This module is designed to reinforce the text materials of the Digital Techniques course above. It provides visual demonstrations of digital electronics concepts and theories applied to real-life circuits.

Students develop hands-on knowledge of digital circuitry as they perform the troubleshooting exercises and experiments, prewired for substantial time savings. The Administrator's Guide provides additional circuit descriptions, experiment information and classroom demonstrations. Both the Laboratory Manual and the Administrator's Guide are used in conjunction with the ETB-6201 Experiment Module.

You'll need the ET-3700 Digital Trainer (this page) and ET-3567 Accessory Backpack (p. 61) with the Experiment Module. A dual trace oscilloscope is also helpful. The Module slides into the Backpack mounted to the ET-3700 Trainer. The ETB-6201 module has open inputs and open outputs that can be used to design and build circuits other than those illustrated in the manual.

ETB-6201 Experiment Module.
Ship wt. 2 lbs. **$149.95**

EB-6201-52 Administrator's Guide.
Ship wt. 1 lb. **$9.95**

EB-6201-71 Student Laboratory Manual.
Ship wt. 1 lb. **$12.95**

dates the ET-3567 Backpack. Experiment circuit boards slide right into the Backpack. The trainer has dimensions of 4¼″ H x 12″ W x 11¼″ D.

Kit ET-3700 Ship wt. 6 lbs. **$119.95**
Assembled ETW-3700 Ship wt. 6 lbs. **$199.95**
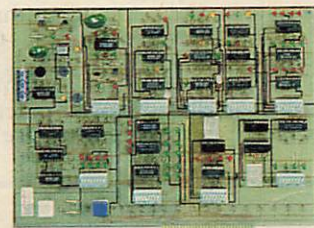
Microprocessing
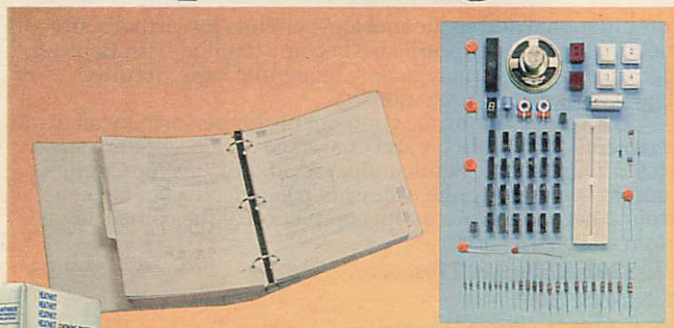
Microprocessors Course

This course won an International Award from the Society for Technical Communication. Coming with a thoroughly illustrated 976-page text, Microprocessors teaches you the fundamentals of 8-bit microprocessors, microcomputers and machine level programming.

Your study starts with a review of the basics of computer number systems and codes. Next you'll learn about terms and conventions, programming instructions, writing and executing programs, and computer arithmetic.

You'll increase your skills through 150 pages of programming experiments and writing programs using the ET-3400 or ET-3400-A Trainer (page 65). You can even 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 the 110 pages of hardware interfacing experiments. For the course experiments you'll work with resistors, capacitors, diodes, general ICs, RAM and other components – all included.

A main objective of this course is to teach you skills ranging from inputting and outputting data through a peripheral interface adapter to developing program flowcharts to define a problem. To get you there, we teach you valuable details about the 6800/6808 microprocessors. You'll study architecture, instruction sets, addressing modes, stack operations, subroutines, I/O operations and interrupts. You'll also find information on interfacing with RAM, ROM, displays, switches and the Peripheral Interface Adapter (PIA).

For most of the course 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 63). For the experiments, you'll need either the ET-3400 or the ET-3400-A Microprocessor Trainer (opposite page), a multimeter and an oscilloscope.

You'll really be proud of the 8.0 CEUs (see page 57) that you'll earn upon passing the final exam.

EE-3401-A Ship wt. 10 lbs. **$99.95**

$AVER! Get both EE-3401-A and the ET-3400-A Microprocessor Trainer and save $60 over buying each separately.
EES-3401-A Ship wt. 17 lbs. **$299.90**

$AVER! Get EE-3401-A, EE-3402 Micro Interfacing Course, EE-3405 Micro Applications Course and the ET-3400-A Microprocessor Trainer and save $100 over buying each separately.
EES-3402-B Ship wt. 37 lbs. **$459.80**
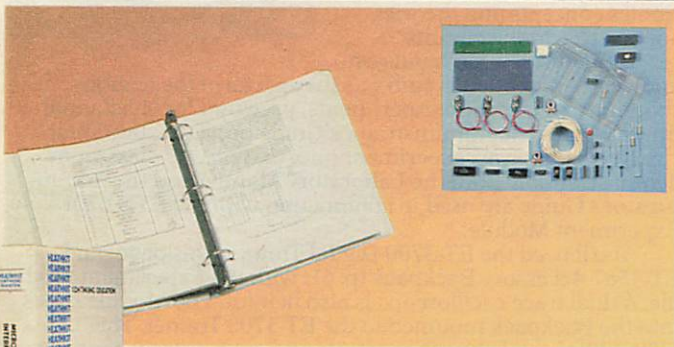
Microprocessor Interfacing Course

This course is a natural second step after completing the EE-3401-A Microprocessor Course. Microprocessor Interfacing introduces you to the powerful 6809 and 6800 processors. In eleven units you'll 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 let you perform parallel-to-serial conversion using the 6850

ACIA, serial standard conversion, 2708 EPROM programming, and ROM/EPROM interfacing. You'll also have actual experience with 6840 PTM input and output, as well as 6809 software operation.

All components required for the experiments are included. The experiments also require the ET-3400 or ET-3400-A Microprocessor Trainer (at right), which you can buy separately.

With this course, you'll become familiar with how to construct a microcomputer-controlled digital voltmeter; interface the 6850 ACIA to a 6800-based microcomputer system to provide serial communications; generate timed intervals and output waveforms; and measure input waveforms by interfacing the 6840 PTM to a 6800-based microcomputer system.

Plus you'll examine a wide range of other valuable information. You'll study the applications of digital-to-analog and analog-to-digital converters. You'll examine the operating characteristics of the ACIA, TTYs, printers, CRT data terminals, MODEMs, cassette recorders, and more.

You'll even see how to interface I/O devices as well as a color TV receiver to a 6800-based microcomputer system. Plus you'll learn how to interface dynamic memory while providing dynamic memory refresh.

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 (see page 57) upon completion.

EE-3402 Ship wt. 11 lbs. **$99.95**

force, pressure, flow and level sensors, and transducers. You'll also gain an understanding of microprocessor control of devices and circuits. Plus, you'll see examples of microprocessor uses in consumer, industrial and business applications and take a look at future microprocessor applications.

You'll become familiar with digital-to-analog conversion techniques and analog signal conditioning. You'll also get a chance to construct a microprocessor-controlled digital multimeter and thermometer, in addition to a microprocessor/stepper motor interface with a control circuit, and a programmable digital frequency synthesizer.

To perform the 13 experiments included in this course, you'll need the ET-3400 or ET-3400-A Microprocessor (below), a VOM and an oscilloscope. You should also complete the EE-3401-A Microprocessor Course and the EE-3402 Microprocessor Interfacing Course (both on opposite page). Pass the optional final exam of this challenging course and earn 8.0 CEUs (see page 57).

EE-3405 Ship wt. 10 lbs. **$99.95**

Microprocessor Applications Course

Microprocessor Applications is designed to help you put your previous microprocessor knowledge to work.

You'll get an in-depth view of microprocessor sensors and transducers. You'll study temperature, light, position, motion,

---

The ET-3400-A 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. You can also 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.

The microprocessor breadboard features solderless sockets for rapid assembly of IC circuitry – ideal for prototyping special interface circuits. All microprocessor address bus, data bus and control lines 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, 8 individual and independently buffered LEDs for monitoring logic states in the breadboard circuitry, 8 SPST binary data switches for logic level switching, and 1 Hz and 60 Hz clock outputs.

Built-in +5 DC at 1.5 A and ±12 DC at 50 mA power supplies furnish power to the internal circuitry and breadboard area with sufficient reserve to power any of the related course experiments. These supplies are routed to the front panel connectors through a standby power switch that allows you to breadboard a circuit without shutting down the internal circuitry.

This fascinating trainer requires 120 VAC, 50/60 Hz a 30 watts maximum of power. The fuse is a ⅜-A slow-blow. Trainer has dimensions of 3½"H x 12⅛"W x 11¾"D.

Kit ET-3400-A Ship wt. 7 lbs. **$259.95**
Assembled ETW-3400-A Ship wt. 6 lbs. **$359.95**

Microprocessor Trainer

SKILL 3 LEVEL This versatile, low-cost trainer/breadboard is designed to teach and illustrate microprocessor operation, programming and applications. With its microprocessor-based software and special interface development system, you can use your Trainer as a miniature digital computer for experiments in microprocessor related courses EE-3401-A through EE-3405 (on these two pages).

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Advanced Microprocessors Course

This course covers 16-bit computer technology and the 8088 microprocessor which are used in most IBM PC/XT-compatible microcomputers. Advanced Microprocessors includes more than 300 pages of software programming and interfacing experiments along with 1200 pages of text divided into ten units. All to show you how a microprocessor operates, addresses memory and communicates with the outside world.

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. As you progress you'll study conditional/unconditional jumps and loops and subroutines. You'll study the 8088 instruction set, addressing modes and memory segmentation. You'll also examine I/O

operations, internal/external interrupts and string operations. Later you'll learn about the various MPU bus and control lines, typical address and data bus networks, and data handling techniques. You'll even get a thorough grounding in the memory system and various forms of input/output interfacing. All of these concepts are reinforced through many Assembly Language program exercises that you will write and execute.

In this course, we also teach you everything you need to know about the internal structure of a typical microcomputer. Plus you'll get valuable experience building and programming many of the circuits found in a microcomputer. This includes several peripheral circuits such as a simple light pen.

And to help you along, we supply a complete parts package with ICs, resistors, diodes, LEDs, photo diode, capacitors and switches. Between these parts and the optional ETW-100 Microcomputer Trainer and monitor, you'll have a lot of learning fun with the course's experiments and exercises.

If you want maximum benefit from this stimulating course, you should have a digital electronics background equivalent to that taught in the Digital Techniques Course (EE-3201-A, page 63). Worth 8.0 CEUs (see page 57).

EE-8088 Ship wt. 10 lbs. **$99.95**

$AVER! Get both the EE-8088 and the ET-100 Computer Trainer (shown below) and save $100 over buying each separately. Separate prices total $899.90.

EES-8088 Ship wt. 49 lbs. .... *Was* $799.90 *Now* **699.90**
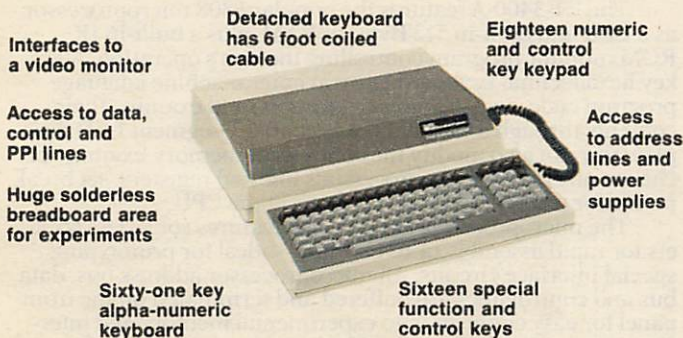
Interfaces to a video monitor

Detached keyboard has 6 foot coiled cable

Eighteen numeric and control key keypad

Access to data, control and PPI lines

Access to address lines and power supplies

Huge solderless breadboard area for experiments

Sixty-one key alpha-numeric keyboard

Sixteen special function and control keys

Microcomputer Trainer – $100 off

SKILL LEVEL 2. 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 microprocessor. The ET-100 is ideal for breadboarding computer circuits that interface to the 8088. 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, video output must be displayed on a monitor, like an NTSC composite video monochrome monitor.

Keyboard is 3½"H x 18¼"W x 7¼"D. Main dimensions are 4½"H x 18¼"W x 12½"D. Uses 100-135/200-240 VAC, 50/60 Hz.

Kit ET-100 Ship wt. 33 lbs. ...... *Was* $799.95 *Now* **$699.95**
Assembled ETW-100 Ship wt. 33 lbs. **$1095.00**

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Save $650

Expansion Accessory turns Trainer into a 16-bit disk-based computer system

With this accessory, you can modify your ET-100 trainer/computer to run 16-bit software applications like data processing, telecommunications, and financial analysis. Once modified, your computer will have 128K bytes of user RAM expandable to 192K with the addition of accessory Z-205-1. It also has high resolution graphics. 64K of video RAM provides dot addressable video graphics expandable to 192K.

This package consists of 2 circuit boards and a 16KB MTR-100 boot ROM. Two full RS-232C serial ports and a Centronics compatible parallel port let you communicate with printers, modems and voice synthesizers. And you also get an independent programmable timer. In addition, this accessory features a 5½" double-sided external disk drive with 360KB storage. Has dimensions of 8⅝"H x 15"W x 8⅞"D.

Configurations:
Assembled EWA-100-B
Ship wt. 70 lbs. .... *Was* $1650.00 *Now* **$1000.00**
Assembled EWS-100-B Includes ETW-100 and
EWA-100-B. Ship wt. 92 lbs. **$1900.00**

Accessories:
ETA-100-1 Extra Removable Breadboard, 1 lb. **$29.95**
Z-205-1 64K RAM Upgrade, Ship wt. 1 lb. **$40.00**

Operational Amplifiers Course

A detailed study of one of the most popular devices used in electronics. This thorough course includes op-amp parameters, basic op-amp linear circuits, integrator and differentiator circuits and more. You'll learn about current/voltage and voltage/current converters, generators, active filters and bipolar FET op-amps, as well as single supply operation and nonlinear signal processing circuits. You'll also design and predict the performance of various op-amps, and design and construct an instrumentation amplifier circuit. To take this course, you'll need a background that includes the Basic Electronics Series (pages 58-61). Comes with a 368-page textbook and parts for performing the 36 experiments. The experiments require the ET-3300-B Trainer (at right), an oscilloscope, multimeter, and frequency generator. Worth 3.0 CEUs (see page 57).

EE-101 Ship wt. 5 lbs. **$49.95**

Active Filters Course

With this 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 gain this proficiency through the stimulating experiments, each requiring the ET-3300-B Trainer (right), an oscilloscope, multimeter, and frequency generator. To get the most out of this course, you'll need knowledge from the Basic Electronics Series (on pages 58-61). This excellent course comes with textbook and a big parts package including resistors, controls, capacitors, diodes, transistors, ICs, an inductor, and a pushbutton switch. Pass the final exam and you'll earn 3.0 CEUs (see page 57).

EE-102 Ship wt. 5 lbs.
Was $44.95 . . . . *Now* **$29.95**

Phase-Locked Loops Course

Look into PLL principles, phase detectors, voltage controlled oscillators, loop filters, digital frequency synthe-sizers and much more. 14 interesting experiments give you a chance to measure phase difference and work with devices like the Exclusive OR Phase Detector, Edge-Triggered Phase Detector, MC1648 VCO, 741 Active Filter, 7490 and 7492 TTL Counters, CMOS 4017 Counter, 74192 Programmable Counter with Display, and the Tone Decoder. Before taking this course, you should complete the Fundamental Electronics Series and EE-3201-A Digital Techniques (on page 62). For the experiments, you'll also need the ET-3300-B Trainer (right), a dual-trace oscilloscope, and an audio signal generator. Comes with textbook and parts. Worth 3.0 CEUs (see page 57).

EE-104 Ship wt. 5 lbs. **$54.95**

Plug-in Breadboard Trainer

SKILL LEVEL 1 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, the Trainer comes with 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. And it's all powered 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 (±4%) at 1.5 amps, +12 volts DC at 100 mA, and −12 volts DC at 100 mA. All supplies are short-circuit protected.

Requires 120 VAC, 60 Hz power. UL listed. 3½″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**

Robotics and automation

Arm with five axes of motion

Head that rotates 350 degrees

Voice synthesizer

Sound detector

17-key hexadecimal keypad

Teaching pendant for quick, easy programming

Top-mounted breadboard

Light detector

Ultrasonic motion detector

Six 7-segment LED display

Ultrasonic sonar system

On-board 8-bit microcomputer

Front steering wheel with optical encoder

Powerful DC stepper motor

Circuit board side panels

Eight motors that control all HERO movements

HERO® 1 Robot Trainer

3. An ideal teaching tool, HERO 1 is a completely self-contained robot that interacts with you and its environment. It's excellent for learning the components and circuitry of robots, as well as artificial intelligence.

HERO 1 has incredible sensing capabilities. It 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 200 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 direction and ranges between objects and the robot from 4" to 8' away. An optical encoder provides precise measurements of distance traveled.

To make HERO 1 even more life-like, the head rotates 350 degrees to position sensors and arm. Seven stepper motors control all movements. Plus powerful front wheel DC motors drive and steer HERO 1 with exceptional maneuverability.

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. A top-mounted breadboard lets you conduct experiments and interface circuits of your own design to the on-board microprocessor. Plus HERO 1 comes with a six 7-segment LED display for viewing memory addresses, data and program steps.

Commanding HERO 1 is easy with four different methods available to you. A top-mounted 17-key hexadecimal keyboard lets you easily enter, verify and modify programs, and select operating modes. 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 an optional remote, radio frequency-controlled transmitter available in two models, each operating at a different frequency. You can also guide HERO 1 by directly linking a host computer with the help of the optional Memory Expansion Board and RS-232 Interface that plugs into the top experimental HERO 1 breadboard.

HERO 1 is powered by four gel cell rechargeable batteries. A 120/240 VAC, 50/60 Hz charger is included. HERO 1 is 20" high, 18" in diameter and weighs 39 lbs. with accessories.

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. .... *Was* $1699.95 *Now* **$1499.95**

Kit ETS-18-37 HERO 1 with Arm and Remote Control operating at 75.43 MHz and with voice. Ship wt. 89 lbs. ... **$1299.95**

Kit ETS-18-38 HERO 1 with Arm and Remote Control operating at 75.67 MHz and with voice. Ship wt. 89 lbs. ... **$1299.95**

Assembled EWS-18-35 HERO 1 with Arm and Remote Control operating at 75.43 MHz. Ship wt. 95 lbs. .. **$1995.00**

Assembled EWS-18-36 HERO 1 with Arm and Remote Control operating at 75.67 MHz. Ship wt. 95 lbs. .. **$1995.00**

Accessories:

Kit ET-18-1 HERO 1 Arm with gripper mechanism. Moves through five axes, picks up small objects, and can lift 16 ounces when retracted. 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. Simulates human speech and speaks in complete sentences in English and other languages. 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. Ship wt. 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**

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

and a serial interface cable.
Ship wt. 1 lb. **$49.95**

$AVER! 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.
Ship wt. 1 lb. **$59.95**

Robotics and Industrial Electronics Course

Our Robotics and Industrial Electronics Course teaches you how robots work, in twelve exciting units. After a review of elementary principles, you'll be introduced to robot mechanics, computer control and low, medium and high-technology robots. From there, you'll learn about 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 overall view 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. You'll learn about the design of microprocessors, microcomputers and microprocessor controllers.

You'll need your HERO 1 (opposite page) and a multimeter to perform the optional experiments. We recommend that you complete EE-3101-A DC Electronics (p. 58), EE-3102-A AC Electronics (p. 58), EE-3201-A Digital Techniques (p. 63), and EE-3401-A Basic Microprocessors (p. 64) before taking this course, or have an equivalent knowledge.

You'll find the 1113-page textbook very thorough. The final exam both recaps important points and enables you to earn 8.0 CEUs (see page 57).

EE-1800 12 lbs. *Was* $99.95 *Now* **$69.95**

Advanced Programming Experiments

Master the operation of HERO 1 (opposite page) 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. You'll learn everything you need to use special RAM addresses and make HERO's experimental board send and receive data. You'll find out how to use all of HERO's sensors and program HERO's response to what it senses. You'll understand how to modify taught programs, program HERO to simulate a variety of tasks, and use HERO's Sleep and Pause commands in applications. With these experiments, you'll even learn how to write your own interpreter for your own interpreter commands.

EB-1802 Ship wt. 1 lb. **$24.95**

$100 OFF! ROBOTICS TRAINING $AVER$

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**
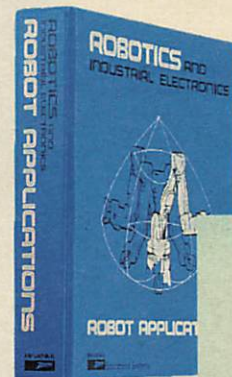
Robotics Applications Course

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 study in depth 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. 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 (opposite page). 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 (see page 57).

EE-1812 Ship wt. 6 lbs. **$99.95**

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Electronic Voice Synthesizer

Temperature and Sound Sensors

Optional on-board 5¼" DSDD Disk Drive

Rechargeable Gelled Electrolyte Battery

Optional Autodock System

Two-wheel Dual Servomotor Drive System

360° Sonar and Light Scanner

16-bit Master Processor and Eleven 8-bit Slave Microprocessors

Articulated Arm

Gripper with Sense of Touch

Radio Remote Control Console with Keyboard, Display, and Teaching Pendant Mode

HERO® 2000

SKILL LEVEL 3 The first of the next generation of training robots. HERO 2000 will help you explore the related technologies of robot automation programming, electronics for automation, intelligent machines and robotics. And it will do it better than any other training aid available.

HERO 2000 features advanced programmability. This incredible robot has a 16-bit 8088 master microprocessor that runs user programs and eleven 8-bit peripheral microprocessors. This lets you simultaneously operate HERO 2000's sensory and manipulative functions. There's also HERO 2000 BASIC stored in the 64K ROM, while other built-in programs are for demonstrations, diagnostics and sensor adjustment routines. What's more, HERO 2000 can even write its own BASIC program.

HERO 2000 has unbelievable expandability. Besides having amazing computational abilities, HERO 2000 features 24K of RAM expandable up to 576K – with the use of 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 (optional) expands HERO's capabilities by allowing you to store and retrieve programs and data on a 5¼" floppy disk. The drive includes the MS-DOS operating system and requires the ETW-19-15 Expansion 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.

HERO possesses unsurpassed flexibility. 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 synthesized voice lets HERO talk, play music and even emit sound effects. And for easy programming, HERO 2000 has direct text-to-speech conversion. The built-in sensors include a 360° sonar with a range of 4.5 inches to 10.5 feet; a light scanner with 255-level coverage at

24 bearings, 15° apart; a temperature sensor that covers from +60°F to +90°F; and a sound sensor that picks up 255 audio levels.

And for maneuverability and manual dexterity, HERO 2000 is second to none. The optional robot arm is multi-jointed with a gripper that has a sense of touch. The arm lifts one pound in any direction, plus has full wrist action and accurate repeatability. Additionally, a powerful two-wheel dual servo-motor drive system pulls up to 26 pounds, while an optional auto-docking accessory enables HERO 2000 to automatically dock with its charger when a low battery voltage is detected. With all these abilities, you'll think this robot is almost human!

Everything's totally under your control. You'll be able to access ROM routines and perform movements from the top-mounted hexadecimal keypad or the optional wireless remote control (included with an assembled HERO 2000). The remote control console features a typewriter-type ASCII keyboard, 80-character LCD display and teaching pendant controls. This incredible console permits wireless control and programming of all functions up to 100 feet away. There's even a two-way radio data link between console and robot. HERO 2000 requires the Remote Console or a computer terminal for programming and checkout routines.

Other sensational features include sixteen head-mounted LED status indicators (eight are user definable) to 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.

HERO 2000 – by far the smartest, most versatile and easy-to-use robot trainer around.

Configurations:

Kit ET-19 HERO 2000 Robot without Arm.
Ship wt. 108 lbs. $1388.00
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 the shipping crate.
Ship wt. 147 lbs., Mtr. Frt. $4499.95
$AVER! **Kit ETS-19-A** Save over $500 on ETS-19 HERO 2000 Robot with Arm and Remote Control, ET-19-14 and ET-19-51 Accessories and Courses EE-1900 and EE-1901.
Ship wt. 191 lbs. . . . . . . *Separately* $2999.95 *System* **$2495.00**

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.
Ship wt. 10 lbs. **$499.95**
Kit ETS-19-36 75.67 MHz Remote Control.
Ship wt. 10 lbs. **$499.95**
ET-19-3 Robot Carrying Cart. Ship wt. 19 lbs. **$99.95**
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**
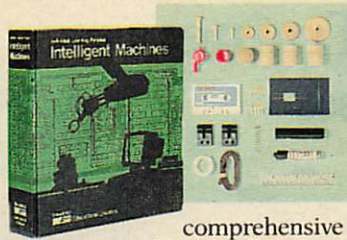
Intelligent Machines Course

An excellent opportunity to gain an understanding of both the operation and application of intelligent machines. In five comprehensive units you'll learn what machine intelligence is, what makes up an intelligent machine system, and how a system makes decisions. You'll learn how to communicate with an intelligent machine and pick up important information about input/output operations; sensory input devices; intelligent machine interface devices; motion; and robots, their components, characteristics, programming, and uses in CAD/CAM.

To perform the 15 exciting experiments, you'll need a HERO 2000 with arm and remote console. Plus, you should know AC and DC, semiconductors, and digital techniques, and be familiar with BASIC language programming.

This course includes a comprehensive text, experiment parts, robot program tape and exams. Worth 3.0 CEUs (see page 57 for information about CEUs).
EE-1900 Ship wt. 8 lbs. . . . . *Was* $99.95 *Now* **$69.95**

Electronics for Automation Course

This course teaches you the concepts and operating principles of the electronics, sensory devices and control circuits used in automated systems. You'll also see how everything comes together in vision systems and tactile sensing systems.

With the 13 experiments you'll get hands-on experience with temperature position and proximity sensing, motor speed measurement, opposed optical scanning, and much more. And it's all done with the HERO 2000, arm, remote console, and ET-19-14 Experimenter Card. This course requires a background in AC and DC, semiconductors, digital techniques, and BASIC language programming. Comes with text, parts package, and exams. Worth 6.0 CEUs (see page 57).
EE-1901 Ship wt. 11 lbs. **$99.95**

Programming and Interfacing Course

This course is an effective way to learn about both the hardware and the software aspects of the automation trainer and various robotic subsystems. In six units you'll look at HERO 2000's features, characteristics, and monitor ROM, plus speech synthesis, motor movement, sensory systems, and interfacing. Includes 17 experiments performed on a HERO 2000 with arm and remote. To take this course, you should be familiar with BASIC language. Comes with text, parts and exams. Worth 6.0 CEUs (see page 57).
EB-1950 Ship wt. 5 lbs. **$59.95**

Robot Arm Trainer

Reduced $800

3. The Robot Arm Trainer is designed to simulate the operation of full-scale industrial robots. 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, including wrist pitch and roll for precise pick-and-place movements. The Arm can lift 1 lb., Gripper force is 0 to 3¾ lbs., while the gripper opening is 4⅜." There's also a patented sense-of-touch gripper that is programmable to exert specific amounts of force. Range of motion for the torso is −180 to 170 degrees; for the arm, 0° to 140°; for the elbow, 0° to 180°; for wrist pitch, −90° to 180°; for wrist roll, −180° to 180°; and for the gripper, 0 to 8 arbitrary units. The axes speed of motion for the torso is 8 to 33 degrees per second; for the Arm, 3° to 15°; for the elbow, 3° to 15°; for the

wrist pitch, 15° to 70°; for wrist roll, 15° to 70°; and for the gripper, 1.8°.

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 micropressor.

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. And 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. Reset the switch and the Trainer resumes the task at the point of interruption. Also, 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 are 48KB RAM, 32KB ROM, and a Z80A control CPU operating at 4 MHz. The Robot Arm Trainer also comes with 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 aids in alignment procedures and provides 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 – both built to last.

Kit ETS-19-32 Ship wt. 52 lbs.
Was $1795.00 . . . . *Now* **$995.00**
Assembled EWS-19-32 Ship wt. 55 lbs.
Was $2795.00 . . . . *Now* **$1995.00**
Accessory: **ETW-19-31** Cassette
Interface. Ship wt. 1 lb. **$99.95**

Save $20

Industrial Robotics and Automation Course

With this course, you'll learn about the physical and operating characteristics of a robot, servo control systems, and the components of hydraulic and pneumatic power supplies, along with comparisons of these systems to an electrical power system. Also, you'll

learn the application for sensing/control/feedback devices used by a robot, plus you'll program a typical robot and workstation. To take this course, you should be familiar with the BASIC programming language. To perform the exciting experiments you'll need the Robot Trainer. Pass the optional final exam and earn 4.0 CEUs.

EE-1903 8 lbs. *Was* **$99.95** *Now* **$79.95**

Introductory Courses

EDUCATION

Linear Circuits Course

Learn basic circuit operation and modifications through concise descriptions and schematics. With the exciting experiments that come with this course, you'll construct over 30 linear circuits including various amplifiers and modulators. To perform the experiments you'll need the ET-3300-B Trainer (page 67). A background in DC and AC Electronics and Semiconductor Devices is necessary to take this course, worth 4.0 CEUs (see page 57). Comes with text, exams, and parts.

EH-701 Ship wt. 2 lbs. **$49.95**

Beginning Electricity Course

This audio 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. This course comes with a text/workbook in a heavy-duty binder and exams worth 1.0 CEU (see page 57) when you pass with a score of 70% or higher. Plus the pre-recorded cassette tapes will let you turn even your car into a classroom.
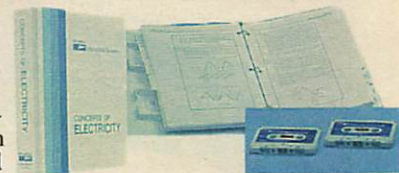
EE-3100 Ship wt. 5 lbs. **$24.95**

Soldering Course

Now you can learn professional soldering facts and techniques at home. With this hands-on course you'll learn everything you need to know about soldering including the chemistry of soldering, proper soldering iron size, and the cleaning and tinning of the soldering iron. This course comes with a comprehensive, well-illustrated textbook that's easy to read. You also get all the parts you'll need to practice what we teach.

EI-3133 Ship wt. 3 lbs. **$19.95**

Printed Circuits Course

This course teaches you all the steps necessary for making circuit boards from scratch. You'll put your knowledge into practice with an actual photoelectric lamp switch and touch switch. And you'll do it with the help of our well-illustrated textbook and our complete parts package. Use the included comprehensive exam as an excellent way to review before you take it for credit. You'll pick up 2.0 CEUs (see page 57) on successful completion.

EI-3134 Ship wt. 7 lbs. **$69.95**

Concepts of Electronics Course

This 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. Plus, you'll gain additional insight with the included hands-on experiments. Concepts of Electronics comes with a text in a three-ring binder and a complete parts package. You, however, must supply the ET-3600 (p. 59) or ET-3300-B (p. 67) Trainers for the experiments. Worth 4.0 CEUs (see page 57).
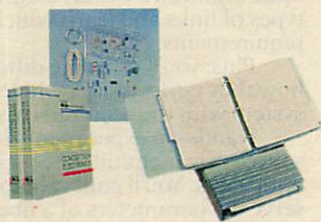
EE-3140-A Ship wt. 9 lbs. **$54.95**

Tutorial Dictionary

Defines terms in 832 pages and contains a summary of 16 electronics-related topics.

EB-1010
Ship wt. 3 lbs. **$14.99**
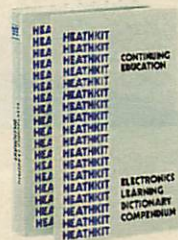
Credit card orders call TOLL-FREE
24 hours a day:
1-800-253-0570
Michigan residents call:
1-800-782-2702

73

Electro-optics
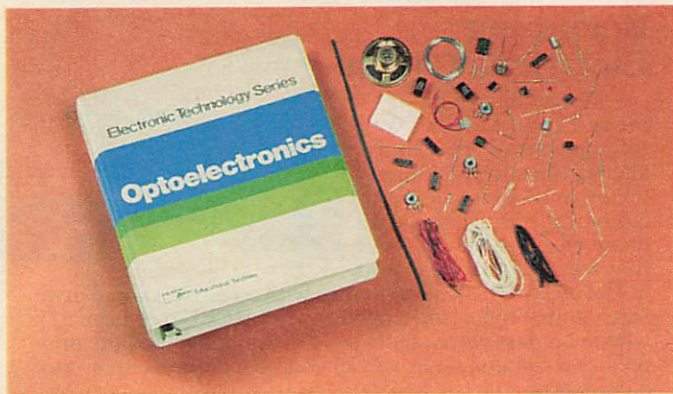
Optoelectronics Course

With this course, you'll pick up important knowledge on light sources and different types of optoelectronic displays available, including 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.

You'll develop an understanding of the electromagnetic, optical and visible spectra, as well as basic optical terms and concepts. You'll also learn the types of light sources available to the designer along with the advantages and disadvantages of

each. You'll receive a thorough background in fiber optic theory and operation, including past, present and future applications as well as its advantages and disadvantages. And when you've completed this course, you'll have a valuable insight into the broad applications of optoelectronics.

In seven exciting experiments, you'll use equipment like the ETW-3300-B Laboratory Breadboard Trainer (page 67), a multimeter and an oscilloscope to come into direct contact with the concepts and devices you'll read about. You'll experiment with incandescent lamps, light-emitting diodes, segmented displays, photocells, photodiodes, and phototransistors. And you'll work with source/sensor pairs and fiber optic transmission.

To take this course, you'll need to have successfully completed the EE-3101-A DC Electronics and EE-3201-A Digital Techniques courses (pages 58 & 63, respectively). This superior course comes with textbook and a parts package including resistors, photocells, LEDs, and integrated circuits. You'll also get solder, a fiber optic cable, a speaker, a breadboard connector block, heat-shrinkable tubing, a hook-up wire, and a transistor. Pass the optional exams and you'll receive 3.0 CEUs (see page 57).

EE-105 Ship wt. 5 lbs. **$64.95**
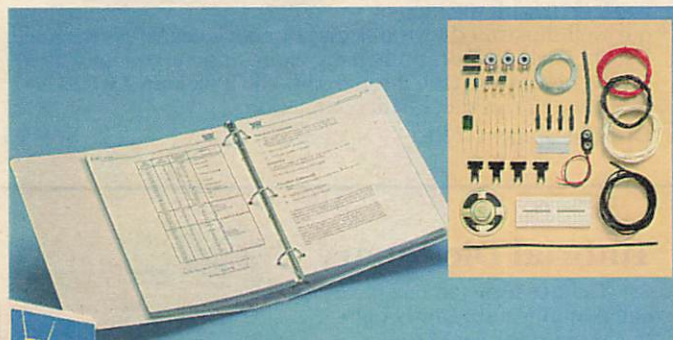
Fiber Optics Course

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. You'll also look at laser emissions and principles assocated with the injection laser diode used 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.

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 (page 63), or ET-3200-B Digital Trainer, an oscilloscope, multimeter and common hand tools (not included). All other necessary parts are furnished.

When you've completed this course, along with your other knowledge, you'll be thoroughly familiar with the electromagnetic spectrum. You'll understand fiber optic interconnection devices and compare them in terms of cost and performance.

We suggest that you take EE-3101-A DC Electronics and EE-3102-A AC Electronics (page 58) or have equivalent knowledge before taking Fiber Optics. Worth 3.0 CEUs.

EE-4201 Ship wt. 6 lbs. **$99.95**
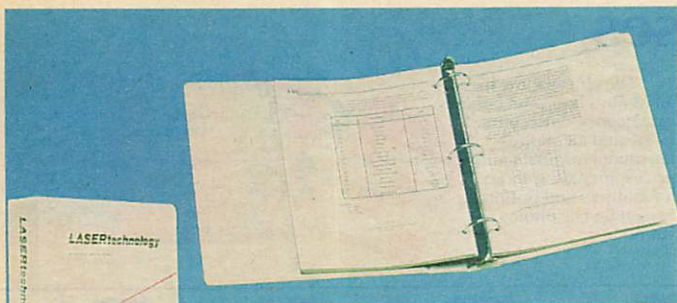
Laser Technology Course

Be on top of one of the most thrilling breakthroughs in technology with our Laser Technology Course. Lasers are being used in many areas including medicine, industry, communications, and earth and space sciences. 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.

Since lasers are powerful, you will also learn about their effects on and potential hazards to the world around you. You'll become familiar with the way your eye transmits and absorbs light, and how it can be damaged by visible radiation. You'll study damage from ultraviolet wavelengths, the effects of infrared radiation, plus much more.

When you finish this course, your knowledge of laser technology will be complete. You'll learn how laser light is generated, and how it can be modulated. You'll learn what laser accessories to use with different lasers in a given application. You'll see exactly what characteristics laser light has in common with ordinary light. Plus you'll learn how each component contributes to the overall operation of the laser. You'll also see how to match the type of laser to the application. And you'll be shown how to calculate power density at the focal point of a lens, through the use of laser and optical parameters.

You'll go beyond ordinary book learning by performing 15 experiments on the ETS-4200 Laser Trainer/Receiver system (below). These experiments include transmitting and reproducing sound over a laser beam and measuring radiometric light. Plus you'll get a first-hand look at irradiance, diffraction and interference, beam diameter, refraction, critical angle, and focal length. You'll also get experience with collimation, reflection, Fresnel Reflection, mirrors, polarization, a laser interferometer, and light and data transmission.

To prepare yourself for this course, we suggest you first gain a knowledge of basic electronics and algebra. This stimulating course comes with textbook, parts package, and exams worth 3.0 CEUs (see page 57 for more information about CEUs).

Come explore with us.

EE-110 Ship wt. 7 lbs. **$99.95**

Receiver
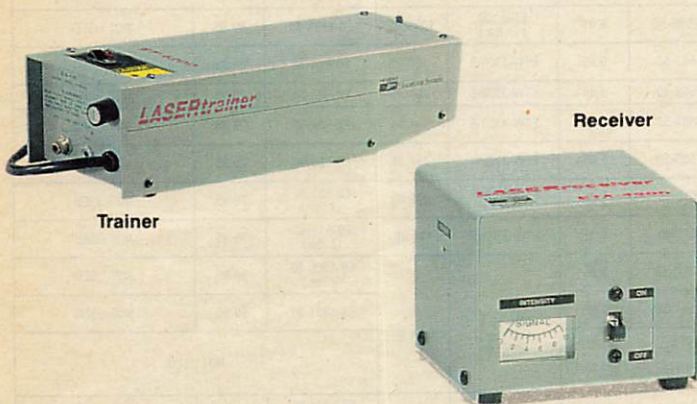
Trainer

Laser Trainer

The use of lasers in medicine, the military, security, construction and other areas is making laser training a must. And now you can get this training with the exciting Laser Trainer System from Heathkit Educational Systems.

Used in all experiments in the EE-110 Laser Course (above), the Laser Trainer has a Helium Neon (HeNe) gas laser that generates intense easy-to-see red light with a wavelength of 632.8 nM. With an output power of 0.4-0.9 mW, the beam has a diameter of 1/ePTS 0.49 mm, a divergence of 1.64 mrad and random Polarization. Plus the beam can be modulated up to 10% for voice experiments.

The Trainer's modulation circuitry – with a bandwidth of 300 Hz-40 kHz (±3dB) – demonstrates the latest communications technology. 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. You can even plug the included microphone into the trainer and send your voice over the beam. The microphone input is 100 mV peak-to-peak, designed for a crystal microphone of 50k impedance. Auxiliary input is 1 volt peak-to-peak.

The Laser Training System even includes a tripod mount and signal input jacks for use with an external signal source.

The Laser Trainer is a compact 3¼"H x 3¾"W x 13⅞"D. And it weighs only 2⅗ lbs. It requires 120 VAC, 60 Hz 15 watts of power.

Listed by Underwriters' Laboratory (UL) and the Canadian Standards Association (CSA).

Kit ETS-4200 Ship wt. 12 lbs. **$279.95**
Assembled EWS-4200-A Ship wt. 5 lbs. **$395.00**
$AVER! 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**

CAUTION
LASER RADIATION
DO NOT STARE INTO BEAM
HELIUM-NEON LASER
1.0 mW MAX OUTPUT
CLASS II LASER PRODUCT

Classroom Version Courses

All of our Individual Learning Programs are also available in classroom versions. Whether you're a college, technical school or corporate training instructor, these courses come with all the teaching support materials you need. Each course comes with a textbook, student workbook, and parts pack. For most courses you'll also get an instructor's guide containing learning objectives, course outline, exams, and answer keys.

The chart below lists all of our classroom courses by category, with course name and all applicable model numbers and prices, including those for trainers and optional cassettes. The choice is yours.

Category	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.)	324.95	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-A (5 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.)	1995.00	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.)	324.95	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.)	324.95	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.)	324.95	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.)	324.95	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	

Artificial Intelligence and Expert Systems Fundamentals Course

If you're a business manager, engineer, or technician, you'll find this introductory course advantageous. It provides you with a broad understanding of Artificial Intelligence, how it developed and where it's going.

In this comprehensive textbook you'll study how AI differs from conventional computing and the advantages and disadvantages of AI. You'll see how AI is applied in problem solving, robotics, computer vision and much more. You'll also look into knowledge representation from deductive and inductive reasoning to propositional logic. You'll even study search methods like the blind search, combinatorial explosion, and forward and backward reasoning.

A large part of this course focuses on expert systems. You'll study a few specific ones where you'll get a solid understanding of the benefits and negative aspects of Expert Systems, as well as the comparison between stand-alone and embedded systems. You'll study how expert systems work and how they are applied in control, diagnosis, planning and more.

Your knowledge of Expert Systems will be further expanded as you learn how they are developed. You'll study the ten steps in creating such a system; how to identify problems, determining the suitability of the problem in question, consid-

ering the alternatives, computing the ROI, selecting a development tool, and designing the system.

This course also helps you develop an understanding of natural language processing and voice recognition. You'll look at language, linguistics, vocabulary and lexicon, as well as grammer, syntax, and semantics. You'll see how natural language processing programs work and how natural language processing is applied in the real world, from natural language interfaces and language translation to grammer analysis and abstracting. When you've completed this course, you'll also know how speech recognition is applied, the classifications of speech recognizers, and how speech recognition systems work.

Not only will you gain all this valuable knowlege, but you'll also get credit for having gained it. After successfully completing the optional final exam you'll earn 6 CEUs (see page 57) and receive a certificate of recognition.

Included with this easily readable two-volume course are experiments on two 5¼" floppy disks. With them, you'll perform 13 different experiments designed to introduce you to the field of AI software. Plus, you'll really benefit from a two-disk demonstration of Texas Instrument's PC Easy Expert systems program (below). To perform the courses, you'll need a Heath/Zenith Personal Computer or compatible equipped with 512KB of RAM and one disk drive.

To take this course, you should have a general knowledge of computer operation and the BASIC programming language.
EC-1126 Ship wt. 6 lbs. **$99.95**

Personal Consultant Easy Software

This quality AI software from Texas Instruments is an excellent tool for learning about and developing expert systems. Use it to quickly and efficiently create a system to solve business, scientific, technical and other problems.

Personal Consultant Easy Software has powerful and helpful features that give it its "easy" name. Easy Software comes with an example-based, tutorial style manual and on-line helps including pop-up windows for text or graphics, cursor-sensitive helps and documentation lines to clarify information or explain a process.

Easy Software even has a certainty factor input and calculation to handle uncertain or incomplete user input and/or imprecise knowledge. There's also rule prioritization capabilities to control the order in which rules are tried in the inference process.

With this incredible software, you can even capture and display graphic images using standard third-party graphics editors. You can also access information from external DOS files or the popular dBASE* II, III, and III Plus data base packages.

To run this software, you'll need a Heath/Zenith PC or compatible with 512K RAM and one disk drive.
EC-1127 Ship wt. 5 lbs. **$495.00**

*dBASE II and III are trademarks of Ashton-Tate.

Microcomputer Professor

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 address your particular problems.

Besides the basics of knowing what you're working with and how you work it, you'll soon be able to do a computer purchasing needs assessment, and relate these needs to software and hardware requirements; choose a proper location for your computer system; identify and troubleshoot hardware and software problems; and perform routine preventative maintanance.

This practical course comes with a textbook written especially for the beginner, MS-DOS Version 3 Quick Reference Guide, Demo Disk needs assessment worksheets, and two sets of 10 disk labels. You'll also enjoy the hands-on experiments that illustrate course concepts. For these experiments, you'll need a Heath/Zenith or IBM PC or compatible computer using the MS-DOS operating system. Successfully pass the optional final exam and receive 2.0 Continuing Education Units (see page 57 about CEUs).
EC-1123 Ship wt. 5 lbs. **$49.95**

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MACRO-86 Assembly Language

Learn to program virtually any computer using the familiar Intel 88/86 series of microprocessors and Microsoft DOS. You'll learn about the internal structure of the 8088 microprocessor and look at instruction and data flow. You'll also learn how to structure COM- and EXE-type programs, develop flowcharts and design program arrays, structures and records. On finishing this course, you'll even know how to program the CPU portion of the Intel 80188 and 80186 microprocessors.

Other useful skills you'll pick up include: performing arithmetic operations with signed and unsigned binary numbers, and packed and unpacked decimal numbers; inputting and outputting data; developing interrupt service routines; designing macro instructions; and combining multiple program source listing files.

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 also 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 89. In addition, you should be familiar with binary and hexadecimal number systems, computer math and operating system operation. You should also have access to system programs (and supporting files). Course comes with 940-page textbook and exam set. Pass the optional final exam and earn 5.0 Continuing Education Units (see page 57 for CEU information).

EC-1201 Ship wt. 10 lbs. **$59.95**
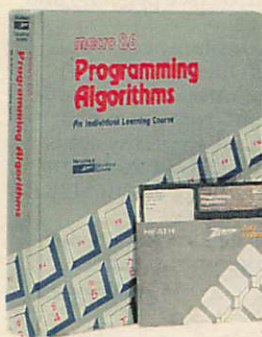
MACRO-86 Programming Algorithms

A natural follow-up course to MACRO-86 Assembly Language (above) that teaches you how to use algorithms to solve problems on a computer.

Your MACRO-86 programming abilities will be greatly enhanced by the information you pick up in this course. You'll be able to develop a clear problem definition. You'll learn to write algorithms and translate them into MACRO-86/Intel 8088 mnemonics. You'll also become familiar with the use of arrays, stacks and linked lists. You'll learn the techniques for integer operations, plus how to compress and expand files to use space as needed. You'll become familiar with the insertion, shell and heap sorting methods and even learn the difference between linear and binary searches. Plus, you'll be able to write routines to: search text files; encrypt and decrypt files using the substitution method when the key is known; and perform simple floating point operations, including addition, subtraction, multiplication, division, extracting a square root, finding the sine and cosine, and input and output.

Through the seven course experiments, you'll get a chance to do some stimulating work. You'll use one- and two-dimensional arrays, search and sort data, search strings, handle multiword integers, and determine the square root of a number. The course experiments are written for computers using the Intel 8088 microprocessor such as: the H/Z-100, Heath/Zenith PCs, an upgraded ET-100 Trainer, and the IBM PC or compatible. The MS-DOS operating system and MACRO-86 Assembler (not supplied) are used in all experiments. A 5¼" floppy disk, included with the course, contains experiments, programs and demonstrations. A programming pad is also included.

To take this course, you should be familiar with binary and hexadecimal number systems, computer math and operating system operation. With such preparation, you should have no trouble understanding the material and passing the optional final exam, worth 4.0 CEUs (see page 57).

EC-1202 Ship wt. 6 lbs. **$59.95**

MS-DOS* Course

If you're a novice computer user, we've designed this course just for you. With it, you'll pick up everything from information for the novice to how to use common Assembly Language utilities.

This course teaches you how to operate a computer using MS-DOS, explain the operation of the MS-DOS command line and list the built-in MS-DOS commands. You'll also find out how to: list and identify the fundamental MS-DOS utilities; create and use batch files; operate the EDLIN text editor; and examine and change programs using the MS-DOS debugger utility. On completing this course, you'll even be able to explain how to interface Assembly Language programs to logical MS-DOS devices using system subroutines.

You'll find this course sequenced just right for effective learning. You'll 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 bebugger. And you'll see how MS-DOS Version 1, Z-DOS and PC-DOS are organized with instructions on all the built-in commands.

Fifteen computer exercises included on a 5¼" floppy disk give you an opportunity to use MS-DOS Version 1 features and commands. You can use this course with an H/Z-100 Desktop, Heath/Zenith PC, an upgraded ET-100 Trainer, IBM PC or PC compatible. You must, however, use 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 89. 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 (see page 57).

This information-packed course features a textbook in a heavy-duty three-ring binder. The text material is accompanied by exercises that provide computer experience and a 3-cassette narration that guides you through the course.

EC-1121 Ship wt. 6 lbs. **$59.95**

*MS-DOS is a registered trademark of Microsoft Corp.

CAD/CAM Course

With this exciting computer-aided design (CAD) and computer-aided manufacturing (CAM) course you'll gain much-needed information about the advancements in tools and techniques that are rapidly occurring in the manufacturing environment. You'll study the workstation concept, hardware, software, the cost parameters associated with CAD/CAM, numerically controlled machinery, data communications and intelligent machines.

You'll also learn about robotics, factory management, and manufacturers' automated protocol. Other related areas you'll be interested in include advanced CAM systems, local area net-works, process planning, and material requirements planning.

But the highlight of your experience will be the seven on-disk experiments. For these, you'll use the included AutoCAD software to make and modify CAD drawings, create symbols, zoom in to show microscopic detail and zoom out for a macroscopic overview – the perfect way to develop skills in computer-aided design.

The experiments require a Heath/Zenith or IBM PC compatible computer equipped with 256K RAM, two 5¼" disk drives, and CGA or Hercules video capability.

You get all this, plus 6.0 CEU (see page 57 about CEU's) credits upon passing the final exam.

EES-109 Ship wt. 12 lbs. . . . . *Was* $79.95 *Now* **$49.95**
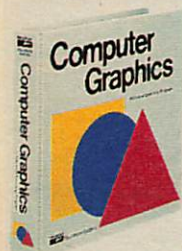
High Resolution Graphics Course

Written for the beginner or experienced programmer, this course presents a broad overview of a whole new world from creation to stimulating professional careers.

This course comes with programming experiments and solutions on a 5¼" floppy disk, written in Microsoft BASIC. With them, you'll draw lines and figures using pixels; use advanced color graphics commands; merge text with graphics; animate graphics; learn how to photograph on-screen graphics using ordinary camera equipment; and learn to control the video screen of your computer.

For the experiments, you'll need an H/Z-100, a Heath/Zenith PC, or an IBM PC equipped with a color graphics card. You'll also need Microsoft BASIC (ZBASIC or GW-BASIC version 1 or 2), or BASICA for an IBM PC. We provide sketching worksheets with acetate overlays.

If you are familiar with your computer's operating system and have a working knowledge of Microsoft BASIC programming language, you have all the background you need to take this course. An understanding of simple algebra is also helpful.

A truly fun learning experience, worth 6.0 CEU's (see page 57 for more information about CEU's).

EC-3000 Ship wt. 6 lbs. **$39.95**

Software for your computer

These software packages run on Heath/Zenith Personal Computers and compatibles equipped with a 5¼" disk drive and 128K RAM, and using MS-DOS Version 2 or later.

Professor DOS: A menu-driven tutorial that teaches common DOS concepts and applications, plus basic and advanced commands – all through DOS simulation. For intermediate computer users ages 13 to adult.

ECT-1005 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 than any other of its kind. With it you'll learn to create and edit worksheets. Contains both version 1.0 and 2.0 of Lotus 1-2-3. To use this software effectively, you should have some computer experience and understand the DOS system.

ECT-1007 Ship wt. 1 lb. **$69.95**

dBASE III Tutorial: If you're a beginner or advanced user, you're sure to learn a lot about creating databases from this in-depth tutorial. Has excellent graphics, animation, and helpful "What do I do next" entries.

ECT-1008 Ship wt. 1 lb. **$69.95**

Improve your touch typing skills with this personal typing tutor

TYPING TUTOR IV is a unique keyboard instruction program. First this tutor program tests your typing ability. Then it continually adjusts to your improving proficiency level. If you're a beginner, start off with just a few keys. This typing tutorial program will automatically add more keys until you're accurately and easily typing the whole alphabet, numbers and punctuation. Lessons and tests are automatically tailored to your unique requirements and learning advancement.

An arcade style LETTER INVADERS game is also included. It enables you to sharpen your typing skills while having some fun at the same time. Both the game and typing tutorial program are easy to use with one-key on-screen help messages. Requires a Heath/Zenith PC, an IBM PC or compatible using the MS-DOS operating system.

EZ-1010 Ship wt. 1 lb. **$49.95**

Complete computer workstations

Word Processing
Workstation

eazy pc

A fresh, bold approach to computers for Zenith Data Systems has made powerful computing simple and affordable. The eazy pc...Zenith's lowest priced personal computer...is the easiest to learn and to understand PC ever.

The eazy pc is a compact, one-piece PC-compatible system offering superior video technology, advanced 3½" disk drives and professional features needed by most PC users.

Plug it in, just like a TV. Once you turn the system on, it tells you in plain English exactly what to do. You can be up and running in under 30 minutes.

All eazy pc models come with 512K RAM and can be expanded to 640K. An attached 14"-diagonal page white monitor delivers sharp, high resolution text and graphics. And all eazy pc models use high capacity 3½" floppy drives that store up to 720K of data.

GW-BASIC and MS-DOS are included but there is no need to memorize DOS commands. Thanks to MS-DOS Manager which is also included.

Student Workstation

$999⁰⁰

- **eazy-pc with one floppy drive**
- **MS-DOS operating system**
- **MS-DOS Manager**
- **Mosaic Integrated 7 + software**
- **GW-BASIC programming language**
- **Epson LX-800 dot matrix printer**

Assembled PBS-2
Ship wt. 45 lbs. $999.00

And when you purchase this powerful, flexible and affordable student workstation you can also get a

- **Modem/Serial Port/128K RAM Module with CPS communications software**
for only $149.00. Plus we'll add a
- **HUG membership**
so you can keep in touch with other Heath/Zenith computer owners.

Word Processing Workstation

$1499⁰⁰

- **eazy pc with dual floppy drives**
- **MS-DOS operating system**
- **MS-DOS Manager**
- **Microsoft WORKS for writing**
- **Epson LQ-500 high speed dot matrix printer**
- **Surge protected outlet strip**
- **All interconnecting cables**

Assembled PBS-11
Ship wt. 57 lbs. $1499.00

And with this workstation you can purchase the time-saving

- **SK-203 Heathkit Printer Buffer** for only $99.00. This is $100 off the regular catalog price of $199.95.

FREE Partnership Pack

Save up to $500 with the discounts you'll find inside a Heath/Zenith Partnership Pack included with each kit or assembled computer. The Pack is filled

with valuable certificates designed to get you up and running with your new computer. Plus it will supply you with support through your very important first year of ownership.

The 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 and free software.

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- **Zenith Data Systems Laptop Computer with dual floppy disk drives**
- **Epson portable printer**
- **2400 baud modem**
- **MS-DOS operating system**
- **Windows software**
- **Integrated 7 + software from Mosiac**
- **Multiplan for accounting**
- **Write/Paint for writing/drawing**
- **GW-BASIC for programming**
- **HyperAccess communications software**
- **Interconnecting cable**
- **Padded laptop carrying case**

Ideal for on-the-go business people or engineers...even students. Call for specifics. Or give us a call and see how we can put a special package together for you at a price to fit your budget.

Assembled PBS-20
Ship wt. 47 lbs. **$2499.00**

Use our TOLL-FREE line 24 hours a day:
1-800-253-0570
Michigan residents call:
1-800-782-2702

Portable Workstation
$2499⁰⁰

- **Z-159 Zenith Data Systems PC with dual floppy drives**
- **ZVM-135 color monitor**
- **Epson FX-286-E printer**
- **MS-DOS operating system**
- **Windows software**
- **GW-BASIC for programming**
- **Write/Paint for writing/drawing**
- **MS-DOS Course**
- **Micro Professor Course**
- **Kensington AC Director**
- **Analog Game Port Card**
- **Kraft Joystick**
- **Interconnecting cables**

Educate...Entertain... Experiment...You can do all three with this impressively equipped workstation.

Assembled PBS-30
Ship wt. 143 lbs. **$2499.00**

And when you purchase this workstation you have the option of purchasing...

- **2400 baud external modem**
- **HyperAccess communications software**
- **Interconnecting cable**

for only $199. This can put you on-line to the world.

1-year limited warranty on all Heathkit products. Other manufacturer's products covered under separate warranties. Heath Company reserves the right to substitute products with those of equal or greater value and/or capability.

Education and Entertainment Workstation
$2499⁰⁰

- **Zenith Data Systems Z-286 PC in a compact, space-saving cabinet**
- **14″-diagonal amber monitor with enhanced EGA capability**
- **Epson EX-1000 136-column printer**
- **MS-DOS operating system**
- **Z-200 learning software**
- **Multiplan for accounting**
- **Accounting software package**
- **Printer cable**

Contact us about how the specific capabilities of this system can fully automate your accounts. A terrific bargain for anyone trying to track accounts payable and accounts receivable.

Assembled PBS-40
Ship wt. 126 lbs. **$3299.00**

Request a kit computer instead of a fully assembled model and reduce even further the already low cost of these super computer systems. Or pick your own software and/or peripherals.

Professional Accounting Workstation $3299⁰⁰

- **Zenith Data Systems Z-286 Advanced Personal Computer**
- **14″-diagonal amber monitor with enhanced EGA capability**
- **Hewlett-Packard LaserJet II laser printer**
- **MS-DOS operating system**
- **Windows multi-program environment**
- **PageMaker desktop publishing software from Aldus Corporation**
- **Kraft Micromouse**
- **Standby power source**
- **Associated cabling and extra toner for the laser printer**

Become your own publisher with this combination of hardware and software. Increase your capability even more with a ScanJet scanner. Call us and see how inexpensive it is to get started into publishing. We're eager to serve you.

Assembled PBS-50
Ship wt. 180 lbs. **$4999.00**

Use your Visa, MasterCard, American Express or Heath Revolving Charge to purchase any of our computer systems.

Desktop Publishing Workstation $4999⁰⁰

- **Zenith Data Systems Z-286 Advanced Personal Computer**
- 13"-diagonal color VGA monitor
- 2400 baud modem
- Epson LQ-2500 136-column ultra-fast letter-quality printer
- Saba Scanner for fast data entry
- Intel AboveBoard increases memory
- MS-DOS operating system
- HyperAccess communications software
- VoiceMail to turn your PC into a complete answering machine
- Multiplan spreadsheet software
- GrafTalk graph software
- WordStar Professional word processing software
- dBase III + data base software
- All interconnecting cables

Every possible work saving advantage is here in this package.

Assembled PBS-60
Ship wt. 164 lbs. **$5999.00**

Product descriptions on many of these system items are found on pages 84 through 106.

Complete Office Manager Workstation $5999⁰⁰

- **H-386 Heathkit PC with a 40 MB hard disk drive**
- 13"-diagonal color monitor
- 80387 Math Co-Processor
- SummaSketch graphics tablet
- Hewlett-Packard 7475A Plotter (not shown)
- Epson EX-1000 high speed printer
- Standby power supply (not shown)
- Extra 1MB Memory Expansion Card
- AutoCAD software from AutoDesk
- All associated cables

Automate your drafting and design with this high-performance CAD system. Accomplish more with less effort. An all-inclusive system that's easy and quick to learn and to use.

Kit PBS-70
Ship wt. 213 lbs. **$7999.00**

CAD Workstation $7999⁰⁰

To order the computer system of your choice call TOLL-FREE 24 hours a day:

1-800-253-0570

Michigan residents call:
1-800-782-2702

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HS-248 Advanced PC
shown with optional ZKB-2
101-key keyboard, video monitor
and second disk drive

Advanced PC with FREE software and a FREE Partnership Pack

SKILL **3.** 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 80 for details.

The Advanced PC is highly compatible with the IBM PC AT, so you can run most 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 3 MB 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 1.2 MB floppy drive. Or install the optional Z-417 Winchester controller card and add an internal 20 MB or 40 MB Winchester hard disk drive. With the optional controller card installed your Advanced PC can handle two floppy and two Winchester disk drives for a maximum in data storage efficiency.

The Advanced PC system includes a Z-449 video card for both EGA/CGA/MGA and 31 kHz FTM.

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 and four 8-/16-bit slots.

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.

Credit card orders call TOLL-FREE
24 hours a day:

1-800-253-0570

Michigan residents call:
1-800-782-2702

STANDARD	80286 Microprocessor	512KB RAM	Single 1.2MB 5¼" disk drive	Z-449 Video Board	Monitors
TO EXPAND ADD	Z-416-C 80287 Numeric Co-Processor	Z-445 Memory Expansion Board	Z-207-7 360K 5¼" disk drive	At the back panel connect	ZCM-1490 ZMM-149 A/P ZCM-1390
HS-248 Advanced PC		Z-405-1 256KB Memory Upgrade	or ZD-12 1.2MB 5¼" disk drive	or PS-02-10 EGA Video Board	ZVM-1380-C ZMM-1470-G ZVM-1240 (Mono) ZVM-1360 (CGA) ZVM-135 (CGA) ZVM-1330 (CGA)
			or Z-417 Winchester Controller		
			HWD-20-AT 20MB hard disk drive	or ZD-200 20MB hard disk drive	or ZD-400 40MB hard disk drive

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Configurations:

Kit HS-248-V Advanced PC with a floppy-only controller and one 5¼" 1.2 MB floppy drive plus the Z-449 color video board. Also includes Windows and Integrated 7 + software.
Ship wt. 64 lbs. **$1599.95**

Kit HS-248-VX Advanced PC with a Z-417 Winchester Controller, HWD-20-AT 20 MB hard disk drive and a 5¼" 1.2 MB floppy drive plus a Z-449 color video card. Also includes Windows and Integrated 7 + software.
Ship wt. 69 lbs. **$1999.95**

Integrated 7+ menu-driven software included with the above two computers contains a spreadsheet as easy as 1-2-3, a word processor, relational database manager, database merging, graphics, terminal emulation and PC-to-PC communications.

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 Board. Ship wt. 1 lb. **$240.00**

Assembled Z-449 Color Video Card with automatic video switching between MDA, CGA, EGA and Hercules graphics on a 31 kHz video monitor.
Ship wt. 3 lbs. **$499.00**

Assembled PS-02-10 Enhanced Graphics Card is compatible with virtually all major PC graphic 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.
Ship wt. 2 lbs. **$399.00**

Assembled Z-416-C 80287 Numeric Co-Processor for 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**

Credit card orders call TOLL-FREE
24 hours a day:
1-800-253-0570
Michigan residents call:
1-800-782-2702

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. 3 lbs. . . . . . *Was* $429.95 *Now* **$379.95**

Assembled ZD-200 Optional 20MB, 40 ms Winchester disk drive. Requires Z-417-2 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-417-2 cable (and separate Z-417 Controller Card for floppy-only models). Ship wt. 9 lbs. **$1699.00**

Assembled Z-417-2 Winchester Cable for connecting two Winchester drives to the controller board in H/Z-200 Computers. Required for the installation of the first Winchester hard disk-drive. Ship wt. 1 lb. **$20.00**

Assembled HCA-200-PC Serial RS-232-C Cable features 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**

TM-200 Technical manual for the Z-200 PC. Ship wt. 1 lb. **$49.00**

Z-286 Computer with optional monitor

286 power in a compact personal computer

A Zenith Data Systems computer that packs all the power of a Z-248 Advanced PC into a smaller package. The same 80286 microprocessor is used and it runs at 8 MHz with one wait state. Already installed video board has superb graphics and its 31 kHz video output supports VGA monitors such as the ZCM-1490, ZCM-1390 and ZMM-149 found on pages 100 and 101. Also features the expanded 101-keyboard, eight slot backplane, 512K RAM, one serial port and one parallel port.

Configurations:
ZDS Model CF-286-02 with dual 720K 3½" floppy disk drives.
Assembled ZDF-2255-BK Ship wt. 48 lbs. **$2399.00**
ZDS Model ZW-286-23 with one 720K 3½" drive and one 20MB hard disk drive.
Assembled ZDF-2225-BK Ship wt. 48 lbs. **$2999.00**
ZDS Model ZW-286-25 with one 1.2MB 5½" floppy and one 20MB hard disk drive.
Assembled ZDF-2237-BK Ship wt. 42 lbs. **$2999.00**

Accessories:
Assembled Z-405-A Memory Card brings computer RAM up to 640K and adds another 640K to the system. Expandable to 1.15MB. Ship wt. 1 lb. **$299.00**
Assembled Z-415 Memory Card. Same as the Z-405-A except that it is fully populated for a total of 1.5MB RAM. Includes extra RAM to fully populate Z-405-A Card. Ship wt. 2 lbs. **$499.00**

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

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

SKILL LEVEL 7 In less than two evenings you can build a powerful 80386-based micro-computer 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 80). 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.

You get a dual port video card with one port to operate your EGA, CGA or TTL monitor, and another to operate Zenith's new FTM shown on page 96.

You also get "zero wait" state technology, 1MB of RAM that can be expanded up to 16MB, serial and parallel communications ports, for hard disks and floppy controllers.

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-B Desktop Computer equipped with 1MB RAM, video card and one 1.2MB 5¼" disk drive. Includes MS-DOS, diagnostics and Integrated 7+ software and Windows.
Ship wt. 65 lbs. **$3349.95**
Accessories:
Assembled ZD-14 Optional 3½" 1.4MB floppy disk drive. Requires ZCA-14.
Ship wt. 3 lbs. **$219.00**
ZCA-14 Cable and mounting hardware.
Ship wt. 1 lb. **$29.00**
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. 3 lbs.
Was $429.95 .... *Now* **$379.95**

Assembled ZD-400 Optional 40MB 30 ms Winchester disk drive. Requires Z-417-2 Cable when installing in floppy-only models. Ship wt. 9 lbs. . **$1699.00**

Assembled ZD-800 Optional 80MB Winchester hard disk drive. Requires Z-417-2 Cable when installing in floppy-only models. Ship wt. 1 lb. .. **$1999.00**

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

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

Assembled Z-525 High-Speed Cache Memory Card with 64KB of RAM.
Ship wt. 3 lbs. **$599.00**

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

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

Assembled Z-449 Color Video Card with two ports and automatic video switching between MDA, CGA, EGA and Hercules graphics.
Ship wt. 3 lbs. **$499.00**

Assembled Z-417-2 Winchester Cable required for the installation of the first Winchester hard disk drive.
Ship wt. 1 lb. **$20.00**

STANDARD	80386 Microprocessor	1MB RAM	Single 1.2MB 5¼" disk drive	Monochrome/ color capability	Monitors
TO EXPAND ADD	Z-416-2 80287 Numeric Co-Processor	Z-505 1MB Memory Expansion Board	Z-207-7 360K 5¼" disk drive	At the back panel connect	ZCM-1490 ZMM-149 A/P ZCM-1390 ZVM-1380-C ZVM-1470-G
	Z-516 80387 Numeric Co-Processor	Z-515 4MB Memory Expansion Board	or ZD-12 1.2MB 5¼" disk drive		
		Z-525 Cache Memory Board	or ZD-14 1.4MB 3½" disk drive		
			or HWD-20-AT 20MB hard disk drive		
			or ZD-200 20MB hard disk drive	or ZD-400 40MB hard disk drive	or ZD-800 80 MB hard disk drive

Personal computers and more at your one-stop computer shopping center

Look to your one-stop source for everything you need from personal computers to computer systems, peripherals, accessories and software. Take advantage of trained experts who will listen to your requirements and then assist you with the right selections. Then SAVE. Every computer comes with a FREE Partnership Pack worth up to $500 (see page 80). Plus there are special workstation offers on pages 80 to 83. Each is suited for a different application. Call TOLL-FREE 1-800-253-0570 24 hours a day. In Michigan call 1-800-782-2702. You can even charge it with your Visa, MasterCard, American Express or Heath Revolving Charge.

The Z-159 Enhanced Desktop Personal Computer System

Zenith Data Systems has a high-performance, low-cost alternative system that overcomes the limits of 8088-based microcomputers. The Z-159 is powerful enough to run an entire business, yet it's affordably priced.

The Z-159 operates at 8 MHz (also at a selectable 4.77 MHz) with zero wait states making it a much faster system. And this computer is IBM PC-compatible. Users can select from virtually the full range of 16-bit software written for the IBM Personal Computer, including spreadsheet, word processing and business programs.

More and more applications are pushing memory limits but the Z-159 counters with EMS capability. This allows memory to be expanded to 1.2MB right on the main memory board. If additional memory is needed, three additional EMS memory cards (Z-315) can be added to bring RAM up to 5MB. The Z-159 follows the Lotus/Intel/Microsoft specification.

The Z-159 offers you high resolution video with an included Z-449 color video card. The 31.5 kHz Z-449 card features automatic video switching between EGA, CGA, MDA and Hercules without resetting switches. Resolution is 640 x 480 and 720 x 350. 100% compatible with EGA software.

Other features of the Z-159 include 4 open expansion slots depending on the model, serial and parallel ports, plus the MS-DOS operating system and a socket for an optional 8087 co-processor. Switch selectable 115/230 VAC, 50/60 Hz operation. Alternate AC line cord is required for 230 VAC. Has dimensions of 6.25" H x 16" W x 16.5" D without the keyboard.

Configurations:

Z-159 Model 12. A Z-159 Zenith Data Systems Computer equipped with 768K RAM, two 5¼" floppy disk drives, 31.5 kHz video, EMS logic installed and the enhanced 101-key keyboard.
Assembled ZDF-1211-DY Ship wt. 43 lbs. **$1899.00**

Z-159 Model 13. A Z-159 Zenith Data Systems Computer equipped with 768K RAM, one 5¼" floppy disk drive, one 20MB Winchester hard disk drive, 31.5 kHz video, EMS logic installed and the enhanced 101-key keyboard.
Assembled ZDF-1217-DY Ship wt. 43 lbs. **$2499.00**

Accessories:

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

Kit HWD-20 Optional Winchester Upgrade for installing a 20MB Winchester hard disk drive.
Ship wt. 4 lbs. **$449.95**

Assembled Z-316-8 8087 Numeric Co-Processor. 1 lb. **$285.00**

Assembled Z-205-4 256K Memory Chip Set. 1 lb. . . . **$80.00**

Assembled Z-315 Expansion memory board. The board comes with EMS (Expanded Memory Specification) logic chips installed and 256K RAM. Empty sockets may be filled with 256K RAM (Z-205-4) to a maximum of 1.2M of RAM. Ship wt. 2 lb. **$179.00**

Assembled ZB-315-1 EMS Upgrade supplies Extended Memory Specification capabilities to previous ZDE and ZDH models. Upgrade consists of EMS logic chips, 256K RAM and software driver. Any memory above 640K may be designated as EMS memory. Ship wt. 1 lb. **$119.00**

TM-159 Technical Manual. Ship wt. 3 lbs. **$25.00**

STANDARD	8088 Microprocessor	512K RAM	Floppy/Winchester disk drive options		Z-449 Card	Monitors
TO EXPAND ADD	Z-316-8 8087 Numeric Co-Processor	Z-205-4 256K Memory Upgrade	or	ZD-372 720K 3½" disk drive	At the back panel connect	ZCM-1490 ZMM-149-A/P ZCM-1390
Z-159 Enhanced Personal Computer above pictured with optional video display monitor		Z-315 EMS Upgrade	or	HWD-20 20MB Winchester hard disk drive		
		ZB-315-1 Memory Expansion				

Six great built-in Microsoft programs
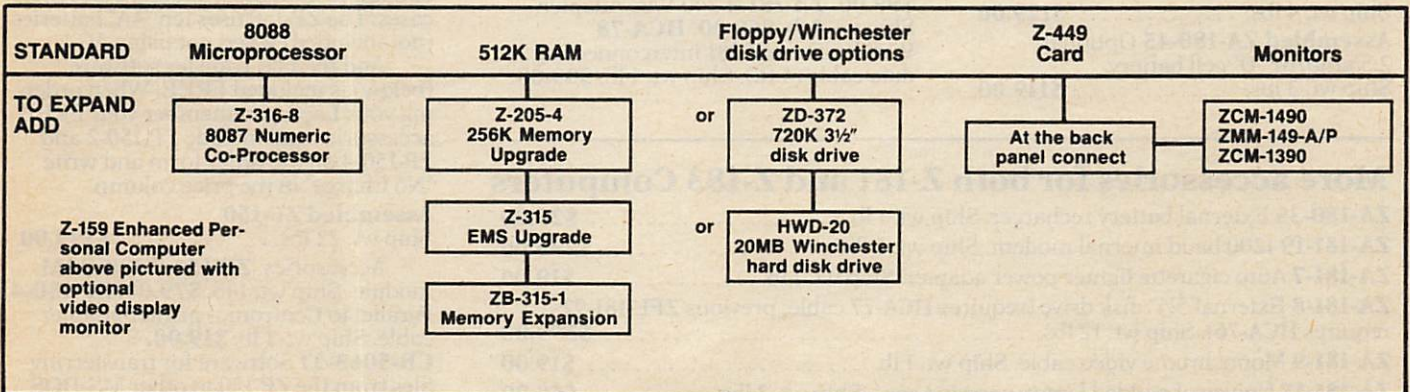
20 MB Winchester in a full-featured portable

Zenith Data Systems now adds more Winchester data storage capability to its popular Portable Personal Computer. With an internal 3½" hard disk drive, the Z-183 puts 20 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. Includes internal battery and 110 VAC 50/60 Hz AC Adapter. 3½" H x 14" W x 13⅜" D.

Assembled ZWL-183-93
Ship wt. 22 lbs. **$3599.00**

Accessories:

Assembled ZA-180-40 Optional 4 amp/hr "D" cell battery.
Ship wt. 4 lbs. **$129.00**

Assembled ZA-180-45 Optional 2.5 amp/hr "D" cell battery.
Ship wt. 3 lbs. **$119.00**

Z-181 Portable PC

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*. 3⅛" 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.**

Zenith Data Systems ZP-150 Laptop Computer is bargain priced. 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 bargain 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 with BASIC programs, record appointments, work with data bases like it a terminal. (HAMS... the ZP-150 makes a great and inexpensive teletype terminal for the pack.) 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, exchanging 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. **$399.00**

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-181-19 1200 baud internal modem. Ship wt. 2 lbs. **$299.00**

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**

1-STOP SOFTWARE SHOPPING ★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			
MS-DOS Vers. 3 (2,5)				OS-63-30	5	150.00
MS-DOS Vers. 3.2 (2,5)	OS-64-61	3	149.00			
★Microsoft OS/2 on 3½" disk	OS-31-2	3	299.00			
★Microsoft OS/2 on 5¼" disk	OS-63-62	3	299.00			
MS-DOS Vers. 3.2 for 3½" drives	OS-64-63	3	149.00			
MS-DOS Vers. 3 Programmer's Package (2,6,7)	CB-3163-30	5	225.00	CB-3163-30	5	225.00
Microsoft Windows* (3,6,7)	MS-5063-30	3	99.00	MS-3063-30	3	99.00
★Microsoft Windows on 5¼" disk (3,7,28)	MS-51-3	3	195.00			
★Microsoft Windows on 3½" disk (3,7)	MS-31-4	3	99.00			
PolyWindows Desk Plus (1,6,7)	PT-5063-1	3	49.00			
★PolyWindows on 3½" disk (1,7)	PT-4264-2	2	99.00			
XENIX* Systems 5 Time Share System	OS-63-80	3	429.00			
XENIX Systems 5 Development System (24)	OS-63-81	3	499.00			
XENIX Systems 5 Text Processor	OS-63-82	3	149.00			
XENIX Version 3 Time Share System	OS-63-70	5	429.00			
XENIX Development System (24)	OS-63-71	5	499.00			
XENIX Text Processor System	OS-63-72	4	149.00			
★Logitech Mouse with 3½" driver	LG-10	2	99.00			
OPERATING SYSTEM INTERFACES						
MS-DOS Manager	MS-4164-50	2	49.00			
WORD PROCESSING						
Multimate* (3,6,7)	SS-5063-1	3	495.00			
PeachText 5000* (1,6,7)	RS-463-75	3	295.00	RS-463-75	3	295.00
WordStar Professional* (2,5,7)				MP-463-17	4	399.00
★WordStar Professional Vers. 4 (2,5,7)	MP-4164-13	3	399.00			
★Microsoft WORKS on 3½" disk	MS-4364-20	3	195.00			

Minimum Computer Hardware and Software Requirements:

(1) 128K RAM
(2) 192K RAM
(3) 256K RAM
(5) One 5¼" disk drive
(6) Two 5¼" disk drives
(7) MS-DOS Operating System
(11) Z-204 Multiport I/O Card
(12) Z-319 Video Graphics Card

(17) Z-304 Synchronous Serial Port
(18) For H-100 mode operation
(19) H/Z-200 Computers only.
(22) 1.2 MB floppy and 20 MB Winchester Drive.
(23) 512K RAM
(24) XENIX Operating System
(25) MS-DOS for the Z-181
(28) H/Z-386 Computers

*WordStar is a registered trademark of MicroPro International Corporation. PeachText 5000 is a registered trademark of MSA, Inc. WordStar Professional is a trademark of MicroPro International Corporation. SuperCalc3 is a trademark of Computer Associates International Inc. XENIX and Windows are trademarks of Microsoft Corporation.

★New products.

	Heath/Zenith Personal Computers and Portable PCs			H/Z-100 Advanced Desktop Computer		
	Model Number	Ship Wt (lbs.)	Price ($)	Model Number	Ship Wt (lbs.)	Price ($)
SPREADSHEETS						
LOTUS 1-2-3 Release 2 (2,6,7,16)	LS-5063-2	5	495.00			
SuperCalc★ 3 (1,6,7)	SC-5063-4	3	395.00			
DATA BASE MANAGEMENT SYSTEMS						
R:BASE 5000 (3,5,7)	MR-5063-1	6	695.00			
R:BASE 5000 Interface (3,5,7)	MR-5063-2	3	395.00			
Condor rDBMS★ (1,5,7)	CD-5063-3	5	650.00	CD-5063-3	5	650.00
dBASE II★ (1,5,7)	AT-5065-2	3	495.00	AT-5065-2	3	495.00
dBASE III★ Plus (3,6,7)	AT-5063-5	11	695.00			
COMMUNICATIONS AND TERMINAL EMULATION						
HYPERACCESS (See page 92)	PM-160	3	149.95			
★CPS on 3½ disk	CB-4364-7	3	49.00			
3278/79 Standard Coax Connector (1,5,7)	CX-5063-1	3	895.00			
MBridge Emulator (1,5,7,17)	MB-5065-1	1	295.00			
★Lap Link	TS-4364-1	2	130.00			
3270 Emulator (2,6,7,17)	PO-5063-1	2	499.00			
3780 Emulator (2,6,7,17)	PO-5063-2	3	499.00			
ZSTEM-VT100 Emulator (1,5,7)	KE-5063-2	2	149.00			
Z-181 Interface software to PCs (25)	CB-5063-37	1	79.00			
Z-181 Interface plus 9 pin/25 pin null modem cable (25)	CBG-5063-1	2	99.00			
Z-181 Interface + 25 pin/25 pin null modem cable (25)	CBG-5063-2	2	99.00			
★H/Z-100/150 to ZP-150 Interface	CB-5063-27	3	49.00			
COMPUTER AIDED INSTRUCTION						
Z-Tap Typing Tutor (3,5,7)	CB-5063-32	3	79.00			
Teach-N-Tutor (3,5,7)	CB-5063-33	3	199.00			
DIAGNOSTICS				CB-463-13	4	79.00
Disk-Based Computer Tests (1,5)	CB-4164-28	3	79.00			
Personal Computer Diagnostics (1,5)	CB-4164-29	3	79.00			
Z-150 PC Diagnostics	CB-4364-38	2	79.00			
★Z-183 Diagnostics	CB-4164-40	3	79.00			
Z-200 PC Diagnostics (3,5)	CB-4164-41	3	79.00			
H-300 PC Diagnostics						
DIRECTORIES						
XENIX Applications Software (3rd Party)	CB-7063-1	1	14.95			
TUTORIALS						
Microstat	CB-5063-22	1	80.00			
Condor★ III	CD-5063-5	1	99.00			
Learning about H/Z-150/200 PCs	CB-3163-36	1	40.00			
MS-DOS Version 3	CB-3163-37	1	40.00			
Graftalk	RG-5063-3	1	39.00			

	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	RG-463-2	3	479.00
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	2	99.00			
★EGA GW BASIC on 3½" disk (2,7)	MS-4264-11	3	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
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
★Smart Watch (1,5,7)	CB-5063-50	3	59.00			
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
(2) 192K RAM
(3) 256K RAM
(4) 320K RAM
(5) One 5¼" disk drive
(6) Two 5¼" disk drives
(7) MS-DOS Operating System
(9) GW-BASIC Programming Language
(11) Z-204 Multiport I/O Card
(12) Z-319 Video Graphics Card
(13) MS-DOS Enhancement Op. Sys.
(15) Version 2.5 Monitor ROM and a Z-205 Memory Card
(16) Not available by mail order. Visit your nearest Heath/Zenith Computers & Electronics Center.
(17) Z-304 Synchronous Serial Port
(18) For H-100 Mode Operation
(25) MS-DOS for the Z-181
(26) Microsoft Windows
(27) Microsoft Mouse

*GW is a registered trademark of Microsoft Corporation.

AutoCAD for the serious designer

Control the power of large scale computer-aided design software to produce high quality drawings and schematics on your computer. This is the latest version using pull-down menus with icons which require an EGA card. For IBM PCs, XTs, ATs and compatibles equipped with 512K RAM and a Winchester hard disk drive. From AUTODESK.

EC-1312-PC AutoCAD Release 9. Ship wt. 1 lb. **$2850.00**

Accessories: **Assembled DMP-29** Houston Instruments Graphics Plotter. Ship wt. 32 lbs. **$2295.00.** Assembled **DMP-29-2** Pen Replacement Set. Ship wt. 1 lb. **$59.00**

AUTOSKETCH for drawing

Also from AUTODESK comes full-function computer-aided design software for creating line art and it is in the price range of shoestring budgets. AUTOSKETCH is the ideal tool for all those who want to draw, lay out an office, design a dream home, or learn about drawing and design. Requires a Heath/Zenith or IBM PC computer equipped with 512K RAM, two 5¼" floppy drives, and CGA or Hercules video capability.

EC-1310-PC Ship wt. 1 lb. **$79.95**

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**

Add a voice to your computer

SKILL LEVEL 2 Give your computer a distinctive voice or voices with the HV-2000 Computer Voice card kit. You can add vocal prompts to batch files or have your computer speak the contents of any text file, including WordStar files. With the HV-2000 installed, you could have your computer tell stories to children or conduct sing-alongs. The HV-2000 could make a computer more accessible or easier to use by those with eyesight problems. The applications of this card are extensive.

The HV-2000 plugs into one of your computer's expansion slots and receives data off of the bus. That information is converted by a synthesizer into an audio signal and amplified. The signal is then reproduced by an included external speaker into words, sentences, sound effects or music.

Extensive software (included) makes this the easiest-to-use, most versatile speech synthesizer you can buy. Special terminal emulator software is also included that enables you to add a voice to modem communications. Or, for an Amateur Radio application, add a voice to sent and received RTTY messages using a TNC like our HK-232 on page 29. The HV-2000 will enable your computer to vocalize any ASCII text that is received through a serial port at baud rates from 150 to 38.4K. There's even an exception file for special pronunciations.

The HV-2000 works on IBM PC/AT, PC/XT and compatibles. Included voice software lets you easily interface to DOS and high level languages. Speaker options can be enabled or disabled, automatically at computer boot-up and/or as text is being spoken.

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

Specifications: **SPEECH ATTRIBUTES: Modes:** 2, Immediate and Transitioned Inflection. **Number of Phonemes:** 64. **Phoneme Durations:** 4. **Speech Rates:** 16. **Inflection (Pitch) Levels:** 4096. **Transitioned Inflection Levels:** 32. **Transitioned Inflection Rates:** 8. **Musical Pitch Frequencies:** 49 (4 octaves). **Amplitude Settings:** 16. **Vocal Tract Filter Frequencies:** Over 250. **Articulation Rates:** 8. **UNIQUE WORD EXCEPTION FILE: Number of Words:** 100 maximum. **Size of File:** 2048 bytes maximum. **ELECTRICAL: Computer Interface:** Standard 62-finger PC bus card. **Line Output:** 10 kohms. **Speaker Output:** Approximately 500 mW into 8 ohms. **Power:** 5 volts DC at 275 mA max., 12 volts DC at 10 mA (obtained from PC bus). **PHYSICAL: Size:** Half card.

92
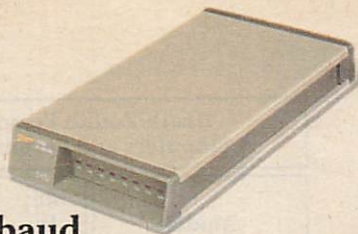
2400 baud modem from ZDS

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 106. Uses 120 VAC, 60 Hz. Has dimensions of 1½" H x 5½" W x 10" D.

Assembled ZM-2401
Ship wt. 5 lbs. **$399.00**

High-speed 18K baud modem is 15X faster

Telebit Corp. used innovative multi-carrier technology to create its Trail-Blazer modem. The TrailBlazer provides error-free data transmission over ordinary telephone lines at speeds of up to 18,000 bits per second, 15 times faster than other commonly used modems.

Works with any asynchronous device with a serial RS232 interface. Besides 18K bps, this modem also operates at speeds of 300, 1200 and 2400 bps. The TrailBlazer automatically recognizes the speed of the modem at the other end and sets its speed accordingly.

Other features include automatic error detection and correction, Hayes command set compatibility and FCC Class B compliance. Recommended for 3COM networks. 120 VAC.

Assembled T-2000 5 lbs. . . **$1349.00**

2400 baud modem

Now get a full-featured 2400 baud modem for less than a 1200 baud modem. Upload files faster and save on 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. **$199.95**

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. Emulate most popular terminals. Lets your computer act as a host. Also uses DOS commands.

PM-160 For Heath/Zenith Personal Computers, the IBM PC and compatibles. Ship wt. 3 lbs. **$149.95**
PM-160-3 For 3½" drives.
Ship wt. 2 lbs. **$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**
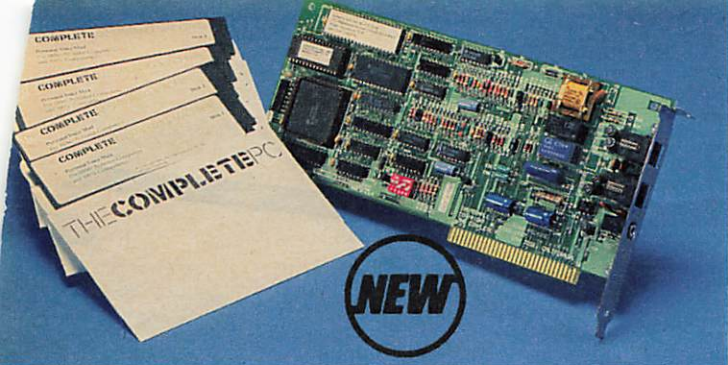
The Complete Answering Machine

Combine the power of your personal computer with your telephone to create the world's smartest answering machine. A personal mail system that digitally stores voice messages.

The Answering Machine requires an IBM PC, PC-XT, PC-AT or compatible equipped with a hard disk, a DSDD floppy disk drive, 384K RAM, MS-DOS 2.1 or later operating system, a standard telephone line with an RJ-11 or RJ-14 connection, and a touch-tone telephone.

Assembled PD-500 Ship wt. 2 lbs. **$349.99**

LQ-500 for quality conscious users

The Epson LQ-500 dot matrix printer is an economical 80 column, 24 wire printer. It offers superior features like 180 cps draft and 60 cps elite letter quality print speeds, standard friction feed and pull tractor, automatic single sheet loading, two standard fonts selectable from the front control panel, and a parallel interface. 5½" H x 15⅜" W x 12½" H.

Assembled LQ-500 Ship wt. 20 lbs. **$449.95**
Accessory:
PPA-246-1 Replacement Ribbon. Ship wt. 1 lb. **$14.95**

LQ-850 dot matrix printer

An ideal 80-column printer for small businesses and corporate offices. The LQ-850 features a fast 264 characters per second (cps) in the high-speed draft mode and 88 cps in its letter quality mode. This printer also has two built-in letter quality fonts (Roman and Sans Serif), and two font module option slots, 6K buffer, sharp 24-pin printing head, push tractor feed and envelope printing. 5.6" H x 17" W x 14.2" D.

Assembled LQ-850 Ship wt. 23 lbs. **$649.95**
Accessory: **PPA-246-1** Replacement Ribbon. Ship wt. 1 lb. **$14.95**

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 8½" wide and continuous feed paper up to 10." 5⅝" H x 16½" W x 13" D.

Assembled PP-86-E Epson FX-86-E Ship wt. 23 lbs. **$399.95**
Accessory: **PPA-225-1** Replacement Ribbon. 1 lb. **$9.95**

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. This printer comes equipped with a parallel interface. 5⅝" H x 21⅛" W x 13½" D.

Assembled PP-286-E
Ship wt. 31 lbs. **$599.95**
Accessory:
PPA-230-1 Replacement Ribbon.
Ship wt. 2 lbs. **$23.95**

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EX-800 printer

Cut down those sizable printing jobs with flair. Choose either 300 characters per second draft mode or 60 cps near letter quality printing. Plus, you get superb graphics with excellent resolution. Customize your documents on this 80-column printer with eight different typestyles. Also features an 8K buffer and a built-in push-feed tractor that helps save paper. Has dimensions of 4⅞" H x 17⅝" W x 14⅞" D.

Assembled PP-256
Ship wt. 26 lbs. **$499.95**
Accessory:
PR-100 Replacement ribbon,
Ship wt. 1 lb. **$14.99**

Top-of-the-line LQ-2500

Superb high-speed printing and versatility mark this 136-column business printer. Print at a very fast 324 or ultra-fast 405 characters per second in the draft mode or 108 cps in the letter quality mode. Plus it has 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 an 8K buffer. Dimensions are 5⅝" H x 23¼" W x 14¾" D.

Assembled PP-262
Ship wt. 32 lbs. **$1099.00**
Accessory:
PR-120 Replacement ribbon,
Ship wt. 1 lb. **$16.99**
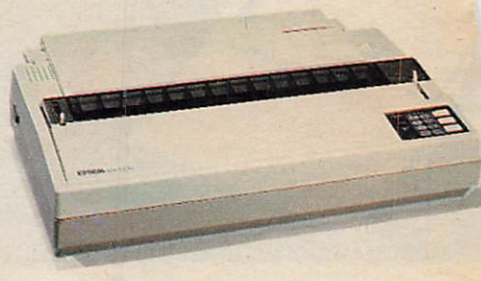
EX-1000 printer

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. 4⅞" H x 23⅜" W x 15⅜" D.

Assembled PP-253
Ship wt. 34 lbs. **$649.95**
Accessory:
PR-100 Replacement ribbon.
Ship wt. 1 lb. **$14.99**

HP DeskJet Printer

NEW

Laser quality documents for under $1000. The Hewlett-Packard DeskJet ink-jet serial printer offers beautiful full-page 300 dpi graphics plus 240 cps draft and 120 cps letter quality printing. This compact printer uses little space and is whisper quiet. Paper loads from the front so you can slide the printer right up next to a wall.

Compatible with popular PCs and easy to learn, the DeskJet features a friendly printer control panel, excellent software support and simple step-by-step operation instructions. A built-in sheet feeder handles plain paper up to 8½" x 14". 8" H x 17¼" W x 14¾" D.

Assembled PP-2276-A
Ship wt. 26 lbs. **$999.00**

LX-800 printer for professional printing at home or the office

The LX-800 dot matrix printer is a full-featured, low-priced 80-column printer with 180 cps elite draft and 30 cps elite NLQ print speeds. From the front panel you can customize documents with a choice of Roman or Sans Serif fonts at the touch of a button. Other features include a 3K buffer, standard pull tractor, automatic single sheet load and a parallel interface. Has dimensions of 3.6" H x 15.7" W x 12.1" D.

Assembled LX-800 Ship wt. 15 lbs. **$229.95**
Accessory: **PPA-225-1** Replacement Ribbon. Ship wt. 1 lb. **$9.95**
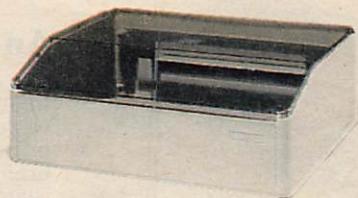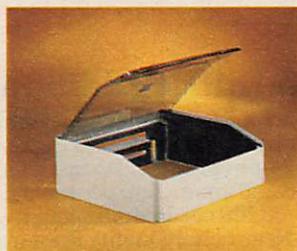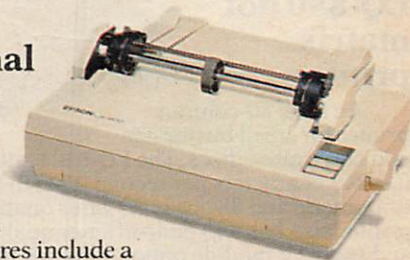
Cut printer noise by 80% with a muffler

Stop a noisy printer from putting your nerves on edge. 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. . . . . Was $59.99 *Now* **$39.99**
Assembled PM-2252 Print Muffler for 132 column printers.
Ship wt. 10 lbs. . . . . Was $79.99 *Now* **$49.99**

HP LaserJet II

The LaserJet II from Hewlett Packard lets you print exciting documents and graphics. The LaserJet II 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 at a high-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. The LaserJet II has dimensions of 8½" H x 18" W x 19" D and uses 120/240 VAC. Toner is included with the printer.

Assembled PPS-3400 LaserJet II. Ship wt. 65 lbs. **$2399.00**
Accessories:
Assembled PP-3443 Optional 1 Mbyte Memory Board.
Ship wt. 1 lb. **$499.95**
Assembled PP-3444 Optional 2 Mbyte Memory Board.
Ship wt. 1 lb. **$999.95**
PR-2295 Toner. Ship wt. 4 lbs. **$125.00**
HP9-2286-B Times Proportional 1 Font. 1 lb. **$250.00**
HP9-2286-F Times Proportional 2 Font. 1 lb. **$250.00**
HP9-2286-L Courier Font. Ship wt. 1 lb. **$250.00**
HP9-2286-M Prestige Font. Ship wt. 1 lb. **$250.00**
HP9-2286-R Present 1 Font, Ship wt. 1 lb. **$330.00**
HP9-2286-Z Microsoft Font. Ship wt. 1 lb. **$330.00**
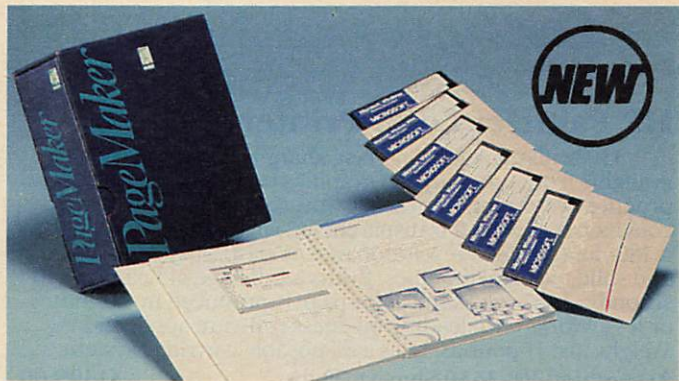
PageMaker for the PC from Aldus

PageMaker brings all the power of the printed word to your desktop. This desktop publishing tool is easy enough for the beginner, yet it's comprehensive enough for the skilled designer. Use PageMaker to integrate text and pictures created with popular word processing and graphics applications like Word, WordStar, Write, Draw, AutoCAD and PC Paint.

Use PageMaker as an electronic layout board where you can paste up text and graphics on your computer's video monitor. Then you can edit text, change typestyles and type size, resize graphics and reposition anything to make the page look like you want. Then print it out on a laser printer or dot-matrix printer.

PageMaker runs under Microsoft Windows* and requires a mouse. You need an IBM PC AT or compatible equipped with one double-sided disk drive and a 20MB hard disk drive, 640K RAM, MS-DOS, a graphics adapter card and a mouse. Although a monochrome monitor can be used, a color monitor is necessary to take full advantage of the graphic color capability of PageMaker.

PA-120 Ship wt. 7 lbs. **$695.00**
*Microsoft Windows is a trademark of Microsoft Corporation.
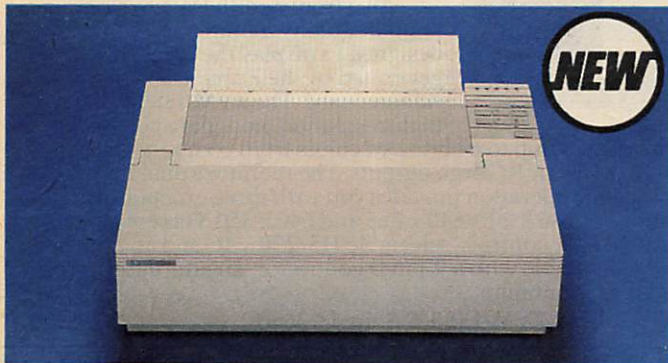
Hewlett Packard Ruggedwriter

The new Ruggedwriter 480 24-wire dot matrix printer from Hewlett Packard gives you great looking text and graphics at an affordable price. With the Ruggedwriter you gain speed without sacrificing quality. You can do all your draft printing at a blistering 480 characters per second. Just think how fast you could level piles of paperwork at that print speed. And then you can print out letter quality letters and documents at 240 char-

acters per second. At these speeds, the Ruggedwriter alone could double the efficiency of your office staff. The optional font cartridge accessory lets you vary the look and impact of your letters.

The Ruggedwriter also enables you to do high quality graphics with a resolution of 180 x 360 dots per inch. With this capability you can add impressive charts and illustrations to all your documents. Besides great graphics, the Ruggedwriter has other looked-for features like a wide paper path, use of 1 to 4 part forms, quiet (56 dBA) printing, and user-selectable tractor/cut sheet paper feeding. The Ruggedwriter has both an RS-232 and a Centronics parallel interface. Compatible with both Epson LQ-1000 and HP PCL level III printer language allowing widespread software support.

Assembled PP-2235-A Ship wt. 41 lbs. **$1699.00**
Accessories:
PR-2156-S Package of three ribbons for printer.
Ship wt. 1 lb. **$45.00**
PP-2239-A Cut sheetfeeder accessory.
Ship wt. 1 lb. **$249.95**
PR-2235-A Four character font cartridge accessory.
Ship wt. 1 lb. **$150.00**
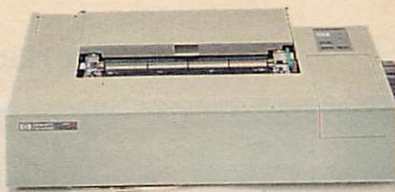
HP PaintJet Color Printer

330 brilliant colors and fast, sharp NLQ text are now available from one compact graphics printer. The PaintJet can produce everything from sharp, full-color CAD drawings to convincing overhead transparencies, spreadsheets and reports. A 180-dots per inch resolution means crisp, easy-to-read text and solid, colorful graphics. Prints a full page of text in 30-40 seconds at 167 cps. A full color page is produced in 4 minutes or less. Works with leading business software applications. Weighs just 11 pounds. Uses a disposable cartridge system.

Assembled PP-3630 Ship wt. 23 lbs. **$1399.00**

Accessories:
PR-1606-A Blackjet cartridge. Ship wt. 1 lb. **$27.99**
PR-1606-C Color cartridge. Ship wt. 1 lb. **$34.99**

ScanJet

Hewlett-Packard now provides an economical way 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%. Included Scanning Gallery software allows images to be scanned and stored in a variety of industry standard file formats. MS-DOS and MS-Windows are supported. Easily imports images for Page-Maker. 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**
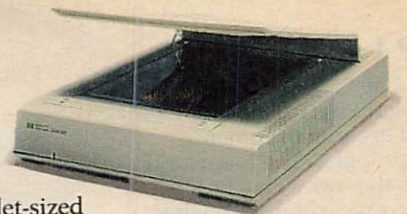
Accessories:
Assembled PP-8290 ScanJet Interface Kit includes interface board for IBM PC/XT/AT and compatibles, manuals and interface cable. Ship wt. 4 lbs. **$499.00**

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 at 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. 45 lbs. **$999.00**

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 EGAmode, 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**

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**

14"-diagonal monochrome monitors

Also from Zenith Data Systems comes two 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 12⅜" 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**

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 14¼" W x 15" D. Has an attached 15-pin D connector cable.

Assembled ZCM-1390
Ship wt. 36 lbs. $699.00

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 12⅞" H x 14⅜" W x 15" D.

Assembled ZVM-1330 Ship wt. 34 lbs. . . . . *Limited Quantities At* **$649.00**
Accessory: **ZVM-1300-1** Tilt/Swivel Base. Ship wt. 4 lbs. **$30.00**

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

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.

Compatible with both composite video or RGB direct drive outputs. Uses 115 VAC. 13¾" H x 15¼" W x 15¼" D. Limited Quantities.

Assembled ZVM-135 39 lbs. **$599.00**

Accessory: **ZVM-135-2** H/Z and IBM PC Cable. Ship wt. 1 lb. . . **$25.00**

All Zenith monitors that use dual 115/230 VAC require an alternate AC line cord for 230 VAC operation.

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 11¾" W x 12⅝" 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**

Accessory: **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 modifications, 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 217, Benton Harbor, MI 49022-0217. Payment must be in U.S. dollars only.

Printer buffer prevents wasted computer time

SKILL LEVEL 2 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.

The Printer Buffer 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**

Accessory:
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

SKILL LEVEL 1 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). 1⅜" H x 6" W x 3⅜" D.

Kit SK-205 Ship wt. 3 lbs. **$49.95**

Data Line Protector

SKILL LEVEL 1 An easy beginner kit with computer applications. Connect it in-line between your computer and peripherals to help 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 2⅛" D.
Kit SK-202 Ship wt. 1 lb. **$14.95**

Surge Protector

SKILL LEVEL 1 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**

Quickly know which cable to use

SKILL LEVEL 1 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 2⅛" D.
Kit SK-204 Ship wt. 2 lbs. **$39.95**

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Monitor shows what your AC line is doing

SKILL LEVEL 2 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. 3⅝" H x 2⅜" W x 1¼" D.

Kit SK-211 Ship wt. 1 lb. **$39.95**
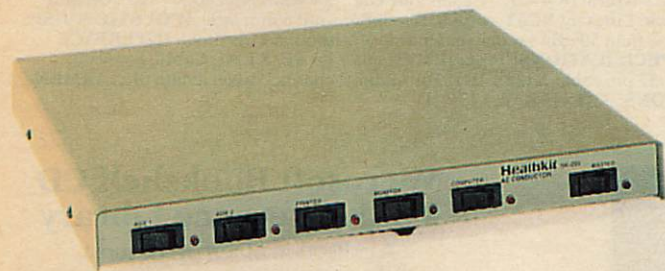
Control your computer and peripherals from one convenient power director

SKILL LEVEL 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 helps shield 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 1¾" H x 13½" 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

SKILL LEVEL 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**
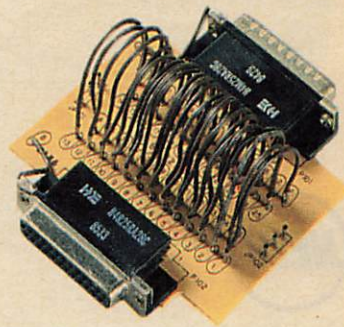
RS-232 Switch Box

SKILL LEVEL 1 Eliminate the bothersome unplugging and replugging 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 1¼" H x 6⅞" W x 5⅝" 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

SKILL LEVEL 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. 1⅜" H x 2⅛" W x 6" D.

Kit PMK-130 Ship wt. 2 lbs. **$79.95**

100

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.

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 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**

Enhanced keyboard for Heath/Zenith Personal Computers

The enhanced 101-key keyboard that comes as standard equipment on most current Heath/Zenith PCs is now available separately. Replace your old 84-key keyboard and gain special features not found on other keyboards. Special function keys have been increased from 10 to 12 and moved above the alphanumeric keys. Cursor and screen control keys are separated from the keypad. PRINT SCREEN, PAUSE and SCROLL LOCK are grouped together. The escape key is isolated to reduce accidental pressing. The numeric keypad has been improved. Accessory ROMs are needed for different computer replacements. ROMs for other Heath/Zenith PCs are listed in the accompanying keyboard installation instructions.

Assembled ZKB-2 Ship wt. 1 lb. **$149.00**
Accessories:
ZCA-10 ROM upgrade for H/Z-200 Computers. 1 lb. . **$24.80**
ZCA-11 ROM upgrade for H/Z-159 Computers. 1 lb. . . **$12.80**

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 protected from power line surges, spikes, noise 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. **$599.00**

Two more power systems

In addition to the 450AT + described above, American Power has two more standby 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 mini-computers from power problems which can result in loss of data or even damage to your computer. Either system will help to prevent power interruptions. Besides safeguarding against blackouts, brownouts and voltage sags, both provide protection against surges, spikes, noise, interference and even overvoltage.

Both 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. 120 VAC, 60 Hz power. Has dimensions of 11.5" H x 7.7" W x 14.5" D.

Assembled PM-1200 1200VA UPS. 79 lbs. **$1399.00**
Assembled PM-800 800VA UPS. Ship wt. 58 lbs. . . **$999.00**

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. . . . . *Was* $49.99 *Now* **$39.99**

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 spike and line noise protected. A static guard nameplate grounds body-accumulated static at a touch. And a swivel base adjusts your monitor with fingertip ease. UL approved. 1⅜" H x 13½" W x 13¼" D.
Assembled PM-2100 Ship wt. 10 lbs.
Was $149.99 . . . . *Now* **$129.95**
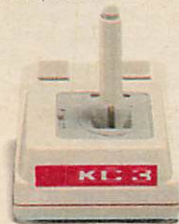
Precision Joystick

The KC3 joystick from Kraft is great for fun, learning and graphics software. Works with Apple II, II+, IIe, IIc and IBM PC, AT, XT and compatibles. Has free-floating or auto-centering modes, trim controls, third stick button, left/right hand firing.
Assembled PI-47 1 lb. **$29.99**

Gravis MK VI

This comfortable joystick has a pistol-grip stick with integrated fire button, two programmable 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**

Analog game port

For Heath/Zenith PCs, the IBM PC and compatibles. 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. **$79.95**
102
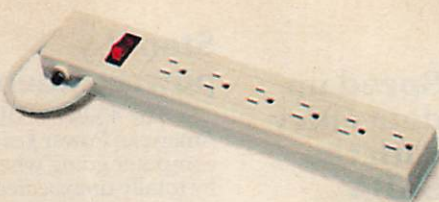
Multiple outlets and protected power strips

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 – anywhere 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 Electricord 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. . . . **$9.99**

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**

(NEW) A/B switching card

The compact D-G DoubleCOM card lets you quickly and easily switch between two serial devices without exiting from the applications software you are using. A few simple keystrokes does it. Or you can use an over-riding toggle switch to change devices. This card also removes the clutter of extra cables or an external A/B switch box from your crowded computer work area.

The DoubleCOM card is designed to be used with the IBM PC, PC/AT, PC/XT and compatibles using PC-DOS or MS-DOS Version 2.0 or later. Included software allows device switching by either a resident program or an externally run program. The card uses standard IBM PC/AT type 9-pin connectors for connection to I/O serial devices.
Assembled DC-1000
Ship wt. 1 lb. **$149.95**
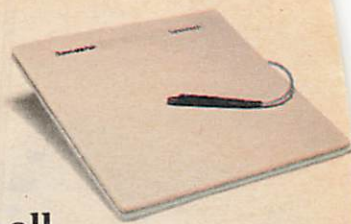
Freely express all your ideas on this graphics tablet

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 11¾" x 11¾" 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 ±0.025" with a repeatability of ±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 16¼" x ¾" and uses 120 VAC.
Assembled SI-1201
Ship wt. 10 lbs. **$479.00**

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 help prevent damage to your 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 improved surge protection in the form of a uniquely-engineered four-element, two-stage filter. And it has a 5 year warranty.
Assembled RT-610 3 lbs. **$49.99**
Assembled RS-610 3 lbs. **$79.99**

NEW

Verbatim floppy disks

Get the floppy disks that are surface tested and certified by Verbatim, the world's leading manufacturer of flexible disks, to be 100% error-free. And they're backed by a lifetime warranty. Includes write protect labels and label kit.

MD-550-1 Box of ten 5¼" standard disks. Ship wt. 1 lb. **$9.99**

MD-600 Box of ten 5¼" high density floppy disks. Ship wt. 1 lb. **$19.99**

MF-360 Box of ten 3½" disks. Ship wt. 1 lb. **$19.99**

Verbatim floppy diskettes in 3 formats

Starter kits for the beginning kitbuilder

Rechargeable Portable Light for any use

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 handy during a power outage. A single charge lasts for 6 hours. Light has dimensions of 10⅝" H x 3⅛" W x 5" D. Includes rechargeable battery.

Kit GD-1246-A
Ship wt. 6 lbs. **$49.95**
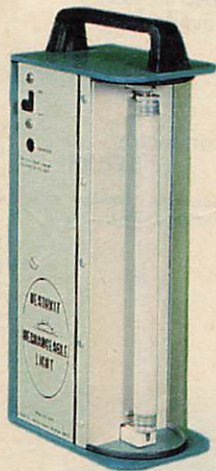
Battery Life Tester gives more than a good-bad indication

The Heathkit GD-1703 Battery Life Tester does more than give you a "bad-good" indication, as many of the testers on the market do. Instead it responds to the voltage and resistance drop of a battery and indicates how much useful life there is still remaining. Checks alkaline and carbon-zinc 9V and 1.5 AA, C, and D size cells, and 1.2V rechargeables. An adapter is also supplied that lets you check 9-volt batteries in the package before you purchase them. 1⅝" H x 2½" W x 3½" L.

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

Solid-State Mono Amplifier

Boost the audio to your headphones or to an alternate speaker system with the Heathkit AA-18 Amplifier. Or 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. 2⅝" H x 7¾" W x 5½" D.

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

Electronic Metronome

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). 6¾" H x 3¾" W x 4" D.

Kit TD-1257 Ship wt. 2 lbs. **$29.95**
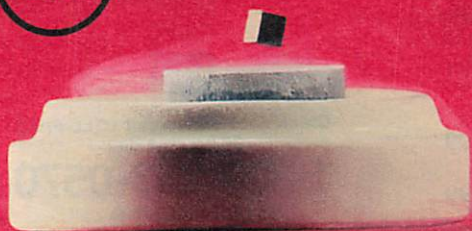
Nobel Prize winning breakthrough in technology

SKILL LEVEL 1. Get a personal demonstration of the new ceramic superconductors that are making headlines everywhere.

This kit demonstrates the Meissner Effect of magnetic levitation at liquid nitrogen temperatures.

Kit comes complete with a 1-inch diameter superconductor disk composed of yttrium, barium, and copper oxides, an extremely powerful neodymium rare-earth alloy magnet, non-metallic tweezers and an informative instruction manual. Liquid nitrogen is easily available from most hospitals, lab supply firms, colleges and welding supply firms which carry industrial gasses. Check your local area for availability before ordering.

Kit SCD-1 Ship wt. 1 lb. **$29.95**

Accessory:
SCD-1-1 One-inch superconductor pellet. Ship wt. 1 lb. **$17.95**

CAUTION: Liquid nitrogen may be dangerous if handled improperly. Read and understand all handling instructions.

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 damage. Spend less than three hours to build an alarm that will alert you to a water problem. Needs 9V battery. 1¾" H x 3⅝" W x 4⅞" L.
Kit GD-1701 Ship wt. 2 lbs. . . **$24.95**

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 3½" H x 2⅝" W. Uses standard 120 VAC.
Kit GD-600 Ship wt. 2 lbs. **$9.95**

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 2⅜" 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. 4 lbs. . . . **$99.95**

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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. Pre- vious 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. 3 lbs. . . **$39.95**

Lightmeter kit
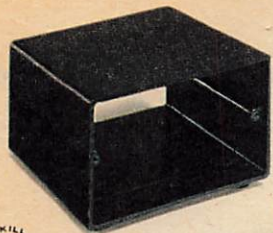
Cabinet

SKILL LEVEL 1. 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 1. 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 5⅜" W x 3⅝" 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**

$AVER! 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 1. 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. 43).

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

The Sound Flasher

SKILL LEVEL 1. 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. 2¼" H x 3⅛" W x 5⅞" D.

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

1-Watt Audio Amplifier

SKILL LEVEL 1. Get extra sound and listening pleasure with the 1-Watt Audio Amplifier. Use the Amplifier with 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. 43).

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

An intercom system for the family

SKILL LEVEL 1. 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.

At least two intercoms must be used and you can link up to four intercoms using two-conductor wire. 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. 43).

Follow the lesson in the optional Educational Manual to learn audio amplifier theory and matching different impedances. 4½" H x 3¼" W x 1¾" D.

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

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The Heathkit Pledge

You will succeed. Carefully written instruction manuals help make certain that you clearly understand the assembly and operation of your kit. And if you do have any questions, just call or write our Heath Technical Consultants (see p. 55) 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. 105). 3" H x 4½" W x 6½" D.
Kit SK-101 Ship wt. 5 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. 105). Requires 9V battery (not included) or PS-2350 Battery Eliminator (p. 43).
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-H
Ship wt. 1 lb. **$4.95**

FM Wireless Mic

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. 105). Operates on two watch batteries (included).
Kit SK-106-H 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**

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 (p. 105), this kit demonstrates the operation of a flip-flop circuit. Uses 120 VAC. 2¼" H x 3⅛" W x 5⅞" D.
Kit SK-111
Ship wt. 1 lb. **$16.95**

ortable AM Radio is a fun first-time kit

⚡ 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's attractive 3¼" H x 6⅜" W x 1¼" D cabinet is both sturdy and easy to clean. Use a 9-volt transistor battery (not included) for portable operation. Or, use an optional PS-2350 Battery Eliminator (page 43) for use with 120 VAC.

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

Radiation Monitor

⚡ 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). 5¾" H x 2⅞" W x 1½" D.

Kit RM-4 Ship wt. 2 lbs. **$129.95**

The Heathkit Index

Mail Order Catalog No. 211
Spring 1988

Free Gifts

Order within 30 days and receive your choice of either the Pen/Pencil Set or the Road Atlas if your purchase from this catalog totals from $50 to $150. Receive the Pencil Sharpener/Letter Opener or Telephone if your purchase from this catalog totals more than $150. Please use the order form at the center of this catalog. **Available for phone and mail orders only.**

1. Rand McNally Road Atlas & Travel Guide

The Rand McNally Road Atlas & Travel Guide includes comprehensive maps of the U.S., Canada, Mexico and major U.S. cities. This convenient atlas is only 8½″ x 11″ and can be rolled up in its attractive snap-shut brown vinyl cover to store or carry. This free gift can be yours with any order of $50 to $150 from this catalog received within the next 30 days. **GDP-5478**

2. Plus USA P's Bar Pen and Pencil Set

Includes mechanical pencil with eraser, plus an assortment of pens: black ball point, blue ink fine roller, red ink fine roller and yellow highlighter. All packaged in a pocket-sized set. At a $9.95 suggested retail value, the Plus USA P's Bar can be yours FREE with any order of $50 to $150 from this catalog received within the next 30 days. **GDP-5479**

3. Pierre Cardin Pencil Sharpener/ Letter Opener

Open a letter or sharpen a pencil with automated ease using this handy office aide from Pierre Cardin. Also includes two pen holders for even more convenience. Normally a $16.95 suggested retail value, it can be yours FREE with any order over $150 from this catalog received within the next 30 days. Requires four C size batteries. **GDP-5480**

4. Pierre Cardin Ambiance 18 Telephone

An excellent designer phone for use with any phone system, rotary or tone dialing. Includes 10 memory and last number redial for busy signal or no answer, auto push button mute key and wall holster. Although this personal phone is a $14.50 suggested retail value, it can be yours FREE with any order over $150 from this catalog received within the next 30 days. **GDP-5481**

a fun first-time kit

SKILL LEVEL 1

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excel... ...st-
time ki... ...r or
adult, int...
building. Th... ...sem-
bly manual exp...
plain language. An... ...shed,
the radio's good tone an... ...e will
surprise you, even when li...ning to
distant situations.

The GR-1009 Radio features a
high-gain antenna for pulling in dis-
tant AM stations and a 2-inch dynamic speaker for clear recep-
tion. A separate earphone is supplied so you can privately listen
to your personally-built radio without disturbing those around
you. The radio's attractive 3¼" H x 6⅜" W x 1¼" D cabinet is
both sturdy and easy to clean. Use a 9-volt transistor battery
(not included) for portable operation. Or, use an optional
PS-2350 Battery Eliminator (page 43) for use with 120 VAC.

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

Radiation Monitor

SKILL LEVEL 1 Check suspected radioactive ele-
ments with this compact Geiger counter.
The RM-4 Monitor uses the sensitive, in-
dustry-standard Geiger-Mueller tube to
detect and warn of low levels of radia-
tion – even "harmless" levels. For the ul-
timate 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).
5¾" H x 2⅞" W x 1½" D.

Kit RM-4 Ship wt. 2 lbs. **$129.95**

The Heathkit Index

Mail Order Catalog No. 211
Spring 1988

Free Gifts

Order within 30 days and receive your choice of either the Pen/Pencil Set or the Road Atlas if your purchase from this catalog totals from $50 to $150. Receive the Pencil Sharpener/ Letter Opener or Telephone if your purchase from this catalog totals more than $150. Please use the order form at the center of this catalog. **Available for phone and mail orders only.**

1. Rand McNally Road Atlas & Travel Guide

The Rand McNally Road Atlas & Travel Guide includes comprehensive maps of the U.S., Canada, Mexico and major U.S. cities. This convenient atlas is only 8½" x 11" and can be rolled up in its attractive snap-shut brown vinyl cover to store or carry. This free gift can be yours with any order of $50 to $150 from this catalog received within the next 30 days. **GDP-5478**

2. Plus USA P's Bar Pen and Pencil Set

Includes mechanical pencil with eraser, plus an assortment of pens: black ball point, blue ink fine roller, red ink fine roller and yellow highlighter. All packaged in a pocket-sized set. At a $9.95 suggested retail value, the Plus USA P's Bar can be yours FREE with any order of $50 to $150 from this catalog received within the next 30 days. **GDP-5479**

3. Pierre Cardin Pencil Sharpener/ Letter Opener

Open a letter or sharpen a pencil with automated ease using this handy office aide from Pierre Cardin. Also includes two pen holders for even more convenience. Normally a $16.95 suggested retail value, it can be yours FREE with any order over $150 from this catalog received within the next 30 days. Requires four C size batteries. **GDP-5480**

4. Pierre Cardin Ambiance 18 Telephone

An excellent designer phone for use with any phone system, rotary or tone dialing. Includes 10 memory and last number redial for busy signal or no answer, auto push button mute key and wall holster. Although this personal phone is a $14.50 suggested retail value, it can be yours FREE with any order over $150 from this catalog received within the next 30 days. **GDP-5481**