

# HEATHKIT®

AUTUMN 1978

## PERSONAL COMPUTERS

that open up a whole new world of convenience and versatility.

## INSTRUMENTS

For greater values and all your test and measuring needs.

## AMATEUR RADIO

There's more for the Amateur at Heath.

## LEARN ELECTRONICS

Faster, easier and for less cost with Heath self-instructional courses!

**PLUS** digital clocks, weather monitors, car accessories... nearly 200 fun-to-build, top value electronic kits to help make your leisure time more fun, more practical and more creative!



## SEE THESE EXCITING NEW KITS!



World's First True  
Hand-Held Air  
Navigation Computer  
—see page 9



Ultrasonic Car  
Intrusion Alarm  
—see page 10



Floppy Disk System  
—see page 2



Self-Instruction Electronics  
Courses  
—see pages 3, 14-17 and 19



Logic Probe  
—see page 29

**PLUS**

**NEW!** Self-Instruction Amateur Radio Course  
—see page 17

**NEW!** Garage Door Opener  
—see page 10

**NEW!** Tiffany Lamps  
—see page 19

HEATH (Gloucester) Ltd. 1978

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# Presenting Heathkit Computers—

The new value standard in personal computing systems featuring two powerful computers with exclusive Heath-designed software plus full documentation and service support



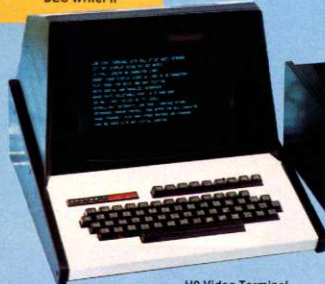
LA36  
DEC Writer II



H11 16-Bit Digital Computer



WH17 Floppy  
Disk System



H9 Video Terminal



H8 8-Bit Digital Computer



H10 Paper Tape  
Reader/Punch

The Heathkit H8 Computer is a powerful 8-bit machine based on the 8080A CPU. It's combination of unique features and low cost makes it an outstanding value among general purpose computers. Unlike many of the so-called low-priced "all-in-one" packaged systems, the H8 lets you add memory and peripherals to increase its power and versatility as you increase your programming prowess.

Other features include: exclusive Heath-designed 50-pin fully buffered bus; mother board with positions for up to 9 plug-in circuit boards that accept the CPU, front panel memory, I/O and other accessory cards; built-in speaker for audible feedback and special effects; front panel status lights and more. The CPU board is fully wired and tested for easy system setup and kit assembly. 16 1/2" W x 6 1/2" H x 17" D. For 120/240 VAC, 50/60 Hz. Requires at least one H8-1 memory board to operate.

Kit H8

The Heathkit H11 Computer features an electrically superior bus with 38 high-speed lines for data, address, control and synchronization. Data and control lines are bidirectional, asynchronous, open-collector lines capable of providing a maximum data transfer rate of 833K words per second under direct memory access operation.

The fully assembled and tested KD11F board contains the LSI-11 CPU, a 4096 x 16 read/write MOS semiconductor memory, DMA operation; and it executes the PDP-11/40 instruction set with over 400 powerful instructions. Additional memory cards can be added to expand memory capacity up to 20K in the H11 cabinet (32K words total). Measures 19" W x 6 1/2" H x 17" D. For 110/220 VAC, 50/60 Hz.

Kit H11

The H9 12' CRT ASCII Video Terminal has all standard serial interfaces, auto scrolling, erase mode, long and short form and plot mode displays and ASCII 67-key keyboard. More details page 40.

Kit H9

The H10 Paper Tape Reader/Punch is a low cost mass storage peripheral. Precise ratchet/solenoid drive, 50 CPS max read rate, 10 CPS max punch rate and the features of similar units that cost far more.

Kit H10

The Heath WH17 Floppy Disk, for the H8 Computer, features both single and dual versions using the popular mini-floppy drive. The storage media is a standard 5.25" diskette, hard-sectored, 40-track with ten sectors per track and 256 bytes per sector for a total storage capacity of 102,400 bytes. Access time is typically less than 350 mS. The operating system includes all present H8 software including extended Benton Harbor BASIC plus the executive. The system has complete file capabilities.

Assembled WH17

Coming Soon! H17 kit version of the WH17, also the WH27 Floppy Disk System for the H11 Computer.

The LA36 DEC Writer II is perfect if you need hard copy. Fully compatible with the H8 and H11, this incredible terminal has a 7 x 7 dot matrix print head, selectable 10, 15 and 30 CPS print speeds, half or full duplex operation and much more.

H36J (LA36 DEC Writer II)

Manual Set for H8 Computer: Includes complete assembly and operations manuals for the H8 Digital Computer, H8-1 memory card, H8-2 parallel interface, H8-3 4K memory expansion chip set, H8-5 serial and I/O cassette interface, H9 video terminal and H10 paper tape reader/punch. H8 software documentation covering monitor, editor, assembler, debug and BASIC is also included. In handsome 3-ring binder.

HM-800 Manual Set.\*

Manual Set for H11 Computer: Includes complete assembly and operation manuals for the H11 Digital Computer, H11-1 4K memory board, H11-2 parallel interface, H11-5 serial interface, H9 CRT terminal, and H10 paper tape reader/punch. Also includes complete software documentation—monitor, editor, assembler, linker, BASIC, FOCAL and related software. In handsome 3-ring binder.

HM-1100 Manual Set\*

\*NOTE: The price of the manual set can be deducted when you order an H8 or H11. Manuals are included with each kit.

## Heathkit Computers Brochure

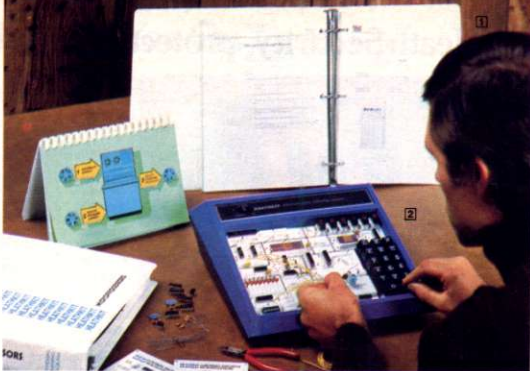
More details in the 16-page colour brochure. Send 20 pence for your copy.

\*Belgium BF20, Holland Df12, Sweden Kr2.

Most computer products now available assembled. See price list.

# Microprocessor Course and Computer Trainer

If you're involved in scientific or electronic pursuits, microprocessors are becoming a way of life and a dominant factor in your success or failure. The EE-3401/ET-3400 course and accompanying trainer is the way to learn microprocessor operation and application techniques. The EE-3401 uses proven self-instructional techniques to teach programming, interfacing and related topics. The ET-3400 Trainer provides the ideal platform for experimentation and later, your own prototyping and design. This is a learn-package you can't afford to miss.



## 1 Learn Microprocessor Operation, Application and Interfacing

*Covers microprocessor basics, computer arithmetic, programming, interfacing and much more, requires knowledge of electronics equivalent to Heath's Digital Techniques Course*

Using Heath's proven self-instruction techniques, EE-3401 adopts a three phase approach to guide you, step-by-step, through the complexities and power of machine language programming, hardware I/O interfacing and microprocessor theory and design applications.

Element I, presented in 8 lessons, utilizes concise self-study texts to cover: Number systems and codes, micro-computer basics, computer arithmetic, introduction to programming, the 6800 microprocessor (part I), the 6800 microprocessor (part II), interfacing the microprocessor (part I), and interfacing the microprocessor (part II).

Colourful audio and visual presentations are combined in element II's six lessons to further enhance your knowledge of such subjects as programming, designing with microprocessors and semiconductor memories. Phase III of EE-3401 provides 19 informative experiments through which valuable "hands-on" experience is gained. The ET-3400 Trainer is utilized and experiments are divided into programming and interfacing applications. Experiments cover program branches, address decoding, arithmetic and logic instructions and much more.

EE-3401 comes complete with 62 electronic components including ICs, RAMs, op-amps and a variety of other microprocessor oriented devices. No additional components are necessary to carry out the experiments provided with this program.

**Course EE-3401**  
**SAVE! ETS-3400, Course and Trainer Together**

See the Digital Techniques Course/Trainer and other courses/trainers on pages 14 to 17.



## 2 Microprocessor trainer for experimentation and design



*Use with Course EE-3401 for an up-to-date computer education*

- Uses 6800 Microprocessor
- Built in 1k ROM monitor program
- 256 bytes of RAM
- Breadboarding socket for prototyping

Functioning as a miniature digital computer, the ET-3400 Microprocessor Trainer has been designed to compliment your EE-3401 Microprocessor Course and provide an ideal platform upon which you may easily and enjoyably expand your knowledge of microprocessor programming and interfacing techniques. In addition, the ET-3400 provides you with plenty of breadboarding capability for experimentation, prototyping and system design.

The ET-3400 is based on the popular 6800 microprocessor and key features include: 1. A built-in 1k ROM monitor program for controlling unit operation. 2. Six digit hexadecimal 7-segment LED display for address and data readout. 3. 17-key hexadecimal keyboard for entering programs, data and control of the unit. 4. 256 bytes of random access memory (RAM), expandable to 512 bytes. 5. Breadboarding socket for prototyping, interfacing and memory circuits. 6. Eight buffered binary LEDs for display of breadboard logic states. 7. Eight SPST DIP switches for binary input to breadboarded circuits. 8. +5, +12 and -12VDC power supply outputs. 9. All microprocessor address, data, and control busses buffered and terminated on the front panel for ease of connection to prototyped circuits. 10. Provision for a 40-pin external connector for extending memory and I/O capability.

**Trainer Kit ET-3400.**

Coming Soon! ETA-3400, expands RAM to 4K.

## BASIC PROGRAMMING SELF-INSTRUCTIONAL COURSE

This course teaches you how to program your computer using the popular BASIC language. BASIC (Beginner's All-Purpose Symbolic Instruction Code) is essential for hobby and personal computing; it is also widely used in education and business. The course covers all formats, commands, statements and procedures plus the creative aspects of computer programming, so you can make practical use of it in solving problems and creating your own unique programs.

Like other Heathkit self-instructional courses, it uses programmed instructions backed by practical hands-on computer experiments and demonstrations to reinforce and personalise the text material. While the BASIC course is keyed to Heathkit computers, it is also equally applicable to any computer system using BASIC.

EE-1100

# Heath Security-protection that works full time

**The Informer™ Alarm keeps a watchful eye in your home**

- Ultrasonic detection system
- Can activate indoor buzzer alarms, outdoor bells, table or floor lamps

No one but you will ever know it's there, but the Heathkit GD-39 Ultrasonic Intrusion Alarm sits quietly on bookshelf or table . . . until something or someone invades its field of surveillance. Then the "Informer" can activate indoor buzzer alarms, outdoor bells, table or floor lamps . . . to alert you to the possible presence of an intruder as far as 25 ft. from the unit.

Easy operation. To operate, simply flip the cut-off-sight switch to activate the system. A soundless signal is transmitted throughout the room, bounced off the walls and returned to the receiver. Any movement that interrupts that transmitted signal in the room is perceived by the receiver, and the lamp outlet is triggered, turning on table or floor lamps. Approximately 30 seconds later, the alarm outlet is triggered, activating indoor or outdoor alarms. Built-in time delay between light and alarm allows you to enter room and deactivate the "Informer" without triggering the audible alarm. A second switch on the back of the unit lets you set the lamp and alarm for automatic reset after the alarm has sounded for 25 seconds. This switch also has a normal position so the audible alarm continues to sound until the unit is manually reset.

Versatile applications. It makes a convenient automatic light switch in dark hallways, or it can be used to alert parents to night-walking children. Unit measures 2½" W x 10½" H x 7½" D.

**Kit GD-39**

**GDA-39-10**, Indoor buzzer alarm

**GDA-39-20**, Alarm bell

## Buy a complete system and SAVE

**GD-39A** (GD-39 & Indoor Buzzer)

**GD-39B** (GD-39 & Alarm Bell)

### GD-39 SPECIFICATIONS

Operating range: Varies with installation. Typical maximum range is 25 ft. Operating times: Turn-on delay: approximately 10 sec. Alarm delay: 20 to 30 sec. (lamp-on time). Automatic reset delay: 20 to 30 sec. (alarm-on time). Power outlets: Two AC sockets: One for Lamp, one for Alarm. Power outlet current: Three amperes total for both. Power requirement: 120/240 VAC, 60/50 Hz, 1½ watts. Dimensions: Chassis only, 2½" W x 9¼" H x 7½" D (approximately). In book-style cover, 2¾" W x 10½" H x 7½" D (approximately).

**The Heathkit Ultrasonic Cleaner handles all those "impossible" cleaning chores**

- Ultrasonic sound waves deep clean most jewellery, brushes, microscopic hardware

The Heathkit Ultrasonic Cleaner makes light work of all those items that you could never get clean without tedious labour. Art and decorator paint brushes, intricate jewellery (except pearls), watches, glasses and contact lenses (except plectrums), dentures.

To use, you simply fill the stainless steel tank with any safe detergent or solvent you would normally use for the item to be cleaned. Place the object or objects in the tank, set the timer and that's all there is to it. No matter what goes into the ultrasonic tank, you'll be amazed how quickly and easily your possessions come clean. Professional artists, jewellers and watchmakers have known about and used ultrasonic cleaning equipment for years. There is simply no more efficient method for getting agitating cleansing power into the most minute crevice of the most intricate object. Now, this low cost kit-form cleaner lets everyone take advantage of this scientific clean-up process. Suitable for domestic use only.

**Kit GD-1150**

### GD-1150 SPECIFICATIONS

Power requirements: 105-130 VAC\*, 60/50 Hz, 100 watts maximum. Operating frequency (transducer): Approximately 41 kHz. Operating temperature: 0°C to 50°C. Timer: 0 to 5 minutes (adjustable). Timer accuracy: ±10% of full scale after calibration at 25°C. Tray size: Approximately 6" long by 4" wide by 2½" deep. [1" solution equals approximately 1½ cups]. Overall size: 11" L by 5½" W by 3½" H.

\* A separate 240/120V isolating transformer is required for 240 VAC operation.



Book cover leaves rear panel exposed for access to switches and outlets. Unit can also be used without cover.



Alarm Bell. Plugs into back of Intrusion Alarm.



Indoor Buzzer Alarm. Plugs into GD-39, can be hidden away.



# Heath Keeps You On Time!



Look no further! Our budget-priced super-accurate digital clock is an ideal choice for your first kit!

- 12 or 24-hour time format
- Automatic brightness control
- 9-minute snooze alarm interval
- 24-hour Alarm, Snooze Button and power-failure indicator

## Low-Priced Digital Electronic Alarm Clock

Start your kit building career with this budget-priced digital alarm clock. The GC-1107 makes a great starter kit, is super-reliable, and you'll really have a great time putting it together! The clock features a pleasant blue-green display that automatically adjusts to ambient light conditions and is easily wired to give you the time in either a 12- or 24-hour format. Also, in addition to hours and minutes, the GC-1107 indicates AM and PM, tells you when the alarm is set, and alerts you if the clock has been shut off during power interruptions.

The alarm on/off switch is easily accessible at the rear of the 1107's cabinet. And if you're the type who hates to face the sunrise, the

"snooze" feature, also accessible on the rear panel, will allow you to take 9-minute catnaps over the period of an hour if you choose!

A Slow switch and Fast switch let you advance the time for easy, accurate setting. And to avoid accidental bumping, or the curiosity of children's little fingers, both switches plus the Time-Alarm switch have been recessed into the base of the GC-1107's mounting cabinet.

You'll find assembly of the GC-1107 to be very easy. A single circuit board forms the basis of the kit and because most of the clocks functions are accomplished by two integrated circuit chips you'll have very few parts to mount.

The GC-1107 has a built in speaker so you'll easily hear its alarm, is styled in a handsome simulated wood-grain finish that fits any decor, and at this low price, is really a bargain. 2 1/4" H x 7" W x 4 3/4" D.

Kit GC-1107

## Heathkit electronic weather monitors

### Digital Wind Speed and Direction Indicator

Outstanding accuracy and easy-to-read digital display make this kit a "must" for pilots, boaters—anyone whose activities are affected by the wind. Pick the two readout modes you want from the three available: miles or kilometres per hour, or knots. Switches select mode and front-panel lights show which is in use. Incandescent bulbs mark the 8 principal compass points, providing 16-point resolution. The transmitter-boom clamps on to any 1" to 1 1/2" TV aerial mast and connects to the receiver with optional cable.

Kit ID-1590E

ID-1590E SPECIFICATIONS: Wind Speed: 0-99 in miles per hour, knots or kilometres per hour (choice of two). Response Threshold: 3 mph. Accuracy:  $\pm 1$  digit or  $\pm 10\%$ , whichever is greater. Direction Response Threshold: approx 2 mph. Operating Temperature: Remote transmitter: -40 to  $+120^\circ\text{F}$ . Receiver: 0 to  $150^\circ\text{F}$ . Power Requirement: 240 VAC, 50 Hz, 6.5 watts. Dimensions: Receiver: 2 1/4" H x 7" W x 5" D. Remote transmitter: 30" boom.

### 8-Wire cable for remote transmitters

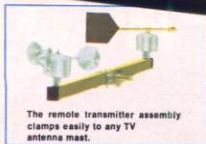
- IDA-1290-1, 50' cable
- IDA-1290-2, 100' cable
- IDA-1290-3, 150' cable

### Digital Indoor/Outdoor Thermometer

You'll never have to "gauge-guess" again! This fun-to-build kit monitors indoor/outdoor (or any two temperatures) with a big, bright, 1 1/2" high digit readout. The readout includes plus and minus signs as well as indoor and outdoor indicator lights, so you know at a glance which temperature is being monitored. Switches select Fahrenheit or Celsius and let you choose continuous readings of one temperature or alternate readings of both. The 85' of cable included lets you place the temperature sensors just about anywhere for a variety of custom applications—home freezer, hot house, garage, basement, pump house, swimming pool, aquarium, almost any temperature.

Kit ID-1390AE

ID-1390AE SPECIFICATIONS: Temperature Range: Fahrenheit -40 to  $+120^\circ$ ; Celsius, -40 to  $+50^\circ$ . Accuracy: Celsius,  $\pm 1^\circ\text{C}$  from  $-15^\circ$  to  $+50^\circ$ ;  $\pm 2^\circ\text{C}$  from  $-30^\circ$  to  $-15^\circ$ ; Fahrenheit,  $\pm 1^\circ\text{F}$  from  $+20^\circ$  to  $+120^\circ\text{F}$ ;  $\pm 2^\circ\text{F}$  from  $-30^\circ$  to  $+20^\circ\text{F}$ . Display: 2 1/2-digit planar gas discharge with + and - sign. Power Requirement: 240 VAC, 50 Hz, 4 to 6 watts approx. Dimensions: 2 1/4" H x 7" W x 5" D.



The remote transmitter assembly clamps easily to any TV antenna mast.



Extra cable lets you place readout at eye level

Bright Red LED Readout can be read from up to 10 feet away

Auto-Manual Control selects automatic on-off or manual operation, allows weighing of lighter objects

Zeroing control lets you accurately weigh contents of a container

Weigh yourself the "space-age" electronic way!

## "Digi-Scale" Digital Readout Electronic Scale

- 4-digit 0.5 inch character display
- Full-scale up to 300 lb or 136 kg in 0.2 lb or 0.1 kg. increments
- Completely safe — battery operated. Automatic switch on

The new Heathkit Digi-Scale is a digital readout "weighing machine" that shows your weight in big, bright, computer-like LED's. Even with a 300-lb. capacity, it reads out to 2/10ths of a pound. It's far more precise and easier-to-read than conventional dial scales, and it's priced lower than any digital electronic scale we've seen yet! Uses solid-state circuitry and a strain-gauge transducer element like those used in expensive electronic laboratory scales. A zeroing feature allows fine adjustments for accurate weighing of small items (weigh the baby, but not the blanket). Has handsome burled walnut-finish platform. Battery-operated, so it's safe to use even after a shower. The kit includes extra cable so you can place the readout at eye level, on a wall, anywhere it's convenient. Operates on six inexpensive 1.5V cells, not included. Platform size, 11½" x 11½" x 1½". Readout/control, 6" x 3½" x 1½".

Kit GD-1186

GDW-1186, Factory assembled version of above

## Freezer Alarm saves you money

It signals if the freezer door is left open; and it signals if freezer temperature reaches -6°C even though the door is closed. The dual-alarm system uses both an audible "beep" and a flashing light. The alarm shuts off automatically when freezer temperature returns to about -12°C. Sensors install easily in any freezer; alarm box mounts anywhere with 20-ft. cable supplied.

Kit GD-1183

## NEW Digital Thermometer

A unique, extremely useful tool for the home, office, laboratory or anywhere a quick temperature reading is needed. A bright, easy-to-read four digit LED display provides temperature readout over a range from 0°C to 100°C in 1/10th degree increments. Uses include photo processing, tropical fish tanks, clinical uses, measuring soil temperatures and checking heating and air conditioning.

Power is supplied by a standard 9V battery. A flashing decimal point provides a low battery warning. Fully assembled. Less battery.

Assembled GD-1226E.

## Fidelity Electronics Deluxe Chess Challenger™

Features three different levels of play

Here's the advanced version of the famous Chess Challenger computerized board that challenges you with its own moves and strategies. New features include programming the computer for the first move, pre-arranging the pieces for mid and endgame situations, and three increasing levels of difficulty selected from the keyboard. The chess board has files and ranks designated in standard international chess notation too.

Has keyboard entry of moves including castling and en passant, a computer memory for position verification, and a digital display with four digit readout to indicate "to" and "from" positions. There are indicator lights for "check" when the computer puts you in check and "I lose" when the computer resigns.

The Chess Challenger is an ideal "trainer" for the beginning chess player. If you're an advanced player or expert, it's three levels of difficulty will help you keep your game "in tune" and sharpen your skills. It's also an instant chess "partner" so you can play the game whenever you want. Includes complete board and keyboard, chess pieces and line cord. For 220/240 VAC, 50 Hz. Fully assembled and ready to use. Compact enough for easy portability. With full instructions.

GD-1248E Fully Assembled.

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# Here's Home & Shortwave Listening fun from Heath

## 4-Band Shortwave just right for the novice

Most components mount on a single circuit board for easy check-by-step assembly in about five evenings

An economic introduction to Shortwave Listening. Take up the fun and fascinating hobby of shortwave listening. An interesting and absorbing project for the whole family; just follow your Heathkit manual and you assemble the SW-717 in a few hours. The Heathkit SW-717 puts local AM stations and shortwave broadcasters from around the world as near as your table or bookcase. Continuous tuning from 550 kHz to 30 MHz, divided into four bands. Ideal beginner's kit . . . most components mount on a single circuit board for easy check-by-step assembly. Reliable solid state design: Advanced devices and techniques give your SW-717 peak performance characteristics, long life and dependability. A dual gate MOSFET mixer stage provides greater signal handling capability and lower noise. Features slide-rule tuning, log-scale, bandspread tuning for separating adjacent stations; variable BFO for clear code reception; built-in speaker, front panel jack for headphone or external speakers; switched automatic noise limiting; signal strength meter, built-in AM rod antenna plus connection for SWL antenna.

### Kit SW-717,

#### SW-717 SPECIFICATIONS

Frequency Coverage: Band A — 550 kHz — 1500 kHz, Band B — 1.5 — 4 MHz, Band C — 4 — 10 MHz, Band D — 10 — 30 MHz. Meter: Indicates relative signal strength. Headphone Jack: Accents low impedance headphones or external speaker. Loudspeaker: Built-in. Controls: Volume with on/off switch, Mode (AM, Standby & CW), BFO, Main Tuning, Bandspread Tuning, ANL on/off. Power Supply: Transformer operated; full-wave bridge rectifier. Voltage Requirements: 120/240 VAC, 60/50 Hz, 8 W. Dimensions: 5 1/4" H x 14 1/2" W x 8" D.

## Top-quality SWL Accessories

**Superex headphones** Ideal for use with Heathkit SWL receiver above, many others. Dual coils, wide headband, 600 ohms.

### GD-396

**Long-wire SWL antenna** 75' long-wire antenna with 30' lead-in, all insulators and hardware.

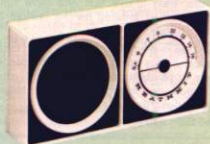
### GRA-72



- This is the famous Heathkit SW-717 — a fine-performing Shortwave Radio and an ideal kit for a beginner — thousands have already built and enjoyed it!



## Play-anywhere AM Medium-Wave Portable Radio



Get a youngster started in kitbuilding with this fun-to-build personal portable.

- Fixed ceramic filters for easy alignment
- Big 3 1/2" speaker

A great kit for beginners. Goes together in a couple of evenings. Has big 3 1/2" speaker, RF amplifier stage, AGC for constant volume, fixed ceramic filters for easy alignment. White & black plastic case measures a compact 4" H x 7 1/2" W x 2" D. Operates on 9-V battery (not supplied). Get a youngster started in kit-building with this fun-to-build personal portable.

### Kit GR-1008



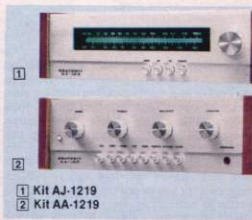
## Heathkit AR-1219 AM/FM Stereo Receiver and Separates

15 watts, minimum RMS, per channel into 8 ohms with less than 0.5% total harmonic distortion from 20-20,000 Hz

Brings you full fidelity AM, FM and stereo FM reception; also has inputs for magnetic phono and tape so you can have a complete and versatile home entertainment setup. Has power enough for solid bass even from inefficient speakers; advanced phase-locked-loop FM stereo circuit for wide stereo separation and minimum distortion; a factory

assembled and aligned FM front end which assures 2  $\mu$ V sensitivity to really pull in FM stations.

Features include: tape monitor for professional-quality recordings with 3-head tape decks, pushbutton input and mode selection, speaker on-off button, stereo headphone jack, precision flywheel tuning with stereo indicator light, inputs for a 75 or 300 ohm FM antenna and a built-in swivel-mounted AM antenna help you get the best reception even from weak stations.



- 1 Kit AJ-1219
- 2 Kit AA-1219

AR-1219 separates, Stereo Tuner AJ-1219 and Stereo Amplifier AA-1219 shown above.

### Kit AR-1219

AR-1219 SPECIFICATIONS: AMPLIFIER—Frequency Response:  $\pm 1$  dB, 7 Hz to 100 kHz. IM Distortion: Less than 0.5% full power; less than 0.2% at 1 watt. Hum and Noise: Phono: 60 dB. Tape: 65 dB. FM SECTION —Sensitivity: 2  $\mu$ V. Selectivity: 60 dB. Image Rejection: 50 dB. Stereo Separation: 40 dB typ. 35 dB minimum —AM SECTION —Sensitivity: 100  $\mu$ V per meter. Selectivity: 40 dB. Power Requirement: 120/240 VAC, 60/50 Hz. Dimensions: 3 1/2" H x 17" W x 13" D.

\*Rated IHF (Institute of High Fidelity) Standards

# Heathkit electronic digital "Super-Clock"

An electronic digital floor clock with full 3 1/4" high numerals in a modern, functional cabinet

- Hour and minute readout
- Automatic dimming circuit
- Power failure indication
- Four smoked-glass shelves



Add elegance with a "space-age" touch anywhere in your home! The GC-1195 "super-clock" is housed in a stylish cabinet with four smoked glass shelves for plants, books or knick-knacks — and the cabinet is finished in handsome simulated walnut-veneer laminate with anodized aluminum corner pieces. The 3 1/4" high clock digits glow brightly enough to be read even in daylight, and an automatic dimming feature adjusts them to diminishing room light for a charming, subtle display in dim or darkened rooms.

The clock displays hours and minutes, with the centre column pulsing each second. A special power failure indicator circuit pulses the display brightness to show that power has been interrupted and clock must be reset. Easy time setting is accomplished by readily accessible, easy-to-use fast and slow time advance switches located on the bottom of the clock chassis.

The GC-1195 is a handsome addition to most any decor, and a great conversation piece. For even more charm and "Old World" distinction, add our electronic clock chimes accessory (described at right).

Kit GC-1195

#### GC-1195 SPECIFICATIONS

Display: 3 1/4" diffused incandescent readout. Format: 3 1/2-digit (12-hour) time readout. Time Accuracy: determined by accuracy of power line frequency. No accumulative error. Power requirement: 108-132 VAC, 50/60 Hz, 30 watts. 216-264 VAC, 50/60 Hz, 30 watts. Dimensions: 14" W x 9 1/2" D x 6 1/2" H. Net Weight: 48 1/2 lbs.



## Digital Electronic Shelf "Super Clock"

Has the same great features as our Digital Floor Clock in a handsome Shelf Clock Case

Uses the same electronics and display as the GC-1195 floor clock, but is housed in a good-looking walnut-veneer cabinet suitable for shelf, table or desk-top use. Adds a touch of timely elegance to your home or office. Accepts optional GCA-1195-1 electronic chimes. Specifications same as GC-1195 above, except dimensions are 6 1/2" H x 12 1/2" W x 6 1/4" D.

Kit GC-1197

## Westminster Chimes Accessory

Authentic "Big Ben" chimes sound

Builds right in to the GC-1195 or GC-1197 to provide a rich, electronically synthesized "Big Ben" chimes sound: 4 notes on the 1/4-hour, 8 notes on the 1/2-hour; 12 notes on the 3/4 hour and the full 16-note passage and hour announcement on the hour. And you can even turn on a reassuring electronic "tick-tock" during clock operation if you desire. Has 2-watt audio output, volume control and pitch adjustment, pleasant sounding speaker.

Kit GCA-1195-1



## The TD-1006 makes music a kaleidoscope of colour for your parties and get-togethers!

Make music "come alive" with vibrant, pulsating colour — adds exciting sights to your sound system

The TD-1006 Colour Organ adds exciting sights to your sound system. It translates any kind of music into pulsing, whirling starbursts of colour. Just connect the TD-1006 to the speaker leads of any sound source (except AM radio). Without affecting the sound, active filters separate the audio signal into four frequency bands, each with 35 brilliantly coloured lights — red for bass, blue for low-midrange, green for upper-midrange and amber for treble (140 lights total). The lights pulsate in time to the music creating spokes of colour that seem to swirl. Input is 1 volt RMS min. to 22 volts RMS max. Line isolation provides source protection.

Just wire the two circuit boards and install the prestrung lights in the factory-assembled cabinet. A single knob on the side controls sensitivity and turns power on or off. Just 4 1/2" deep — even hang it on the wall. Walnut-grained vinyl-clad case, black-out front panel. 22 1/2" W x 22 1/2" H x 4 1/2" D. For 120/240 VAC.

Kit TD-1006



There's built-in pride and satisfaction in every Heathkit product you buy.



## World's First TRUE Hand-Held Aircraft Navigation Computer!

- The most powerful low-cost Aircraft Navigation Computer Available
- Built-in clock and timer for time-related computations
- Countdown fuel indication
- Scientific calculator functions
- ETA to checkpoint and destination
- Flight leg countdown
- Accepts preflight data and vectors for up to nine flight legs
- Automatically computes in-flight wind, then updates all subsequent flight data

Now, for the first time, true computer power in a hand-held, easy-to-use navigation computer! Three on-board microprocessors with a 14-digit multi-function display make it the most powerful low-cost instrument available to the general aviation pilot!

The OC-1401 computes magnetic heading...true air speed...ground speed...true course...ETA to next check point...ETA to destination...clock time to next check point...clock time to destination, with dynamic displays to show distance and time to check point and/or destination as well as amount of fuel remaining!

Build it yourself in two hours or less, or order it assembled and tested. The OC-1401 features internal rechargeable batteries to keep data in memory (charger included); in flight, powered from your aircraft's lighter plug (with converter and cable included) and from optional rechargeable power pack in carrying case. Measures 6 1/2" L x 3 1/2" W x 1 1/2" D (162 x 83 x 41 mm).

Kit OC-1401

Assembled OCW-1401

Kit OCA-1401-1E, Battery Pack/Carrying Case

Assembled OCW-1401-1E, Battery Pack/Carrying Case

# New

Built-in Diagnostic Circuitry  
PLUS Full-Fledged  
Scientific Functions

No External  
Programs  
Required!



Change tunes  
fast'n' easy

## Heathkit Electronic "Doorbell"

What an exciting way for visitors to announce themselves...your favourite melody plays when they touch the door button. Use as many as 16 notes to programme your favourite tune. Change it whenever you wish...programme to celebrate a season, anniversary, birthday, or a special party. And the TD-1089 tells you whether a visitor is at the front or rear door by the length of the tune. Changing your tune is easy. Just rearrange the programming leads in the connectors of the C through C' one-octave "keyboard" located behind the front-panel access door. The assembly manual includes instructions for a variety of tunes, or you can compose your own. Controls for tuning, volume, speed, and decay characteristics of the electronically synthesized sound also are located inside the front-panel door. Single circuit board construction makes it easy-to-build even if you're a first-time kit builder. And installation is easy too. Requires 16 volt, 10VA transformer (not supplied). The attractive brown plastic cabinet with gold colour trim and tan fabric panels is included in the kit. Plays in any position. 5 1/2" H x 8 1/2" W x 2 1/2" D.

Kit TD-1089



## Seven Functions Time Any Event

1. Start/Stop Elapsed Time
2. Sequential Timing
3. Total Activity Time
4. Split Time
5. Start/Stop Activity Time
6. Upcount to Preset Time
7. Downcount from Time

## The world's most versatile stopwatch

For features, versatility and accuracy, we don't think you can find a better stopwatch than our GB-1201! Two exclusive Heath PMOS IC counters and quartz crystal accuracy make it ideal for almost any timing job. Reads hours, minutes, tens and hundredths of seconds in a bright red digital readout that's easy to see in most any light. We even include a sunscreen so you can read it in direct daylight!

Includes pre-wired AC adapter/charger, rechargeable batteries, sunscreen, lanyard for wearing the GB-1201 around wrist or neck. Special modification instruction lets you convert the GB-1201 to read hundredths of minutes—perfect for car rallies and time studies.

Kit GB-1201E

ICA-2009-1, Felt-lined Naugahyde® carrying case



## 1 Indoor/Outdoor Intercom

Master functions include "All Call," "Talk," "Dictate"... plus monitoring of up to four Remotes. Indoor Remotes can be rendered private to prevent monitoring. GD-110 and GD-120 are light green and measure respectively 4 1/2" H x 8 1/2" W x 6 1/2" D and 3 1/2" H x 6" W x 5 1/2" D. GD-130 has weatherproof crinkle finish. 5 1/2" H x 3 1/2" W x 2 1/2" D.

Kit GD-110, Master Station

Kit GD-120, Indoor Remote

Kit GD-130, Outdoor Remote

GDA-110-2, 100 ft indoor cable

GDA-110-4, 100 ft outdoor cable

## 2 2-Station Intercom

Master station accommodates up to two remotes. Remotes can initiate "private" calls to Master. Master can call either or both remote stations. Master controls include Sta. 1, Sta. 2, Talk, Dictate, & Volume. Remotes have Talk & Dictate controls. 3" x 5" microphone-speakers for crisp, clear sound. Low-profile cabinets with plastic feet for surface use, holes for wall mounting. Each unit, 3 1/2" H x 6" W x 5 1/2" D.

Kit GD-140, one Master, one Remote

Kit GD-120, one extra Remote

GDA-110-2, 100 ft cable

# New Heathkit Garage Door Opener for year'round convenience



- Stop Fighting Heavy Garage Doors in Bad Weather
- Door instantly reverses and returns to full open if obstructed

The GD-3310E garage door opener is an investment that really pays off in time and labour saved, convenience and extra security. Simply touch the button on the radio transmitter\* in your car—your garage door opens automatically and the garage light turns on. Drive into the garage, touch the button again, and the garage door closes behind you. Has a powerful  $\frac{1}{2}$  hp motor that opens even the heaviest residential garage doors (up to 7 $\frac{1}{2}$  x 2.286m, maximum height) with ease; responsive, self-lubricating screw drive. The adjustable slip clutch provides opening safety, stopping the door automatically if obstructed. When the door is closing, the important safety reverse feature takes over. If the door encounters ANY obstruction it stops and reverses instantly, and returns to full open position. Assembly is really easy, there's absolutely no soldering! Connecting leads are pre-cut and push-on connectors are already installed. A separate doorbell-type switch and 20' (6.10m) cable let you operate the unit from inside your house, or anywhere you may choose.

\*IMPORTANT NOTE TO USERS IN THE UK. The radio control transmitter does not operate within the legal frequency range permitted in the UK. The garage door opener must therefore be operated by the separate doorbell-type switch as above, or key-type switch (not supplied).

- GD-3310E, Transmitter, Receiver, Mechanism.  
 Kit GDP-3310E, Mechanism only.  
 GDP-3311E, 1 Transmitter only.  
 GDP-3312E, Transmitter and Receiver

GD-3310E SPECIFICATIONS: Overall Size: 12" L x 12" H x 9" W (304 x 305 x 229mm). Motor: 220 VAC,  $\frac{1}{2}$  HP. Open and Close Time: Approx. 12 seconds. Mounting Clearance: 3" (76mm) above highest point of door travel. Safety Lamp: Delay circuit keeps lamp on 1 to 3 minutes. TRANSMITTER: Powered by standard 9-volt battery. RF Frequency: 27 MHz. Useful Temperature Range: -20°C to +70°C. Receiver: Powered by 24 VAC from opener mechanism. RF Frequency: 27MHz.

## New factory assembled transmitter and receiver with latest digital circuitry

The fully assembled transmitter and receiver in the GD-3310E system incorporate the latest in solid-state electronics for improved security and reliability. The transmitters and receivers are digital and use exclusive custom IC's. They transmit an 8-bit "word" with 256 user-programmable combinations to provide maximum security and freedom from false triggering. Reprogramming is easy too—just flip the eight switches in the transmitter and receiver to a new combination. The transmitter and receiver units are fully assembled and ready to use.



## Up-Down Limiters

Permanently installed limiters let you adjust amount of door travel so door closes smoothly to proper position, open or close.



## Windshield Wiper Delay



Ideal safety accessory for driving in light rain, mist and fog. Eliminates constant wiper arm movement when an occasional sweep is sufficient. Lets you vary the time between sweeps. Moulded plastic case mounts on or under dash. Easy kit to build.  
 Kit CH-1068

# New Ultrasonic Car Intrusion Alarm

- Protect your car and its contents
- Installation requires just three connections
- Easy to operate
- Easy kit assembly

Stop the thief! Protect your car and its contents with the rugged Heathkit Ultrasonic Car Intrusion Alarm. It's easy to operate. Simply move the slide switch to the ARM position or remove the security plug from its socket and your GD-1558 is on duty—ready to protect your valuables. An alarm delay gives you plenty of time to enter and disarm the GD-1558 when you're ready to use your car. When unauthorised entry occurs the GD-1558 waits 10 seconds and then begins sounding the horn. The kit is very easy to assemble and installation in your car requires just three connections. The GD-1558 mounts on the visor or, if a more permanent installation is required, you can attach with sheet metal screws. Installation requires car with horn relay. If your car doesn't have a horn relay, purchase of the GDA-1558-1 relay kit is required. Only 4 $\frac{1}{2}$ " W x 3 $\frac{1}{4}$ " D x 1 $\frac{1}{4}$ " H, operates from your car's 12-volt battery.

- Kit GD-1558  
 Kit GDA-1558-1

# Useful and convenient accessories for your car



## Heathkit CD Ignition System

- *Helps you get longer life from plugs and points*
- *Assures fast, sure starts in all kinds of weather*
- *Improves mileage to help you save money and energy*

Get better petrol mileage, save your plugs and points, get up to 50,000 miles between tuneups with the Heathkit CP-1060 capacitive-discharge ignition. Delivers higher voltage to your spark plugs for more complete and efficient combustion—assures fast, sure starts in any weather, improved over-all performance. For use on cars, trucks, boats—any 12-volt engine with a conventional battery/distributor/coil negative ground system. Goes together in a couple of hours, installs in less than that. Two standard connectors screw onto the coil terminal posts without rewiring. An external override button switches your engine back to its original ignition system. Measures just 3½" H x 3¼" W x 6" D—installs in wheel well or other convenient spot near your engine.

Kit CP-1060

## Easy-to-build Digital Readout Tachometer

- *More responsive and accurate than meter-type tachs*
- *Helps you find the best operating efficiency*

Reads your engine's RPM, even in direct sunlight, on the ½"-tall numeric display. The readout shows 1st 2 digits, multiply by 100 for actual rpm. A dimmer control adjusts the brightness for safe nighttime driving. The CI-1079 operates with conventional ignition systems, capacitive discharge systems (like the Heathkit Model CP-1060), and factory electronic ignitions. For 4, 6, 8 cylinder 4-cycle engines; 2, 3, 4 cylinder 2-cycle engines; 2, 3, 4 rotor Wankels. Easy installation—simply connect the CI-1079 directly to the primary side of the ignition coil. For engines with magnetos or without access to the primary, order the optional inductive pickup below.

Kit CI-1079

Kit CIA-1079-1

## Heathkit/Dana Electronic Speed Control

Long distance drivers will really appreciate the CS-2048. Just accelerate to the desired cruise speed, press a button and the CS-2048 electronically takes over and maintains your speed. A "memory" remembers the cruise speed and returns the vehicle, at the push of a button, to that speed after you've used the brakes to slow down. A touch on the brake pedal disengages the unit or the manual override may be used.

The only prerequisite for installation is that the vehicle have an open driveshaft. Comes completely assembled and vehicle installation is comprised basically of four operations; mounting the control unit on the turn signal arm, installing the electronic control module under the dash, connecting the vacuum servo to the throttle and mounting the speed transducer unit adjacent to the driveshaft.

NOTE: Vehicle installation requires a certain amount of mechanical knowledge and proficiency.

Assembled CS-2048



## Heathkit Auto Intrusion Alarm

Here's effective auto protection at an affordable price! Has 5-15 second adjustable delay so you can enter or leave the car without sounding the alarm, under-dash alarm set switch. Alarm sounds for approx. 2 minutes, then resets and repeats. Once the alarm sounds, the only way to disable it is to flip the reset switch on the concealed alarm unit. If the passenger compartment is tampered with, the entry delay is defeated and further attempts to enter car will trigger alarm instantly, so when you return to your car you'll know it's been tampered with. The optional horn relay adapts the GD-1157 to cars whose horns do not use a relay or use a plug-in relay. The optional siren accessory provides an attention getting "yelping" sound, instead of sounding car horn. With all switches, hardware. Alarm unit, 2½" H x 4¼" W x 5" D. For 12 VDC negative ground.

1 Kit GD-1157

2 Kit GDA-1157-1, Optional Siren Accessory

Kit GDA-1157-2, Optional Horn Relay (not shown).





Tune up for better performance and economy with **Heath tune-up gear**

## Exhaust Gas Analyzer checks fuel efficiency

- Shows air-fuel ratio and percent of carbon monoxide
- Helps you tune-up your car for peak performance
- Includes all you need for fast and easy hook-up

Monitors your car's exhaust for minimum air pollution and maximum efficiency by measuring thermal conductivity of the exhaust gases. Shows the air-fuel ratio, combustion efficiency and the percentage of carbon monoxide in the exhaust. The CI-1080 is essential when you're tuning up a car which must meet specific requirements for exhaust emissions, or when you simply want peak operating efficiency. Comes with all cables and tubing for easy connection.

### Kit CI-1080

**CI-1080 SPECIFICATIONS:** Meter Scales (3): 11.5-15.0 Air-Fuel Ratio, 70%-90% Combustion Efficiency, 0-8% Carbon Monoxide. **Exhaust Type:** From 4-cycle gasoline engines. Not for use with catalytic converters. **Accuracy:** Within 1 Air-Fuel Ratio depending on fuel used. **Meter:** 4 1/2", 100-0-100  $\mu$ A. **Connectors:** Battery cord, 7 feet. **Sensor cord,** 21 feet. **Exhaust flexible tube,** 30 inches. **Power Requirement:** 6-volt or 12-volt car battery, less than 150 mA. **Weight:** 4 lbs., 12 oz.



## Low-cost professional-grade Engine Analyzer

This professional-grade instrument tests conventional, magneto, transistorized, and most capacitive discharge ignition systems—both positive and negative ground, any voltage, or any 3, 4, 6 or 8-cylinder engine. Also tests storage battery, generator or alternator, voltage regulator, starter, distributor, ignition circuit (points, condenser and coil), accessories and all the electrical wiring. Large 6" colour coded meter with  $\pm 3\%$  accuracy on all ranges. Operates on three 1.5V cells (not supplied). Includes all leads and accessories.

### Kit CM-1050

**CM-1050 SPECIFICATIONS:** Voltmeter Ranges: 0-3.2 V DC, 0-32 V DC,  $\pm 3\%$  of full scale; Ohm-meter: Two ranges: R x 1 (100  $\Omega$  center scale), R x 100 (10 k $\Omega$  center scale),  $\pm 3\%$  arc. **Tachometer:** Two ranges: 0-1200 rpm, 0-6000 rpm,  $\pm 3\%$  of full scale. **Dwell Meter:** Two ranges: 0-45° (on 0-60° scale), 0-60°,  $\pm 3\%$  of full scale. **Ampères:** -5 to +30 amperes DC,  $\pm 3\%$  of full scale. **Spark Output:** 0-50 Point Resistance; Good/Bad. **Alternator:** Good/Bad. **Condenser:** 0.22  $\mu$ F, 10%. **Accuracy:**  $\pm 3\%$  of full scale. **Cables Supplied:** Two 8' two-conductor test cables. One 2' alligator to alligator lead. One 2' alligator to push-on connector lead. One calibration cable. **Accessories Supplied:** 90-ampere shunt, 0.25  $\Omega$  resistor assembly. One insulation-piercing alligator clip. Two #10 solder lugs. (#14). **Dimensions:** 7 1/2" H x 10 1/2" W x 8 1/4" D.



**COA-2600-4**  
Deluxe timing light and advance meter. Measures advance to 60°.

## Deluxe Ignition Analyzer with 12" CRT

The Heath CO-2600 helps ensure peak performance from your car's ignition system. It features solid-state dependability, bright 12" CRT (with graticule marked for voltage and dwell measurement), and simple pushbutton selection of parade, superimpose, or individual cylinder patterns. Complete with Heath's excellent instruction and operation manual—even the "novice" will find little difficulty in diagnosing ignition problems quickly and correctly. In addition the CO-2600 features an 8-inch multi-purpose meter. Great for tune-ups, the meter functions as a 3-range tachometer (1000, 3000, and 6000 rpm), dwell meter, and a dual-range DC voltmeter.

### Kit CO-2600

**Kit COA-2600-4, Timing Light/Advance Meter**  
**COA-2600-2, Alternator Test Adaptor**  
**COA-2600-3, Scope Cart**

**CO-2600 Specifications:** For Use With: Standard, transistorized, or C-D ignition systems; 4, 6 or 8-cylinder (4-cylinder, or 2-rotor) Wankel engines. **Signal Pickup:** Direct from primary, inductive for parade trigger, and capacitive for secondary. **Tachometer and Voltmeter Accuracy:**  $\pm 3\%$  of full scale on any range. **Scope Vertical Expand:** Minimum 2 to 1. **Operating Temperature Range:** 0°C to 40°C. **Tachometer:** 1000, 3000 or 6000 rpm. **Voltmeter:** 2 or 20 VDC. **Power Requirements:** 110/120 or 220/250 VAC 50/60 Hz. **Dimensions:** 12 1/2" H x 25 1/2" W x 14 1/2" D (32" x 64" x 35.9 mm). **Weight:** 53 lb.

## Heathkit CO-1015 Ignition Analyzer with 5" CRT

- Built-in rpm indicator
- Clamp-on inductive pickup for easy hookup

Detects shorted spark plugs, bad ignition points, defective wiring, worn distributor parts, incorrect dwell angle, plus coil or condenser defects and transistor or capacitive discharge circuitry problems. Can be used with any standard, transistorized or capacitive discharge ignition system on four, six or eight-cylinder engines with distributors. You select one of four different patterns—primary or secondary, in either

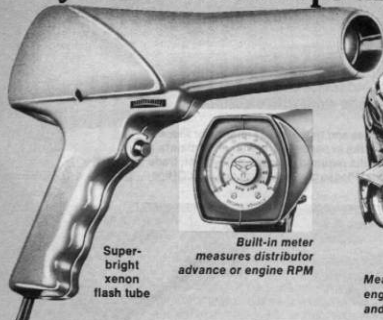
parade or superimposed display. For detailed analysis, the horizontal sweep can be expanded 10 to 1, vertical sweep 2 to 1.

### Kit CO-1015

**CO-1015 SPECIFICATIONS:** **Power Requirement:** 120/240 VAC, 60/50 Hz, 16 W. **RPM Range:** 400-5000. **Cylinders:** 3, 4, 6 or 8. **Vertical Expand:** Approx. 2 to 1. **Horizontal Expand:** Approx. 10 to 1. **Sweep Length:**  $\pm 5\%$  over entire RPM range. **Intensity, Focus, Presets:** Focus, Astigmatism, Trigger Adjust. **Tach Cal:** Connection Cables: 12' pick-up clamp; ground and secondary clip leads extend 2' beyond pick-up clamp. **Tachometer:** 0-1000 RPM, 0-5000 RPM  $\pm 5\%$  of full scale. **Dimensions:** 7" H x 10 1/2" W x 17 1/2" D (178 x 267 x 445 mm).



# Do your own tuneups and save!



Super-bright xenon flash tube

Built-in meter measures distributor advance or engine RPM



Measures dwell, engine rpm and voltage

## CI-1096 Deluxe Timing Light with Built-in Advance Meter and Tachometer

Here's a really convenient, easy way to keep tabs on your car's engine timing and distributor advance functions. The CI-1096 incorporates a timing light, advance meter and tachometer in one compact, lightweight unit. Merely press the trigger to get a super-bright timing flash and a meter indication of distributor advance in degrees. Take your finger off the trigger and the meter indicates engine RPM. The 250° meter movement measures mechanical or vacuum advance up to 60° from 1500 to 4500 RPM and indicates engine speed to a maximum of 4500 RPM. Inductive pickup snaps around the #1 sparkplug wire for quick connection. Powered directly from your car's battery or from a separate 12VDC power supply. Functions with all types of ignition systems.

### Kit CI-1096

CI-1096 SPECIFICATIONS: Useful Light Range: Up to 2 ft. in daylight. Triggering: Current pickup coil. Power Requirement: 12VDC battery or separate 12VDC power supply. Dimensions: 7 1/4" H x 2 3/4" W x 1 1/2" D.

## Deluxe Timing Light—brighter than daylight

Keep your car properly timed for better driving efficiency, cleaner running, smoother performance and increased petrol economy. Features a handy inductive pickup that snaps directly around the #1 spark plug wire without removing wire, using adapters, etc. Has super-bright xenon flash bulb. With all cables, pickup and clips.

### Kit CI-1040

CI-1040 SPECIFICATIONS: Useful Light Range: Up to 2 ft. in daylight. Triggering: Current pickup coil. Power Requirement: 12 VDC battery or separate 12 VDC power supply. Dimensions: 6 1/2" H x 2 3/4" W x 1 1/2" L.

## Hanson Basic Tester Set

Helps you keep your car in top shape! Includes Model 714 Remote Starter Switch, Model 715 Deluxe Compression Tester, Model 709 Vacuum/Fuel Pump Tester, CGP-1036, Assembled.



## Three-in-One Tune-up Meter

- Helps you keep your car in top shape
- Measures dwell, engine rpm and voltage
- Easy to use — just connect two leads to your engine
- Works with all factory-installed ignition systems

The CM-1073 combines a distributor cam dwell meter, an electronic tachometer and a direct-current voltmeter in a single, compact unit. Measures dwell angle on most 4-cycle, 3, 4, 6 and 8-cylinder engines. Shows engine RPM on two scales — 0-1500 RPM and 0-4500 RPM. Checks voltage from 0-20 volts.

Can be used with both 6 and 12-volt electrical systems with positive or negative ground, and with all new factory-installed solid-state and high-energy ignition systems. It has just two leads to connect to the engine and draws its power directly from car battery. Complete with leads, instructions and high-impact case. Easy kit assembly too.

### Kit CM-1073

CM-1073 SPECIFICATIONS: Dwellmeter: Three dwell scales: 8 cyl., 10-45 degrees; 4 cyl., 20-90 degrees; 6 cyl. & 3 cyl. x 2, 25-60 degrees. Tachometer: Two RPM ranges: Low range — 0-1500 RPM; High Range — 0-4500 RPM. Voltmeter: Direct reading scale, 0-20 VDC. Power Requirement: 10 mA approximate average current. Meter: 4 1/2"; 1 mA (100 degree movement). Accuracy: ±3% of full scale. Dimensions: 4 1/2" H x 8 1/2" W x 7 1/4" D.

## Small Engine Tune-up Meter

Ideal tune-up tool for all 1 to 4 cylinder, and 4 cycle engines. Set up your car, motorcycle, lawn mower, outboard etc., with electronic accuracy. The Heathkit CM-1045 is a completely portable instrument that tests volts, ohms, dwell and continuity—in many cases permits checking the entire ignition system on a small engine without tearing down to get to the ignition points behind the flywheel. Built-in tachometer with snap-on inductive pickup. Less batteries.

### Kit CM-1045

CM-1045 SPECIFICATIONS: Voltmeter: 0-20 V DC. Ohmmeter: 0 to 100 kΩ (10 kΩ centre scale) Tachometer: Two ranges: 0-3000 rpm, 0-15000 rpm. Dwell Meter: Four scales: 1 cylinder, 90°-360°; 2 cylinder, 40°-180°; 3 cylinder, 30°-120°; 4 cylinder, 20°-90°. Power Source: Three 1.5 V SP11 batteries. Dimensions: 9 1/2" H x 9 1/2" W x 5 1/2" D.



HEATHKIT  
CONTAINING  
INSTRUCTIONHEATHKIT  
CONTAINING  
SUPPLIES

AC ELECTRONICS

DC ELECTRONICS

# Heathkit Self-Instruction Electronics Courses

The easy, low-cost, self-paced learning system designed to teach anyone about electronics—ideal for beginners or as “brush-up” courses for those who work with electronics

NOTE: These courses and trainers may qualify for Income Tax Relief where the expense is undertaken to maintain or improve skills required in your employment, trade or business. Please contact your Local Tax Office.



Thousands of people just like you have already learned electronics the easy Heathkit way—and you can, too. The secret is our efficient approach to self-learning with easy, step-by-step “programmed” instructions; audio records (or optional cassettes) to introduce and reinforce key concepts; self-evaluation quizzes to

test your understanding; and interesting experiments that let you learn the easy “hands-on” way. All you need is a record or cassette player, small hand tools and a VOM, such as the IM-5284. The optional Heathkit Experimenter/Trainer is specifically designed to help you do the experiments in each course.

## Course 1: DC Electronics

A basic introduction to electrical fundamentals, theory and practice. You learn how to solve basic problems involving voltage, current, resistance and power; build and experiment with DC circuits of your own design; explain the relationship between voltage, current and resistance and much more.

Your first step on the way to a complete understanding of electronics, Course 1 covers the following: Electron theory; current flow; voltage; resistance; Ohm's Law; magnetism; electrical measurements; network theorems; inductance and capacitance. In addition to that mentioned

operation and function of resistors, potentiometers, switches, fuses, relays, capacitors, inductors and batteries. You will also be able to use a multimeter to measure voltage, current and resistance, draw equivalent circuits using a diagram as a guide, and construct DC circuits from a schematic diagram. As you complete each section of the course, quizzes let you test your retention. Ultimately, you have a detailed knowledge of basic DC electronics in just a very short time. Includes text, records and 56 electronic components for 20 experiments.

Course EE-3101  
EEA-3101, Optional Cassettes\*  
EES-3101, Course with Kit Trainer

above, you will learn the relationship between electricity and magnetism and you will be able to solve basic electronic problems involving current, voltage, resistance and power, convert from one metric prefix to another and work with powers of ten, build and experiment with basic DC circuits of your own design, explain the construction,

## Course 2: AC Electronics

Explains alternating current principles and theory. You'll learn how to analyse AC circuits containing resistance, capacitance and inductance; explain the operation of series and parallel resonant circuits; explain basic transformer and AC generator operation and more.

Course 2 covers AC fundamentals; AC measurements; capacitive circuits; inductive circuits; transformers and tuned circuits. In addition to that mentioned above, you will learn to explain the difference between AC and DC, describe the operation of a simple AC generator, explain

the frequency of an AC waveform when its period is known, explain how AC meters are used to measure current, power and voltage, analyse simple AC circuits that contain resistance or a combination of resistance, capacitance or inductance, describe the electrical properties of capacitance and inductance and more. Course 1 or equivalent knowledge is the prerequisite for this course. Includes text, records and 16 electronic components for 8 experiments.

Course EE-3102  
EEA-3102, Optional Cassettes\*  
EES-3102, Course with Kit Trainer

basic transformer action, explain the operation of series and parallel resonant circuits, determine the average or effective value of an AC sine wave when its peak or peak-to-peak value is known, determine

\*Optional Cassettes duplicate material on records, but in convenient, easy-to-use cassette format.

## Course 3: Semiconductor Devices

The heartbeat of solid-state electronics; semiconductors. Learn about the technological revolution that reshaped the electronics world. When you've finished Course 3 you'll be able to name the primary advantages that semiconductors have over valves; explain how most important semiconductors operate and how they are constructed; recognise the schematic symbols used to represent the wide variety of semiconductors now in use and a great deal more.



Learn how semiconductor devices are used in actual circuits

- Bipolar Characteristics
- IC's
- Zener Diodes
- FET's
- Optoelectronic Devices
- Special Diodes
- Thyristors
- Fundamentals
- Bipolar Transistor Operation
- Diodes

One of the most important of the Heathkit Self-Instruction Courses, Course 3 will lead you from basic theory to the sophistication of bipolar transistors and integrated circuit design. Informative text and audio visual presentations simplify learning and speed you toward full understanding of: N and P type materials, holes, electrons, current flow, majority and minority carriers, depletion regions,

doping, barrier junctions, biasing and gain. Once you've mastered the basics move on to: diodes; Zener diodes; special diodes; bipolar transistor operation; bipolar characteristics; field effect transistors; thyristors; integrated circuits and optoelectronic devices. You'll learn in addition to what is mentioned above; how to describe the electrical characteristics of semiconductor materials, how to properly handle sensitive semiconductor materials, how to recognise the most commonly used semiconductor devices, and how to test various semiconductors for proper operation. Prerequisites are Courses 1 and 2 (or equivalent knowledge). Included are texts, records and 27 electronic components for 11 experiments.

Course EE-3103  
EEA-3103, Optional Cassettes\*  
EES-3103, Course with Trainer

## Course 4: Electronic Circuits

Teaches you basic transistor circuitry including amplifiers, oscillators, filters and pulse shapers; explains amplitude and frequency modulation; shows you how to construct transistor and integrated circuit amplifiers, oscillators and other common solid state circuits.



Explains the operation of all the most common solid-state electronic circuits

- Basic amplifiers
- Operational amplifiers
- Oscillators
- Typical amplifiers
- Power supplies
- Pulse circuits
- Modulation

Course 4 instructs you in the operation of all the most common solid-state electronic circuits. You study basic amplifiers; typical amplifiers; operational amplifiers; power supplies; regulators; oscillators; pulse circuits; modulators and demodulators. In addition to that mentioned above, you will learn to analyse and design simple inverting and non-inverting amplifiers that use operational amplifiers, discuss the basics of oscillation and identify and describe the

operation of commonly used LC, RC and crystal oscillators. You will learn about pulse circuits and multivibrators. Then you will study amplitude and frequency modulation including SSB. You will also learn how to use a voltmeter and an oscilloscope to analyse the operation of electronic circuits. Course 4 brings all the theory of your first three courses together and shows you how it applies in actual circuit operation. Prerequisites are Courses 1 through 3 (or equivalent knowledge). Included are texts, records and over 110 electronic components for 18 experiments.

Requires an oscilloscope (such as the Heathkit IO-4541) for some experiments.

Course EE-3104  
EEA-3104, Optional Cassettes\*  
EES-3104, Course with Kit Trainer



Heath recommends the use of the IM-5284 Solid-State Multimeter for these courses. For more details see index under Meters.

# SAVE!

SAVE when you order all the four basic courses and the ET-3100 Trainer together.

ETS-3114, All four courses and trainer

## Heathkit Basic Experimenter/Trainer Kit

For the Heathkit DC, AC, Semiconductor and Electronic Circuits courses — helps you perform each experiment quickly and easily. And after you finish the course, it's ideal for "breadboarding" your own design projects. Has solderless breadboarding sockets, 2-range variable sine and square wave (200-20,000 Hz) signal source, dual-variable power supplies for positive and negative voltages (both variable over 1.2 to 16 volts, 120 mA, both regulated and short-circuit protected), 1k and 100k linear potentiometers. Centre tapped transformer provides 30 V rms, 50 Hz for line experiments. For 120 VAC, 60 Hz or 240 VAC, 50 Hz.

Kit ET-3100

STW-3100, Factory Assembled Trainer.



\*Optional Cassettes duplicate material on records, but in convenient, easy-to-use cassette format.



## Advanced Digital Techniques Course

The most advanced of Heath's courses and the nucleus of future electronics; digital electronics. You'll learn the operation of digital logic circuits and the major applications of

digital techniques in electronics. Everything from TTL and CMOS to ROMs, PLAs, microprocessors and computers a *must* course for those who *must* be up to date.

- *Introduction: techniques and uses, binary numbers, digital codes.*
- *Semiconductor Devices for Digital Circuits.*
- *Digital Logic Circuits: AND gates, OR gates, NAND/NOR logic, etc.*
- *Digital Integrated Circuits: TTL, ECL, CMOS, NMOS, PMOS, how to choose.*
- *Boolean Algebra.*
- *Flip-Flops and Registers: latches, D & JK flip-flops, storage registers, applications.*
- *Sequential Logic Circuitry: binary, BCD modulo N, up/down, counters, dividers, shift registers.*
- *Combinational Logic Circuits: encoders, decoders, exclusive OR, comparators, multiplexers, ROM's, PLA's.*
- *Digital Design: combinational and sequential circuits, procedures.*
- *Digital Applications: counters, computers, microprocessors.*

Course 5 covers fundamentals and theory; uses; digital logic circuits; digital integrated circuits; Boolean algebra; flip-flops and registers; sequential logic circuitry; combinational logic circuitry and digital design. You'll also learn to discuss the advantages of using digital techniques, to convert between binary and decimal number systems and to recognise the binary codes, discuss the operation and applications of binary and BCD counters, shift registers and other sequential logic circuits; use Boolean algebra to express logic operations and minimise logic circuits in design, name the major components used in implementing digital circuits and explain how they operate, explain the operation of flip-flops, design both combinational and sequential logic circuits for a given application from definition and concept to the selection of the integrated circuits and discuss the operation and application of digital counters in time and frequency measurements. The course covers in short, everything from TTL and CMOS to ROMs, PLAs, microprocessors and computers. Average completion time for Course 5 is 40 hours. A prior knowledge of electronics (such as the Heathkit Courses 1 thru 4) is required but the course can be successfully completed by those with mathematics or science backgrounds. Includes texts, records and 44 electronic components for 24 experiments. The ET-3200 Digital Trainer is required for performing the experiments.

Course EE-3201  
EEA-3201, Optional Cassettes\*  
EES-3201, Course with Kit Trainer ET-3200

Note: Heath recommends the use of the IM-5284 multimeter and an oscilloscope such as the IO-4541 with this course.

\*Optional Cassettes duplicate material on records, but in convenient, easy-to-use cassette format.

### Versatile Digital Trainer

A must addition to your EE-3201 Digital Techniques course. The ET-3200 Trainer rounds out your education and provides the "hands-on" experience necessary for your proper understanding of digital devices and operations. Use the ET-3200 to perform all the experiments in the Heath Digital Techniques Course develop projects, build and test prototypes, verify circuit operation and check digital IC's. Has solderless breadboard sockets for experimentation and design, four binary data switches, 2 "no-bounce" switches to pulse logic circuits, 3-frequency pulse clock generator and 4 LED's for visual indication of logic states. The ET-3200 also contains three regulated power supplies with outputs of +12 VDC @ 100 mA, -12 VDC @ 100 mA and +5 VDC @ 500 mA. Each output features current limiting and is overload protected for safe operation. Breadboard sockets accommodate up to eight 14 or 16-pin dual-in-line IC's, also 24, 28, and 40-pin DIPs. For 240 VAC, 50 Hz.

Kit ET-3200

ETW-3200, Factory assembled



See the Microprocessor Course and Computer Trainer on page 3.





# Amateur Radio Course

## Self Instruction Course to help you get your Ticket!

This deluxe course prepares you for the Amateur Radio examination, and provides you with helpful guidelines for setting up and operating your own station once you pass the examination. The course includes a programmed learning text and two audio cassettes to reinforce text material and provide Code practice.

Study and learn at your own pace. Covers rules and regulations, radio phenomena, operating procedures, emission characteristics, electrical principles, circuit components, practical circuits, antennas and transmission lines and radio communications practices.

Helpful operating aids include a glossary of common abbreviations, twelve most common Q signals, instructions for making your own antenna, international prefixes and Morse Code characters.

The Heathkit HD-1416 Code Practice Oscillator is recommended for this course. See page 19.

Course ER-3701

# The Heathkit Reference Library

## TEST EQUIPMENT

**Handbook of Practical Electronic Tests and Measurements.** EDP-137

**101 Ways to Use Your VOM/VTVM.** Covers equipment checks AC and DC voltage, DC current, ohm-meter, signal tracing, alignment and color TV. EDP-150

**Understanding and Using the Oscilloscope.** Functions, circuits, inputs, waveforms, etc. EDP-139

## SHORTWAVE LISTENING

**99 Ways to Improve your Shortwave Listening.** Antennas, receivers, accessories, troubleshooting, etc. EDP-155

**Shortwave Listener's Handbook.** Covers basic equipment, modifications for better listening, receiver characteristics, antennas, schedules and reception reports. Lists major shortwave stations by country and frequency. EDP-196

**Microcomputer Dictionary and Guide (Matrix).** Definitions and basic info on computers and related topics. EDP-218

**Introduction to Microcomputers Vol. I.** (Osborne). EDP-224

**Introduction to Microcomputers Vol. II.** (Osborne). Complete descriptions of all popular microprocessors. EDP-225

**How to Buy and Use Minicomputers (Sams).** A fundamental text on operation. EDP-227

**TV Typewriter Cookbook (Sams).** Good text explaining I/O terminals, interfacing, etc. EDP-226

**Bugbook III (E&L).** Superior reference source on 8080 interfacing and programming. Includes experiments. EDP-231

**8080 Programming for Logic Design (Osborne).** EDP-229

**8080 Software Gourmet Guide and Cookbook (Scelbi).** Excellent source for 8080 programs and subroutines. EDP-228

**Practical Microcomputer Programming: 8080 (Northern Technology).** Machine/Assembly programming. EDP-235

**8800 Programming for Logic Design (Osborne).** EDP-230

**8800 Software Gourmet Guide and Cookbook (Scelbi).** Excellent Source of commonly used 8800 programs. EDP-233

## ELECTRONIC DEVICES

**The TTL Data Book.** Specifications, pin outs, test data, applications. EDP-220

**TTL Cookbook.** What TTL is, how it works and how to use it. EDP-183

**IC Op-Amp Cookbook.** Theory of operation, applications. EDP-184

**Transistor Substitution Handbook.** Substitutions for 100,000 bipolar transistors. EDP-175

## REFERENCE/GENERAL

**How to Build and Use Electronic Devices.** Guide to using op-amps and other electronic devices. EDP-202

**Reference Data for Radio Engineers.** EDP-176

**Metal Detector Handbook.** Basics of metal detection, techniques, etc. EDP-222

## AMATEUR RADIO

**ARRL Amateur's Handbook.** Up to date electronics theory and application. Covers all facets of Amateur operations. Tube data, construction projects, antenna theory, SSB etc. HDP-293

**Radio Handbook.** Comprehensive radio theory and practice for hams. EDP-117

**Amateur Tests and Measurements.** EDP-119

**DX Callbook.** Complete listing of foreign Amateurs, addresses, postal rate charts, call zone maps. EDP-127

**73 Dipole Antennas.** EDP-180

**73 Vertical and Beam Antennas.** EDP-181

**ARRL Antenna Handbook.** EDP-182

## COMPLETE COMPUTER LIBRARY

**8800 Microprocessor Applications Manual (Motorola).** Comprehensive review of typical 8800 applications. EDP-244

**M6800 Program Reference Manual (Motorola).** EDP-245

**Minicomputer Systems: Organization and Programming (Prentice-Hall).** Emphasis on the PDP-11. EDP-238

**PDP-11 Programming (Algonquin).** A programmed instruction text teaching operation and programming of the PDP-11. EDP-239

**The Minicomputer in the Laboratory (Wiley).** Operation, programming and applications of PDP-11 computers. EDP-246

**Assembly Level Programming (Lexington).** EDP-236

**101 BASIC Computer Games (DEC).** A classic. Have fun with your computer. EDP-237

**BASIC Software Library, Vol. I.** Complete lists of BASIC applications, bookkeeping games, pictures (graphics). EDP-240

**BASIC Software Library, Vol. II.** Math, engineering, plotting and statistical programs in BASIC. EDP-241

**BASIC Software Library, Vol. III.** Advanced business applications programs in BASIC. EDP-242

**BASIC Software Library, Vol. IV.** Games and business applications programs in BASIC. EDP-243

**BASIC Software Library, Vol. V.** Games, graphics, and useful math programs in BASIC. EDP-251

**Minicomputers: Structure and Programming (Hayden).** EDP-260

**BASIC Workbook (Hayden).** EDP-261

**Your Home Computer (Dymax).** EDP-252

**Home Computers, 210 Question and Answers.**

**Vol. I. Hardware (Dilithium).** EDP-253

**Vol. II. Software (Dilithium).** EDP-254

**Some Common BASIC Programs (Osborne).** EDP-255

**How to Program Microcomputers (Sams).** EDP-256

**8080A/8085 Assembly Language Programming (Osborne).** EDP-262

**Step-by-Step Introduction to 8080 Microprocessor Systems (Dilithium).** EDP-263

**The 8080A Bugbook (Sams).** EDP-267

**Digital Microcomputer Handbook (DEC).** EDP-268

**Microprocessor Interfacing Techniques (Sybex).** EDP-270

**BASIC for Everyone (Prentice-Hall).** EDP-273

**Getting Acquainted with Microcomputers (Sams).** EDP-275

## Our Finest Metal Locator

Build the GD-1190 and enjoy the thrill and excitement of locating small coins and other valuables!



# Heathkit Metal Locators

These Heathkit metal locators really get you in on the fun and excitement of treasure hunting — find coins, antiques, buried metal objects of any type, fast 'n easy. They're fun to use, practical too — use to locate buried plumbing pipes, metal cables, etc. before you dig.

- Search Coil Optimized for "Coin-Shooting"
- Adjustable Discrimination for Varying "Junk" conditions
- Pushbutton Tuning saves time and Maintains Optimum Sensitivity

The GD-1190 is the finest Metal Locator Heath has ever produced! Designed with the "coinshooter" in mind, it features a search coil optimized for coin locating, and adjustable discrimination so incredibly good you'll be finding "treasure" in areas where high "junk" content makes operation with other locators all but impossible. Pushbutton tuning maintains perfect sensitivity—effortlessly. And for shallow water searching the 1190's waterproof head won't leave you out of the action. Weight is minimal and to cut fatigue even more an adjustable shaft custom balances your unit. The 1190 collapses for easy storage and transportation. And with its optional GDA-

1190-1 Nicad pack installed you can recharge the 1190 at home or, in the field from the lighter of your car! An outstanding value.

Kit GD-1190

GDA-1190-1, Nickel-Cadmium Battery Pack

GDA-1190-2, Headphones

GDA-1190-3, Carrying Case

GD-1190 Specifications: Sensitivity: 4" to 6" (102-152 mm) depending on coin size, amount of discrimination, and soil condition. Operating Frequency: 55,965 Hz. (Crystal controlled) Method of Detection: Off-resonance type External Controls: Volume, Discrimination, Tuning, 4-position mode switch Internal Controls: Meter, Calibrate, Audio Frequency Adjust, Sample Hold Adjust, Search Coil Calibrate, Output, Meter, Speaker, Phone Jack, Shaft Adjustable Height: 35" to 29" (902-749 mm) Location: Dimensions: Search Coil: 6" (152 mm) diameter Overall Length: Shaft extended 45" (1156 mm) Shaft collapsed: 22" (572 mm) Receiver Case: 10" x 4 1/2" W x 3 1/2" H (254 x 108 x 83 mm) Power Requirements: Six HPT Dry cells or Alkaline, or rechargeable Nicad pack (GDA-1190-1) Weight: 3.4 lb (1.54 kg)

## Heathkit GD-348 Deluxe Metal Locator

- Contoured pistol-grip and up-front controls for real operating convenience
- Lightweight, easy and FUN to use
- Easy PC board assembly

The GD-348 uses an "Induction balance" search system in which no tone is heard until a metal object enters the field of the search coils and upsets the balance between them. This unbalanced condition results in a signal which is amplified and coupled to the built-in speaker, producing a loud tone which increases or decreases in volume as you get closer or farther away from the metal object. Convenient front-panel meter pinpoints your "find". Built-in jack is provided for use with optional headphones. The null and ten-turn sensitivity controls are conveniently located on the carrying handle for precision fingertip setting. The pistol grip and control console are designed for perfect balance and effortless use.

The handle telescopes down and rotates so that search coil handle and control console all fold into a neat, flat, compact, portable package you can slip into a suitcase, or carry with you in the optional leatherette case with shoulder strap. Power is supplied by a single 9-volt battery (not supplied).

Kit GD-348, Locator only  
GD-396, headphones  
GDA-348-1, carrying case



GD-396

Convenient handle-mounted controls.

Easy, three-evening circuit board assembly

GDA-348-1

## Heathkit Power Inverter converts your ship's 6/12 VDC system to 220 VAC

- Operates electric razors, lamps, etc.
- Power output up to 140 watts
- Easy kit assembly

Ideal for operating electric razors, lamps, and other small appliances aboard your craft. Converts your boat's 6 or 12 VDC

electrical system to 220 VAC square wave with up to 140 watts continuous at 12 volts. Features include solid-state circuitry; 2 receptacles for plugging-in appliances; 25-amp fuse to protect battery and wiring in event of short circuits. Not recommended for equipment requiring high starting current or sine wave AC. Kit goes together easily in a couple of spare evenings.

Kit MP-10E

# Start your amateur radio hobby with Heath!

Let Heath help you start a rewarding CW and Amateur Radio hobby. This CW kit is easy and fun to build, and offers excellent reliability and performance. Helps you learn how to communicate with the world.



*The FUN way to practice code—it's an easy-to-build starter kit too*

## Heathkit HD-1416 Code Practice Oscillator

Fun to build and use! Most components mount on a single circuit board for easy assembly. The unit operates from a single inexpensive 9-volt transistor battery (not supplied) and comes complete with telegraph key and phone jack. Has built-in speaker, volume and adjustable internal tone control. Once you get your license, the HD-1416 can serve as a side tone oscillator for any transmitter using grid block keying. Plastic cabinet matches Heathkit "SB" series.

Kit HD-1416

HD-1416 SPECIFICATIONS: Mode of Operation: Speaker or headphones. Tone Frequency: 200-800 Hz adjustable. Battery Required: 9-volt transistor battery equivalent (Beric PP-3 (not supplied). Headphones: 8-2000 ohms. Dimensions: 3" H x 4" W x 4 1/2" D (67 x 105 x 111 mm).

## New Self-Instructional Soldering Manual and Practice Kit

- Perfect for hobbyists, schools and industrial training
- Programmed instruction format is interesting and easy to follow
- Includes practice kit for "hands-on" experience

Heath's new EI-3133 Soldering Manual and Kit teaches you the techniques necessary for high reliability soldering in all electronics applications. Using a proven programmed instruction format, the text covers mechanical connection, tinning, temperature control and much more. And to give you "hands-on" experience for really effective learning, a handy practice kit has been included. Great for individuals or schools and industry and a great first kit-building experience. Requires soldering iron and small hand tools.

Course EI-3133

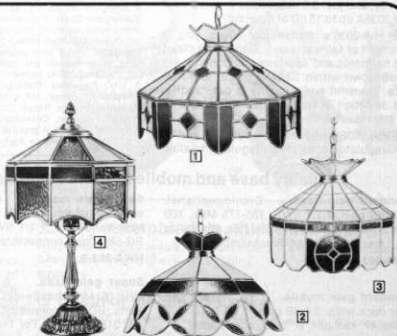


## New Tiffany Lamp Kits

Add the delicate hues of old world charm with colourful Tiffany Lamps from Heath

Full leaded, stained-glass Tiffany Lamps add that perfect touch to just about any decor. With these superbly crafted kits, you can add a touch of that turn of the century charm to any room in the house. Each kit, whether it is one of the exquisite hanging lamps or the table lamp, contains all pieces necessary to put the kit together easily—all glass parts are pre-cut and all lead strips are pre-channelled. The only special tool you'll need to put these lamps together is a soldering iron. Note: All models require the use of Edison Screw type lamps.

- 1) Model 1672
- 2) Model 2052
- 3) Model 1862
- 4) Model 1011



# Heathkit 2-metre is your best buy



with standard microphone

## HW-2036 2-metre Transceiver with Frequency Synthesis

With Heath's HW-2036A you're ready for all the action because the 2036A's phase locked synthesizer/VCO loop lets you operate with just the flip of a switch. Choice of simplex or standard  $\pm 600$  kHz split operation. Or pick your own offset in the unit's auxiliary position.

The synthesizer is locked to a precision 10 MHz time base for outstanding accuracy, has crystal controlled offsets, IC divide chain, and a unique NAND gate logic system which displays locked/unlocked status.

The receiver features a double tuned front end with MOSFET RF amplification, dual-conversion, 8-pole crystal IF filtering for perfect bandpass shaping and outstanding adjacent channel selectivity, IC limiting, Quad detection, and excellent audio quality. Schmitt-trigger circuitry insures squelch action that's quick and sure, a front panel LED display alerts you instantly to channel activity, and just 0.5 microvolts in gives your HW-2036A up to 15 dB of quieting!

The HW-2036's transmitter gives you a minimum of ten watts out. Signals are clean and harmonic and spurious components are 60 dB down within 20 MHz of carrier reference. Transmit audio quality is outstanding and deviation is continuously adjustable to 7.5 kHz maximum.

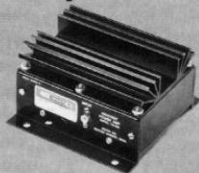
The HW-2036A also features built-in 5 and 11 VDC regulators, hash filter/regulator to elim-

inate ignition noise and alternator whine, and diode protection to prevent damage from connection to incorrect voltage polarity. Comes with gimbal mount for mobile operation.

**Kit HW-2036-2**, Transceiver with microphone

**Kit HWA-2036-4**, Tone burst accessory

**HW-2036A SPECIFICATIONS:** Receiver: Sensitivity: 0.5  $\mu$ V for 12 dB SINAD (or 15 dB of Quieting). Squelch Threshold: 0.3  $\mu$ V or less. Audio Output: 1.5 watts at 10% T.H.D. typically 2 watts. (5 kHz deviation). Image Rejection:  $\geq 45$  dB or greater. Spurious Rejection:  $\geq 50$  dB or greater. IF Rejection:  $\geq 60$  dB or greater. Internally Generated Spurious: Below 1  $\mu$ V equivalent. Bandwidth: 6 dB at 15 kHz min. and 60 dB at 30 kHz max. Modulation Acceptance: 7.5 kHz, min. Transmitter: Power Output: 10 watts min. at 25°C and 13.8 VDC, into a 50  $\Omega$  load. Harmonic & Spurious Output:  $\geq 60$  dB. Modulation: FM, 0 to 7.5 kHz, adjustable. Duty Cycle: 100% with infinite VSWR. Tone Encoder: 3 tones, 70 to 200 Hz, approx.  $\pm 700$  Hz deviation. Transmitter Offset: 0 (simplex),  $\pm 600$  kHz,  $\pm 600$  kHz with crystals supplied. Provision for one additional offset crystal. Maximum offset 1 MHz. General: Frequency Coverage: Any 4 MHz segment from 143.5 to 148.5 MHz. (Both receiver and transmitter must be aligned for the same 2 MHz segment.) Frequency Increments: 5 kHz. Frequency Stability:  $\pm 0.0015\%$ . Operating Temperature Range: 15° to 125° F. ( $-10^{\circ}$  to 50° C). Operating Voltage Range: 12.6 to 16 VDC (13.8 VDC nominal). Current Consumption: RX: 700 mA max. squelched. TX: 2.6 A max. at 13.8 volts. Dimensions: 2 3/4" high x 8 1/4" wide x 9 3/4" deep. Weight: 6.25 lbs.



## HA-202A 40W 2-M amplifier

Delivers solid 40W minimum for 10 watts in. Draws just 7A max. from your car battery. Has automatic T/R switching, tuned input/output circuits. Withstands VSWR's up to 3:1. Covers any 1.5 MHz portion of the 143-149 MHz band. Final alignment requires VTVM, wattmeter or SWR bridge.

**Kit HA-202A**

### HA-202A SPECIFICATIONS

Power Output: 20W @ 5W in. 30W @ 7.5W in. 40W @ 10W in. 50W @ 15W in. Impedance: 50 ohms nom. Power Requirement: 12-16 VDC. 7 A max. Dimensions: 3" H x 4 1/4" W x 5 1/2" D.



## HA-201A 10W 2-M amplifier

For anyone who wants extra output at low cost, the HA-201 delivers up to 10 watts for a 1 $\frac{1}{2}$  watt input, 8 watts for a 1 watt input—ideal for handheld or portable rigs. Features fully automatic operation, solid-state transmit/receive switching, tuned input and output for maximum efficiency and reduced spurious emissions. Withstands infinite VSWR load without failure. Includes dummy load and RF detector. Easy 1 to 2 hour assembly. VVM needed for tuneup. Operates from any 12-16 VDC supply.

**Kit HA-201A**



## AC Power Supply for HW-2036

The HWA-2036-3 supplies the necessary voltage and current to power your HW-2036 or HW-202E 2-metre transceiver from a standard AC outlet for base station operation. Delivers 13.8 VDC (adjustable internally from approx. 10 to 15 VDC) at 2.7 amps with better than 1.0% regulation. Has 120/240 VAC wiring options, fused overload protection. With all cables for easy hookup and 3-wire line cord. Compact metal case sets up easily just about anywhere.

**Kit HWA-2036-3**

## Quality base and mobile 2-Metre Antennas

**Standard gain fixed.** Omnidirectional. 3.75 dB gain, 1.1:1 SWR, 135-175 MHz, 100 watts. 52 ohm feed with PL-259. Mounts to 1 1/4" masts. Less coax. Preassembled.

**HWA-202-11**

**Standard gain mobile.**  $\frac{1}{2}$  wavelength rear deck whip. 3.4 dB gain, 1.1:1 SWR, 100 watts, 47" radiator. 17' coax, connectors.

**HWA-202-3**

**Super gain mobile.** Phased  $\frac{1}{4}$  and  $\frac{1}{2}$  wave radiators. 5.2 dB gain, 200 watts; 6 MHz bandwidth; 1.1:1 SWR. Height 85". 17' RG-58U coax, connectors.

**HWA-202-9**

**Super gain fixed.** 6 dB gain. 140-150 MHz. 6 MHz bandwidth. 1.2:1 SWR, 1000 watts. SO-239 connector, 117" long, 4 radials; 21" alum. rod. For 1 3/4" mast. Less coax.

**HWA-202-10**

# Useful Station Accessories

## Heathkit solid-state Dip Meter delivers more performance at big savings

- Covers 1.6 to 250 MHz
- 7 colour coded plug-in coils & carrying case
- 9-volt battery operation

The Colpitts oscillator covers 1.6 to 250 MHz in fundamentals with a MOSFET paraphase amplifier and hot-carrier diodes for more sensitivity and a better dip. It uses a Q-multiplier for greater detector sensitivity and a responsive 150  $\mu$ A meter movement for positive resonance indications. It includes a phone jack for modulation monitoring. It's smaller and lighter than others, too. Completely portable. Whether you're checking resonant frequencies, adjusting traps, looking for parasites, or using it as a signal generator, the HD-1250 is designed to go anywhere. It fits your hand and thanks to its solid-state design and 9-volt battery operation, it's ready to use instantly wherever you are. The custom moulded grey carrying case protects the meter and the 7 colour-coded, pre-adjusted, plug-in coils in transit, and makes a handy storage place. Build it in one evening. Nearly everything mounts on two circuit boards. And when you finish, you'll have the best dip meter around — for a lot less money.

Kit HD-1250, less battery



## 1 Heathkit Wattmeter / SWR Bridge

Two switch-selected ranges: 10-200 & 100-2000 W...built-in SWR bridge with adjustable sensitivity for tune up, transmission line antenna matching. Negligible insertion loss in 50 ohm line. Remote detector permits placement of meter in any convenient location... 6 ft. of cable supplied.

Kit HM-102

HM-102 SPECIFICATIONS: Frequency Range: 1.6 to 30 MHz. Wattmeter Accuracy:  $\pm 10\%$  of full-scale reading. Power Capability: 10 to 2000 watts. Impedance: 50 ohm nominal. Connectors: UHF type SO-239. Dimensions: 5 $\frac{1}{2}$ " H x 5 $\frac{1}{2}$ " W x 6 $\frac{1}{2}$ " D.

## 2 Bi-Directional Wattmeter

Covers 100 MHz to 1 GHz. Three forward ranges 30, 75 and 300 watts and three reflected ranges 3, 7.5 and 30 watts. Requires 9-volt battery (not supplied). 4 $\frac{1}{2}$ " H x 4 $\frac{1}{2}$ " W x 4 $\frac{1}{2}$ " D (114 x 108 x 117 mm). More details on page 32.

Kit IM-4190

## 3 Heathkit VHF Wattmeter

Lets you test 2-Mtr transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts  $\pm 10\%$  of full scale, 50 ohm nominal impedance permits placement in the transmission line permanently with little or no loss. Built-in SWR bridge lets you tune antennas for proper match, and has less than 10-watt sensitivity.

Kit HM-2102

HM-2102 SPECIFICATIONS: Frequency Range: 50 MHz to 160 MHz. Wattmeter Accuracy:  $\pm 10\%$  of full scale. Power Capability: To 250 W SWR Sensitivity: Less than 10 W Impedance: 50 ohms nominal. Connectors: UHF type SO-239. Dimensions: 5 $\frac{1}{2}$ " H, 5 $\frac{1}{2}$ " W and 6 $\frac{1}{2}$ " D. \*Using a 500 noninductive load.

## 4 "Cantenna" Transmitter Dummy Load

One of the most useful station accessories available... a "must" item for tune-up work. Provides 50 ohm non-inductive load with SWR less than 1.5:1 for frequencies of 1.5 to 300 MHz. Coax fitting to transmitter line, and phone jack for relative power measurements. One gallon coolant oil capacity (oil not included) permits power up to 1 kW.

Kit HN-31

## 5 Heathkit coax switch

Designed to switch one RF source to any one of several antennas or RF loads while grounding the unused outputs. Two can be used to switch up to four antennas/loads to four different units (transceivers, transmitters, receivers, etc.). Standing wave ratio to 250 MHz, 1:1:1 max. Power capability is 1000 W (2000W PEP). Bracket provided for mounting on equipment cabinets, desk or wall.

Kit HD-1234



## 6 Fully assembled Heathkit Desk Mike

Hi-Z dynamic; grip-to-talk. For convenient VOX or PTT operation with station transceivers. With cables.

HDP-121

## 7 Heathkit mobile PTT mike

Rugged, hi-Z ceramic mike ideal for mobile work. With cable, less connector. Excellent for "single banders".

Kit GH-12A

# Heathkit SB-104A SSB Transceiver

Completely broadbanded — Instant QSY — no preset, load or tune controls!

... now with improved sensitivity  
and reduced assembly time

Digital Transceiver

Matching Speaker



## Heathkit SB-104A Amateur Transceiver... now with improved sensitivity and reduced assembly time

Totally broadbanded, completely solid-state. Operates USB, LSB or CW — you can go from CW on the low end of 80 to USB on the high end of 10 in seconds — maintaining 0.5  $\mu$ V receiver sensitivity and 100 watts TRANSMITTER OUTPUT! Just choose the band, select mode and go; no more preselector, loading or tuning controls. True digital readout with 6 electronic digits. Digital circuitry covers all three frequencies: VFO, HFO and BFO — you don't even need a calibrator.

Spin the main tuning knob and appreciate its feel as you smoothly move the 104A's temperature-compensated FET Hartley VFO up or down the band. And as you QSY, you'll quickly discover that the SB-104A's completely re-engineered front end receiver board really means business! Its circuitry is factory pre-assembled and tested.

Transmitter delivers 100 watts output; or QRP'ers can flick the switch for instant 1-watt output. The four final transistors are protected against high SWR and thermal runaway. Puts out a clear, strong signal with low harmonic and spurious radiation, third-order distortion down 30 dB or better. Has 15 MHz WWV position on the bandswitch, tune button for loading linears, PTT mike jack, pushbutton 400 Hz or 2.1 kHz IF bandwidth selection for CW mode, mobile noise blanking, ALC/relative power/S-meter, switchable VOX with gain and delay, and more. Alignment requires only a dummy load, mike and VTVM. Operates from 12V auto electrical system. For fixed station, hook up the HP-1144 Power Supply.

### Kit SB-104A

Kit SBA-104-1, Noise blanker

Kit SBA-104-2, Mobile mount

Kit SBA-104-3, 400 Hz CW crystal filter

**SB-104A SPECIFICATIONS:** Frequency Coverage: 3.5 MHz through 29.7 MHz amateur bands, 15 MHz WWV receive only. Frequency Stability:  $\pm 1$  Hz or less than 100 Hz/hr drift after 30-min. warm-up; less than 100 Hz drift for  $\pm 10\%$  change in primary voltage. Readout Accuracy: Within  $\pm 200$  Hz  $\pm 1$  count. TRANSMITTER — RF Power Output: High Power (50-ohm non-reactive load). SSB: 100 watts PEP  $\pm 1$  dB; CW: 100 watts  $\pm 1$  dB. Low Power SSB: 1 watt PEP (minimum); CW: 1 watt (min.). Output Impedance: 50 ohms, less than 2.1 SWR. Carrier Suppression and Unwanted Sideband Suppression:  $-50$  dB down from 100 watt single-tone output at 1000 Hz reference. RECEIVER — Sensitivity: 0.5 for 10 dB S+N/N for SSB. Selectivity: 2.1 kHz minimum at  $-6$  dB, 5 kHz max at  $-60$  dB (2.1 nominal shape factor). CW Selectivity: (with accessory CW filter) Selectable 2.1 kHz/400 Hz. IM Distortion:  $-65$  dB min.;  $-57$  dB typ. with noise blanker. Image Rejection:  $-60$  dB min. Dimensions: 5 7/8" H x 14 1/2" W x 13 1/2" D.

**Station Speaker.** Designed to match the SB-104 Transceiver. Cabinet is large enough to house the HP-1144 AC Power Supply, too. 5" x 7" oval speaker (3.2 ohm with a 3.16-ohm magnet) is response-tailored for SSB. Frequency response: 300-3000 Hz. Connector plug and cable are included. Dimensions: 7 1/2" H x 10 1/2" W x 14" D.

### Kit SB-604

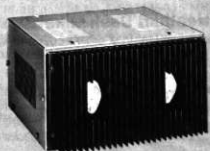
## Fixed Station Power Supply

120 or 240 VAC operated supply provides 13.8 VDC required by SB-104 Transceiver. Full-wave bridge circuit has triple Darlington regulation with an IC which samples at the transceiver, compares and automatically maintains a fixed voltage — almost no change in voltage from no load to full load. Mounts inside SB-604 speaker cabinet.

Kit HP-1144

### HP-1144 SPECIFICATIONS

Output Voltage: 13.8 VDC regulated (adjustable from approximately 11 to 16 VDC). Maximum Output Current: 20 amperes, intermittent. 8 amps continuous. Power Requirement: 110 to 130 VAC @ 6A or 220 to 260 VAC @ 3A, 50/60 Hz maximum. Regulation: Less than 2% output voltage variation from no load to 20 amperes. Ripple: Less than 1% at 20 amperes. Fuses: 7-amp, 3AG, slow-blow primary, 20-amp, 3AG, output. Dimensions: 5 1/2" H x 9 1/4" W x 10 1/4" D. Net Weight: 23 lbs.



# Heathkit Linears—Packed with Power and Features

## Heathkit SB-220 2 kW Linear Amplifier

### • High-efficiency pre-tuned broadband pi-input

The one that's making Amateur Radio history because it offers more features and performance for the price! Uses a pair of conservatively-rated Eimac 3-500Z's to deliver up to 2000 watts PEP SSB input. It can be loaded to a full 1 kW on both CW and RTTY. A broadband pre-tuned pi-input delivers maximum efficiency with low distortion over the complete 80-10 meter bands. And it requires just 100 watts drive!

### Kit SB-220

**SB-220 SPECIFICATIONS:** Band coverage: 80, 40, 20, 15 and 10 meters. Driving power: 100 W. Max. power input: SSB 2000 W, PEP, CW, 1000 W; RTTY 1000 W. Duty cycle: SSB, Continuous voice modulation; CW, Continuous (maximum key-down 10 minutes); RTTY, 50% (maximum transmit time 10 minutes). Third order distortion: -30 dB or better. Input impedance: 52 ohm unbalanced. Output impedance: 50 ohm unbalanced; SWR 2:1 or less. Front panel controls: Tune, Load, Band, Sensitivity Meter Switch, Power, CW/Tune - SSB, Plate meter, Multi-meter (Grid mA, Relative Power and High Voltage). Rear panel: Line cord, circuit breakers (two 10 A), Antenna Relay (phono), ALC (phono), RF Input (SO-239), Ground post, RF Output (SO-239). Tubes: Two Eimac 3-500Z. Power requirement: 120 VAC, 50/60 Hz at 20 amp. max. 240 VAC, 50/60 Hz, at 10 amp. max. Cabinet size: 8 1/4" H x 14 1/2" W x 14 1/2" D.



## SB-230 1 kW Conduction-Cooled Linear

Eimac 8873 triode in proven, stable, grounded grid circuitry delivers up to 1200 watts PEP SSB, 1000 watts CW input from less than 100 watts drive. It's also rated at 400 watts input for slow-scan TV and RTTY. And the final is completely double-shielded. Features include microswitch interlocks, temperature monitored heat sink shut-down circuit, delay circuit for valve warmup circuit breaker.

### Kit SB-230

**SB-230 SPECIFICATIONS:** Band Coverage: 80, 40, 20, 15 and 10 meter. Duty Cycle: SSB, continuous voice modulation; CW, continuous (max. key-down time 30 seconds); RTTY/SSV, 50% (max. transmit time 10 minutes at 400 watts). Driving Power Required: less than 100 W. Third Order Distortion: -30 dB or better. Output Impedance: 50 ohms at 2:1 SWR max. Input Impedance: 52 ohms at 1.5:1 SWR max. Zero Signal Plate Current: 25 mA. Power Requirement: 120 VAC, 50/60 Hz, 14 A max. or 240 VAC, 50/60 Hz, 7 A max. Dimensions: 14 1/2" W x 16" D x 7" H. Net Weight: 33 1/2 lbs.



## Heathkit SB-200 1 kW Linear Amplifier

Delivers a full 1200 W PEP SSB input, 1 kW on CW. Features include: Solid-state power supply with circuit breaker protection, metering for SWR, grid, plate current, relative power, plate voltage.

### Kit SB-200

**SB-200 SPECIFICATIONS:** Band coverage: 80, 40, 20, 15 & 10 meters. Maximum power input: 1200 W P.E.P. SSB; 1000 W CW. Driving power required: 100 W. Duty cycle: SSB, continuous voice modulation; CW 50% (key-down time not to exceed 5 min.). Third order distortion: 30 dB or better at 1000 W P.E.P. Output impedance: 50-75 ohm unbalanced; variable pi-output circuit SWR: not to exceed 2:1. Input impedance: 52 ohm unbalanced; broadband pre-tuned input circuit requires no tuning. Front panel controls: Load, Tune, Band, Relative Power Sensitivity, Meter Switch, Grid-Plate-Rel. Power-SWR HV, and Power Switch, on/off. Tube complement: Two 572B/160-L (in parallel). Power requirements: 120 VAC @ 16 A (max.), 240 VAC @ 8 A (max.). Cabinet size: 6 1/2" H x 14 1/2" W x 13 1/2" D.



## SB-644A Remote VFO

Designed for use with the SB-104/104A. Provides split transmit/receive capability so necessary for "DX" and net operations. Multi-mode capability allows transceive operation with either the "644A" or the "104/104A". Use either of two crystal positions for fixed-frequency control. Use "644A" tuning scale for reference, exact frequency readout takes place in the "104/104A".

### Kit SB-644A



## SB-614 Station Monitor

Monitors transmitted SSB, CW, & AM signals up to 1 kW from 80-6 meters. Shows non-linearity, insufficient or excessive drive, poor carrier or sideband suppression, regeneration, parasitics and key clicks. Manual includes 40 CRT displays and explanations. Solid-state circuit, easy-to-build with a circuit board and wiring harness to simplify assembly.

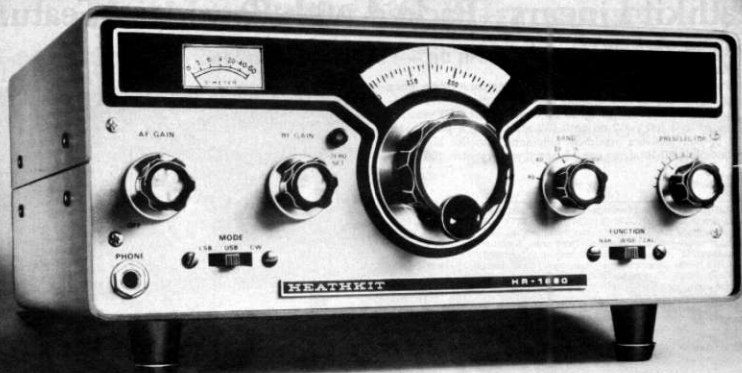
### Kit SB-614



## SB-634 Five-function Console

Adds real operating versatility to your station! Provides five of the necessary station functions every amateur needs. 24-hour digital clock; ten-minute ID timer; RF wattmeter with 200 or 2000 watt full scale ranges; SWR bridge with sensitivity control; phone patch that can be used manually or with VOX control. Wattmeter impedance is a nominal 50 ohms and insertion loss is negligible.

### Kit SB-634



## HR-1680 High-performance SSB/CW Receiver

An outstanding addition to ANY Station—listen to Amateur Radio voice and code broadcasts from all over the world!

- Easy kit assembly, easy NO-INSTRUMENT ALIGNMENT
- Built-in AC power supply, or external battery operation
- Excellent sensitivity lets you work weak signals
- Stable operation for drift-free SSB and CW reception
- Extra-large spinner for really easy tuning
- Headphone jack for working stations in private

Listen to world-wide SSB and CW with the HR-1680. This high-performance, low-cost Amateur radio receiver covers 500 kHz segments of the 80, 40, 20 and 15-metre Amateur bands plus two 500 kHz segments for the lower 1 MHz of 10 metres. Its advanced solid-state circuit and convenience features make it ideal for novices, short wave listeners and amateurs.

### Deluxe Matching Station Speaker

Styled to match the HR-1680, with response tailored for SSB, 4 ohms impedance for use with most other gear too. Includes cable and plug. Easy kit assembly.

Kit HS-1661



This is the famous Heathkit SW-717—a fine-performing Shortwave Radio and an ideal kit for a beginner.

See page 7.



The superhet double-conversion receiver features a double-tuned RF stage to provide maximum signal on each band. AGC controlled IF and RF stages permit signals of varying strengths to be received without fading or blasting. A four pole crystal filter provides excellent SSB reception and a two-stage active audio filter provides a very sharp bandpass for excellent CW operations. The use of solid-state components throughout eliminate heat buildup and drift, and contributes to the HR-1680's outstanding frequency stability.

Has a front panel "S" meter to indicate relative signal strength. AF and RF gain controls, and preselector. The extra-large, easy-tune spinner and easy-to-read dial calibrated in 500 kHz increments make "right on" station selection fast and easy. Even uses the same dial readout for all four bands—simply flip the bandswitch to change bands. Has mode and function selectors, front panel headphone jack for low-impedance headphones, diode bandswitching, built-in 100 kHz crystal calibrator. The mode switch selects LSB, USB and CW with fast or slow AGC automatically engaged.

Kit construction is easy, with most parts mounted on printed circuit boards, an open chassis layout, and a wiring harness to simplify assembly. The HR-1680 can be aligned completely without external equipment. Its handsome "101 series" styling and clean functional look makes it ideal for use with Heathkit transmitters and many others. Its built-in AC power supply makes it useful in any base station operation.

#### Kit HR-1680

##### HR-1680 SPECIFICATIONS

Frequency Coverage (MHz): 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-28.5, 28.5-29.0. Sensitivity: Less than 0.5  $\mu$ V for 10 dB S+N/N for SSB operation. IF Selectivity: 2.1 kHz minimum at 6 dB down, 7 kHz maximum at 60 dB down. Overall Audio Response: Wide; 2100 Hz minimum at 6 dB down, 7 kHz maximum at 60 dB down. Narrow, 250 Hz minimum at 6 dB down, 2.5 kHz maximum at 60 dB down (center frequency approx 750 Hz). Overall Gain: Less than 1.5  $\mu$ V input for 0.25 watts audio output. Audio Output Power: 2 watts into an 8-ohm load or 1.2 watts into a 4-ohm load at less than 10% THD. AGC Characteristic: Blocking level, 3 volts. Dynamic range, 120 dB. Time Constant, attack time less than 1 ms. Release time switch selectable at 100  $\mu$ s (CW) or 1 second (SSB). Intermodulation Distortion: -60 dB. Image Rejection: 50 dB or better. IF Rejection: 60 dB or better. Internally Generated Spurious Signals: Below 1  $\mu$ V equivalent antenna input except at 3.74, 21.2, 28.6 and 28.9 MHz. Frequency Stability: Less than 100 Hz per hour drift after 30 minutes warmup. Less than 100 Hz drift for 10% change in line voltage. Tuning Rate: approx 15 kHz per turn. Dial Accuracy: Within 2 kHz after calibration at nearest 100 kHz marker. Muting: Shorted external ground at mute socket. Sidetone Input Level: 10 mV or greater (300 mV maximum). Dial Backlash: 50 Hz or less. IF Frequencies: First, IF, 8.335-8.895 MHz; Second IF 3.395 MHz. Antenna Input Impedance: 50 ohms unbalanced. Temperature Range: -10°C to +50°C. Meter Calibration: 0 to 5-9 + 60 dB. Power Requirement: 120 or 240 volts AC (60/50 Hz) 27 watts maximum or 11.5 VDC to 15 VDC at 0.75 amperes maximum. Dimensions: 12 1/2" W x 6 1/2" H x 12" D. Net Weight: 9 1/2 lbs.





## HW-101... Lets You Explore the World

The HW-101 is a 5-band SSB/CW transceiver with the features you NEED for operating ease, convenience and versatility. Provides 180 watts input PEP, 170 watts CW. Features 0.35  $\mu$ V sensitivity, a high stability FET VFO, both PTT (push-to-talk) and VOX (voice-operated transmit) operation. A crystal-controlled heterodyne oscillator assures accurate, stable operation. Triple action level control prevents overdriving the finals.

A built-in crystal calibrator lets you accurately calibrate the HW-101 at 100 kHz intervals. Smooth dial drive with 36:1 ratio and an extra-large tuning knob provide back-lash free tuning. The front panel meter shows signal strength on receive, ALC voltage on transmit, and switches to read relative power output or final amplifier cathode current.

The HW-101 is designed for long life and outstanding flexibility. Kit assembly is easy, with an open chassis layout, uncrowded circuit boards and a colour-coded wiring harness. Special "Switch Boards" with built-in wafer switches help eliminate intricate switch wiring to greatly simplify assembly. Buy and build the HW-101—join the thousands of Amateurs who've found you can't beat it.

### Kit HW-101

SBA-301-2, 400 Hz CW crystal filter

**HW-101 SPECIFICATIONS: RECEIVER:** Sensitivity: <0.35  $\mu$ V for 10 dB S+N/N for SSB operation. SSB selectivity: 2.1 kHz min. @ 6 dB down; 7 kHz max. @ 60 dB down. (3.395 MHz filter). CW selectivity: (optional SBA-301-2 CW crystal filter): 400 Hz min. @ 5 dB down; 2.0 kHz max. @ 60 dB down. Output impedance: 8 ohm speaker, and high impedance headphone. Power output: 2 watts with <10% distortion. Spurious response: Image and IF rejection >50 dB. **TRANSMITTER:** DC power input: SSB 180 watt PEP (normal voice, continuous duty cycle). CW 170 watts (50% duty cycle). RF power output: 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 ohm non-reactive load). Output impedance: 50 ohm to 75 ohm with <2:1 SWR. Oscillator feed-through or mixer products: 45 dB below rated output. Harmonic radiation: 40 dB below rated output. Transmit-receive operation: SSB; PTT or VOX. CW: Provided by operating VOX from a keyed tone, using grid-block keying. CW sidetone: Internally switched to speaker or headphone in CW mode. Approx. 1000 Hz tone. Microphone input: High impedance with a rating of -45 to -55 dB. Carrier suppression: 45 dB down from single-tone output. Unwanted sideband suppression: 45 dB down from single-tone output at 1000 Hz reference. Third order distortion: 30 dB from two-tone output. RF compression (TALC): >10 dB at 0.1 mA final grid current. **GENERAL:** Frequency coverage: 80-10 M amateur bands. Frequency stability: <100 hertz per hour drift after 45 minutes warmup from normal ambient conditions. <100 Hz for  $\pm 10\%$  line voltage variations. Modes of operation: Selectable upper or lower sideband (suppressed carrier) and CW. Dial calibration: 5 kHz. Calibration: 100 kHz crystal. Audio frequency response: 350 to 2450 Hz. Power requirements: 700 to 850 volts at 250 mA with 1% maximum ripple; 300 volts at 150 mA with 0.5% maximum ripple; -115 volts at 10 mA with 0.5% maximum ripple; 12 volts AC/DC at 4.76 amps. (see fixed & mobile power supplies below). Cabinet dimensions: 6 $\frac{1}{2}$ " H x 14 $\frac{1}{2}$ " W x 13 $\frac{1}{2}$ " D.

\*Triple Action Level Control.

### 1 HP-23C Fixed Station AC Power Supply

Provides the following supplies—high voltage, two low voltages, fixed bias and 12.6 volt filament.

Kit HP-23C

#### HP-23C SPECIFICATIONS

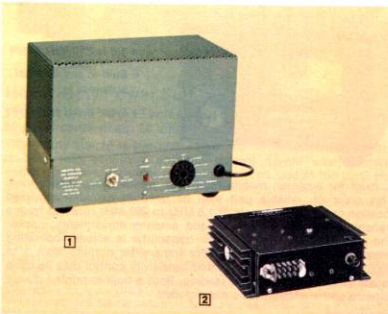
Power requirements: 120/240 VAC, 60/50 Hz, 350 watts maximum. High voltage output: 820 VDC no load, 700 VDC @ 250 mA  $\pm 10\%$ . AC ripple: Less than 1% @ 250 mA. Duty cycle: 150 mA continuous to 300 mA @ 50%. Low voltage output: (high tap) 350 VDC, no load; 300 VDC @ 150 mA  $\pm 10\%$ . (low tap) 275 VDC, no load; 250 VDC @ 100 mA,  $\pm 10\%$ . Less than 0.5% AC ripple @ 150 mA, continuous duty to 175 mA. Fixed bias: -130 VDC  $\pm 10\%$ , no load; -100 VDC @ 20 mA. Filament voltage: 12.6 VDC @ 5.5 amps. Dimensions: 9" L x 4 $\frac{1}{2}$ " W x 6 $\frac{1}{2}$ " H.

### 2 Heathkit HP-13B Mobile Power Supply

Kit HP-13B,

#### HP-13B SPECIFICATIONS

Input voltage: 12 to 16 VDC (neg. ground only). Input current: 25 amp. max. full load. High voltage output: 800 VDC, no load; 750 volts DC @ 250 mA. AC ripple: less than 1% @ 250 mA. Low voltage output: (high tap) 310 VDC, no load; 200 VDC @ 150 mA. (low tap) 265 VDC, no load; 250 VDC @ 150 mA. AC ripple: Less than 0.5% @ 150 mA. Fixed bias: -130 VDC @ 20 mA. Dimensions: 7 $\frac{1}{2}$ " W x 7 $\frac{1}{2}$ " L x 2 $\frac{1}{2}$ " D. All voltages referenced at 13 VDC.





## HW-8, It works the world on a couple of watts!

- 0.2  $\mu$ V gives you readable signals
- 4 Band CW Operation
- Front panel Relative Power Meter

When was the last time you worked the States, snagged a YV or exchanged reports with a DJ6... all with just three watts in? If you've never tried it, you're in for some real excitement and challenge. It takes a good rig though, one with excellent performance and specifications, and probably the best QRP rig going is Heath's HW-8.

Look at the receiver. As little as 0.2 microvolts in at the antenna terminal gives you a readable signal. Hum and microphonics are minimal. Couple that with a tunable preselector, direct conversion with RF amplification, a balanced product detector followed by active audio processing, and you've got a hot little receiver that's going to dig in and dig out the stations you're chasing!

The transmit section's the same story... performance! You'll get a minimum of 3 watts in 80 through 20 and 2.5 in on 15. Each band is individually selected and crystal controlled heterodyne circuitry insures accurate frequency mixing. The HW-8's VFO features an MPF-105 FET in a temperature compensated Hartley configuration. This

design approach provides overall stability and covers the units 3.5-3.75; 7.0-7.25; 14.0-14.25; and 21.0-21.25 MHz operating ranges with excellent accuracy.

Operating convenience wasn't forgotten either. The HW-8 features an RF and AF gain control, solid state band switching and full break-in CW operation including, adjustable T/R delay. Operate your HW-8 from its optional AC supply or take it to the mountain top and run on batteries. HW-8 and QRP — it's your most exciting challenge.

### Kit HW-8

#### Kit HWA-7-1, AC Power Supply

**HW-8 SPECIFICATIONS:** TRANSMITTER — DC Power Input: 3.5 watts (80 M); 3.0 watts (40 M); 3.0 watts (20 M); 2.5 watts (15 M). Frequency Control: built-in VFO. Frequency Stability: Less than 150 Hz/hour drift after 60 minute warm-up. Output Impedance: 50 $\Omega$ , unbalanced. Spurious & Harmonic Levels: —35 dB or better. Off-set Frequency: approx. —750 Hz, fixed on all bands. RECEIVER — Sensitivity: 0.2  $\mu$ V for readable signal; 1  $\mu$ V or less for 10 dB S+N/N. Selectivity: wide, —750 Hz @ —6 dB narrow, —375 Hz @ —6 dB. Audio Output Impedance: 1000 $\Omega$ , nominal. GENERAL — Frequency Coverage: 3.5-3.75 (80 M); 7-7.25 (40 M); 14-14.25 (20 M); 21-21.25 MHz (15 M). Frequency Stability: less than 100 Hz/hour drift after 30 min. warmup. Power Requirement: 12-16 VDC, 90 mA, receive; 430 mA, transmit. Dimensions: 9 1/2" x 8 1/2" x 4 1/2". Net Weight: 4 lbs.

## HD-1410 Solid State Electronic Keyer



- Selectable 10-35 or 10-60 wpm
- Adjustable paddle travel and tension
- DC or AC operation

Sending code's easy with the HD-1410 whether you're operating fixed or portable. The dot and dash paddles travel and tension are easily adjustable. When the two paddles are treated as one, the HD-1410 operates like a single-paddle keyer with dot and dash memories. Iambic operation forms most characters with reduced wrist movement. Dots and dashes are self-completing.

Operates from 240 VAC or 12 VDC and features built in speaker, adjustable side-tone and low profile styling. An excellent accessory for your SB-104A, HW-8 or HW-101. 3" H x 5" W x 7 1/2" D.

Kit HD-1410

## Field Strength Meter for faster adjustments



- 1.8 to 250 MHz range
- Built-in and external antennas
- Front panel sensitivity control

A must for amateur, mobile radio and marine radio applications. This compact, reliable unit may be used in a mobile or fixed location to measure signals of 1.8 MHz to 250 MHz received from a transmitter. Makes transmitter and antenna adjustments quicker and more precise; lets you know transmitter is actually operating (ideal for marine applications). For transmitter outputs from 1 to 1000 watts. A front panel mounted sensitivity control may be used to adjust the on-scale meter reading. Both a built-in printed circuit antenna and a whip antenna are included.

Kit HD-143R

# Versatile easy-to-use Heathkit Power Supplies

Constant current or constant voltage operation. Choose analogue or digital readout.



## Digital & Analogue Power Supplies

Features remote programming and voltage sensing; simplified front panel operation. Digital readout type has two decade autorangeing for high resolution on low voltage and current settings.

Kit IP-2710, 30V @ 3A analogue  
Assembled SP-2710, 30V analogue  
Kit IP-2711, 30V @ 3A digital,  
Assembled SP-2711, 30V digital.

IP/SP-2700 SPECIFICATIONS: Max. Rated Output: IP/SP 2710 & 2711: 30V, 3A, model IP-2730 7.5V, 10A. Load Regulation: Voltage:  $\pm 0.05\%$ ,  $\pm 1$  mV. Current:  $\pm 0.10\%$   $\pm 3.5$  mA. Line Regulation: Voltage:  $\pm 0.05\%$   $\pm 1$  mV. Current:  $\pm 0.10\%$   $\pm 1$  mA. Ripple & Noise: Voltage: 1 mV RMS; 0.03% of rated output, peak-to-peak. Voltage/Current Readout (Switchable): Analog: 3 1/2", 100% meter. Digital: 3 1/2"-digit (1999), two-decade, auto-ranging, digital meter. Readout Accuracy: Voltage: Analog  $\pm 3\%$  of rated output. Digital  $\pm 0.5\%$  of reading  $\pm 1$  count using lab standards.  $\pm 1.0\%$  of reading  $\pm 1$  count using built-in calibrator. Current: Analog  $\pm 3\%$  of rated output. Digital  $\pm 1.0\%$  of reading  $\pm 4$  count using lab standards.  $\pm 1.5\%$  of reading  $\pm 4$  count using built-in calibrator. Readout Response Time: (Digital): 2 seconds to within 5 counts. Stability at Output Terminals: Voltage:  $\pm 0.01\%$   $\pm 1$  mV/hr. Current:  $\pm 0.05\%$   $\pm 1$  mA/hr. Operating Modes: Constant current, constant current, auto-series, auto parallel. Power Requirements: 120/240  $\pm 10/20$  VAC, 60/50 Hz, 2.0/1.0 Amps max. Overall Dimensions: 5.5" H x 15" W x 13.5" D.



## Heavy-Duty Power Supply/Battery Eliminator

Provides variable 9-15 volt output capable of 12 amps continuous, 20 amps intermittent

Heavy-duty supply is the one you NEED for reliable Amateur and mobile radio servicing, any high-current 12-volt use. Features negligible ripple; excellent regulation from no load to full load. Has double heat sinks with 4 output transistors, extra-large transformer for steady smooth power easy-to-read front panel meters for voltage and current, rugged metal case with carrying handles.

Kit IP-2715

IP-2715 SPECIFICATIONS: Output Voltage: variable from 9-15 VDC. Output Current: 12 amps continuous, 20 amps intermittent (per derating curve in manual). Ripple: less than 1% at full load. Regulation: less than 2% variation from no load to full load. Fuses: 7A, 3 AG slow-blow primary; 20A, 3 AG output. Power Requirements: 110-130 VAC, 7A or 220-260 VAC, 3.5 A, 60/50 Hz. Dimensions: 5 1/4" H x 11" W x 11" D.

## Tri-Output Experimenter's Power Supply

Three floating outputs can be connected in any combination for a wide variety of output voltage and current capability

Combines 5 VDC fixed output with two 0-20 VDC variable outputs in a single, compact supply ideal for experiments. The 0-20 variable outputs can be tracked — one will "follow" the other at any specified voltage difference — ideal for analogue circuits requiring a + and - voltage. The 5-volt output is useful for digital circuits. All outputs are short-circuit proof, with current limiting. They can be operated independently, in series, or in parallel. Switchable front panel meter monitors all outputs.

Kit IP-2718

Assembled SP-2718

IP-2718 SPECIFICATIONS: Outputs: 5 volts DC  $\pm 5\%$  at 1.5 A. Two 0-20 VDC at 0.5A, continuously adjustable. Regulation: Load: less than 0.1% variation from no load to full load on 20-volt supplies; less than 2% variation from no load to full load on 5-volt supply. Line: less than 0.2% variation for line voltage change of 10 volts on 20 volt supplies; less than 0.15% variation for line voltage change of 10 volts on 5-volt supply. Power Requirement: 100-135 VAC or 200-270 VAC, 60/50 Hz, 100 watts full load. Dimensions: 4 1/2" H x 10 1/4" W x 9 1/4" D.

## 0-400 VDC General-Purpose Power Supply

This versatile supply provides 0-400 VDC at 0-100 mA continuous (125 intermittent) with excellent line and load regulation. Has front panel voltage and current meters and built-in circuit protection. Binding posts are insulated from chassis to allow positive or negative high voltage and bias operation.

Kit IP-2717

Assembled SP-2717

IP-2717 SPECIFICATIONS: Additional Outputs: 0 to -100 VDC at 1 mA variable bias voltage, 0.3 VAC at 4 amps, 12.6 VAC at 2 amps, (25 VA max. AC load), filament voltage. Regulation: Output variation less than 1% from no load to full load. Ripple: Less than 10 millivolts rms. Output Impedance: Less than 10 ohms. DC to 1 MHz. Meters: Voltmeter 0-400 V or 0-150 V, Milliammeter 0-150 mA. Power Requirement: 120/240 VAC, 60/50 Hz, 150 W max. Dimensions: 5 1/4" H x 13 1/4" W x 11" D.



## 1-15 VDC Regulated Power Supply

Perfect for servicing, testing or designing transistor radios, portable tape recorders and other low voltage solid-state devices. Continuously adjustable 1-15 VDC output, 50 mV line and load regulation and fully adjustable current limiting. AC or DC programming capability lets you control output voltage from another source. Three-terminal "floating" output gives positive and negative voltages.

Kit IP-2728

IP-2728 SPECIFICATIONS: Ripple and Noise: Less than 5 mV. Current Output: 500 mA maximum continuous load. Current Limiting: Adjustable from 10 mA to over 500 mA. Transient Response: 25 microseconds. Output Impedance: 5 ohms or less to 100 kHz. Power Requirement: 120/240 VAC, 60/50 Hz, 15 W at full load. Dimensions: 4 3/8" H x 5 1/2" W x 5 3/4" D. Programming: AC or DC, 5000 ohm input resistance.



# Heathkit Instruments give you more VALUE!

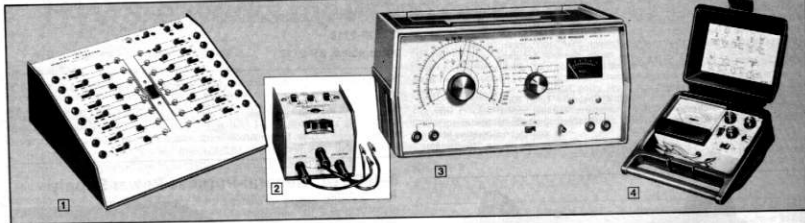
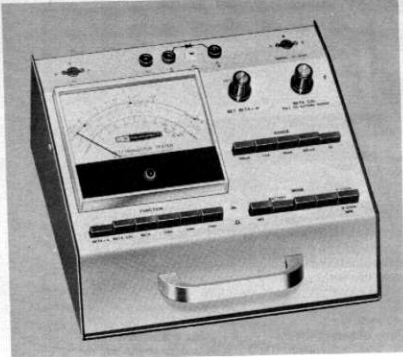
## High-performance FET/Transistor Tester

- A "must" for servicing solid-state equipment
- Tests components in or out-of-circuit
- Easy-to-use pushbutton range, mode and function switches

Reduce your service time with quick, accurate tests of conventional (bipolar) transistors, diodes, FETs, SCRs, triacs and unijunction transistors. Tests components either in-circuit using colour-coded test leads supplied or out-of-circuit using built-in sockets. Shows gain (DC Beta), trans-conductance (Gm) and leakage directly. Special circuitry balances out in-circuit impedances. Five current ranges measure leakage to  $1 \mu\text{A}$  and collector currents to 1 A. A built-in battery testing circuit provides a meter indication of battery condition. Add the IT-3120 to your bench for easy and accurate servicing of modern solid-state equipment.

### Kit IT-3120

IT-3120 SPECIFICATIONS: DC Beta: 1 to 5000 in ranges of 1 to 50, 5 to 250, 10 to 500, 50 to 2500, 100 to 5000. Collector Currents Available: 1 mA, 5 mA, 10 mA, 100 mA, 500 mA and 1 A. Gm: 0 to 50,000  $\mu\text{mhos}$ . Leakage Measurements: Five ranges, 0 to 100  $\mu\text{A}$ , 0 to 1 mA, 0 to 10 mA, 0 to 100 mA, 0 to 1 A. Out-of-Circuit Accuracy:  $\pm 5\%$  for DC beta and leakage. In-Circuit Accuracy: Indicates good or bad transistor, FET, diode, SCR or triac. Diode Test: Tests for forward conduction and blocking. Unijunction Transistor Test: Measures  $I_{B1}$ ,  $I_{B2}$  and emitter current. Power Requirements: Two 1½ V cells, (alkaline for best performance, not supplied). Dimensions: 5" H x 9½" W x 8½" D.



## 1 Heathkit deluxe Digital IC Tester

- "Zero Force" Insertion Socket prevents bent pins on IC's
- No-bounce stepping switch

A "must" for anyone working with digital IC's. Lets you determine functions of unknown IC's, check operation against your own data sheets. Features a special high-quality "zero-force" insertion socket — the same as used in expensive production-line testers — lets you make thousands of insertions and extractions without worrying about bent pins. Exclusive "bounce-free," computer-type mercury stepping switch allows safe and easy "exercising" of multi-function IC's such as flip-flops. Has input-output jacks for each pin; neon indicators. 14- or 16-pin IC's can be installed in any position, switches and banana jacks allow each IC pin to be used as input or output.

### Kit IT-7400

IT-7400 SPECIFICATIONS: Pin Arrangement: accepts 14 or 16-pin dual in-line IC's. Indicator Lamps: 17 neon lamps, one at each pin, plus ON indicator. Stepping Circuit: mercury switch with zero bounce stepping into any pin selected. Pull-up Resistors: externally connected, with patch terminals. Patch Terminals: one at each pin. Selector Switches: two at each terminal, one for +5V, step, or off; the other for gas discharge or ground. Gas Discharge: allows direct driving of neon indicator, lamp or high voltage decoder driver. Power Supply: 5 VDC regulated,  $\pm 5\%$ , 300 mA and 3.6 VDC, switch selected. Power Requirement: 100-135/200-270 VAC, 60/50 Hz, switch selected. Dimensions: 4½" H x 11½" W x 9¼" D.

## 3 RCL Bridge for design and experimentation

- Front panel null meter
- Direct reading of resistance, inductance and capacitance
- Battery operated or optional mains power supply.

A tough 5280 series cabinet houses the solid-state circuitry that lets you easily determine unknown values of resistance, inductance and capacitance. Resistance is indicated in three ranges from 100 to 10M $\Omega$ , inductance in three ranges from 10 $\mu\text{H}$  to 10H and capacitance, also in three ranges, from 10pF to 10 $\mu\text{F}$ . Easy single circuit board construction speeds assembly.

### Kit IB-5281.

IB-5281 SPECIFICATIONS: Resistance Ranges: 100 to 10M $\Omega$  in three ranges. Inductance Ranges: 10 $\mu\text{H}$  to 10H in three ranges. Capacitance Ranges: 10 pF to 10 $\mu\text{F}$  in three ranges. Oscillator Frequencies: 1 kHz, 10 kHz, 100 kHz. External Standard Range: 1 to 10.1. Power Requirements: Two 9-volt 9PP3 batteries or IFA-52801 power supply. Dimensions: 5½" H x 11" W x 7¼" D.

## 4 Test transistors in- or out-of-circuit

Large easy-to-read meter permits direct reading of DC Beta (gain) on two ranges, 2-100 and 20-1000. Also makes out-of-circuit leakage measurements for transistors and diodes, range 0-5000  $\mu\text{A}$ . It will also match and identify NPN or PNP transistors.

### Kit IT-3118

IT-3118 SPECIFICATIONS: DC Beta: x1 range -2 to 100, x10 range -20 to 1000. Out-of-circuit accuracy:  $\pm 5\%$ . In-circuit accuracy: Indicates good or bad (accuracy depends upon circuit being tested). Icco (out-of-circuit only): 0-5000  $\mu\text{A}$ . Icco (out-of-circuit only): 0-5000  $\mu\text{A}$  diodes forward or reverse current.  $I_{S1}$ -5000  $\mu\text{A}$ . Power: One standard SP2 cell (not supplied). Dimensions: 4½" H x 8½" W x 7¼" D (including handle).

## 2 Portable Transistor/Diode Checker

Checks high and low power transistors (NPN & PNP) for shorts, leakage, opens and current gain, diodes for forward and reverse current and serves as a continuity checker. Uses two 1.5 V SP11 cells, not supplied. 3½" H x 3½" W x 3½" D.

### Kit IT-3127

# New High Performance Logic Probe

- TWO indicator lights for clear, unambiguous readings

The Heathkit IT-7410 detects and indicates both high and low logic levels in TTL or CMOS digital circuitry. It also indicates the polarity and presence of signal pulses as short as 10 nsec duration, and shows intermediate or "bad" logic levels. When used in conjunction with an oscilloscope, the IT-7410 can save you time and trouble servicing digital counters, multimeters, frequency synthesizers, synthesizing circuits in mobile radios, TV's, hi-fi components; computers, digital clocks, ANY TTL or CMOS digital circuits.

Has TTL/CMOS function switch memory to show when either threshold level is crossed, memory reset button, 34' power leads with strain relief and colour-coded mini-clips; detachable high-frequency ground clip. The unit is powered by the circuit under test, or it



can be used with a separate power supply.  
Kit IT-7410  
Assembled ST-7410

**IT-7410 SPECIFICATIONS:** DC Threshold Levels (switch selected): 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: 400k ohms parallel with 10 pF. Response Limits\* TTL or CMOS at 5 VDC. Single pulse or pulse train, 10 nS minimum. Squelch: 100 MHz maximum. CMOS at 15 VDC. Single pulse or pulse train, 10 nS minimum, squarewave, 80 MHz maximum. Memory Indicator (LED): Turns on any change of either logic level indicator. Manually reset after turn on. Probe Input Protection: ± 50 VDC continuous ±

175 VDC (124 VAC) 5 seconds. Power Leads Protection: 25 VDC continuous + 25 VDC (17 VAC) 1 minute. Power Requirements: 4.75 to 5.5 VDC at 75 mA maximum (TTL); ± 75 to 115 VDC at 115 mA maximum (CMOS). Operating Temperature Range: 10° to 40° C. Dimensions: 1" H x 1" W x 9 1/2" L (19 x 25 x 235 mm).

\*Response limits are determined by using high frequency ground clip and  $V_{DD}/V_{CC} = 2.4$  V for TTL, 90% of supply voltage for CMOS.  $V_{LOW} = 0.4$  V for TTL, 10% of supply voltage for CMOS.

## IT-3121 Curve Tracer

- Test bipolar transistors, diodes, SCR's, FET's, etc.

Just connect the IT-3121 to any oscilloscope with horizontal sensitivity of 0.5 V/div, and vertical sensitivity of 1 V/div, and get an accurate display of operating parameters for virtually any discrete semiconductor. Devices such as bipolar transistors, diodes, SCRs, triacs, FETs, etc. can be inspected or tested for specific applications. Plug-in cables are supplied for fast, easy scope hookup. A calibration switch permits fast and accurate scope calibration. You can display fundamental parameters such as gain (beta), leakage, breakdown voltage, saturation, forward conduction voltage, output admittance, linearity, capacitance effects, temperature effects and others (see insets for typical displays). The extensive manual included in each kit tells how to interpret each display.

### Kit IT-3121

**IT-3121 SPECIFICATIONS:** Sweep Voltage Ranges: 0-40 volts at 1 ampere max. 0-200 volts at 200 mA max. Sweep Voltage Sampling: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20 and 50 V/div. ±3%. Sweep Current Sampling: 0.5, 1, 2, 5, 10, 50, 100 and 200 mA/div. ±%. Step Currents: 0.002, 0.005, 0.01, 0.02, 0.1, 0.2, 2, 5, and 10 mA/step. ±3%. ±250 mA offset current max. Step Voltages: 0.05, 0.1, 0.2, 0.5, and 1 volt/step. +3%, ±5% mA maximum offset voltage. Oscilloscope Requirements: Bandwidth to 20 kHz or greater. (DC-coupled oscilloscope is recommended). Power Requirement: 110 to 130 V or 220 to 260 VAC. Dimensions: 4 1/4" H x 11 1/4" W x 10" D.

## Heath-approved tools for all your kitbuilding needs

- 4 Basic Kitbuilders tool set. Everything you need to get started. Includes Solon soldering iron, diagonal cutters, long-nose pliers and two screwdrivers.

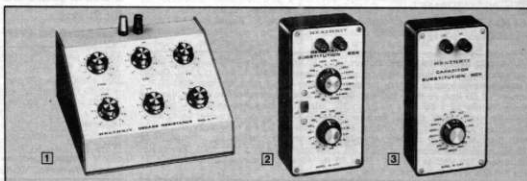
### TK-1

- 5 Kitbuilders tool set. Includes Antex soldering iron, combination wire stripper and side cutter, two screwdrivers, two open-ended spanners (0-2BA, 4-6BA), tweezers and roll-up plastic case

### TK-2

- 6 Adcola 19-watt soldering iron. General purpose iron ideal for first time kitbuilders.

### Adcola



### 1 Decade Resistance Box

Six decades provide range of 1 ohm to 999,999 ohms in 1-ohm steps. Resistors are 1-watt, ½% accuracy. Invaluable as a variable multiplier or shunt, a variable substitution resistor, or an arm for AC and DC bridges. Use in conjunction with the IN-3147 for solving complex networks.

### Kit IN-3117

**IN-3117 SPECIFICATIONS:** Minimum DC Resistance: 0.25 ohms or less at terminals with all switches at zero. Dimensions: 5" H x 7 1/2" W x 6 1/2" D.

### 2 Resistor Substitution Box

15 ohms to 10 megohms. 36 EIA standard 10% 1-watt resistors. 5 1/8" H x 3 1/4" W x 3" D.

### Kit IN-3137

### 3 Capacitor Substitution Box

18 EIA standard capacitors from 100 pF to 0.22 µF. Rated at 600 V except 3 lowest and 2 highest values are 500 & 400 V respectively. 5 1/8" H x 3 1/4" W x 3" D.

### Kit IN-3147



# There's a top-performing Heathkit



- Super-low distortion
- Flat output across entire range



## Sine-Square Wave Audio Generator

- Sine wave output from 1 Hz to 100 kHz
- Square wave output from 5 Hz to 100 kHz
- Simultaneous or independent outputs

The IG-5218 is ideal for gain and frequency response measurements in audio amplifiers, as a signal source for harmonic distortion measurements or as an external modulator for RF signal generators. Sine wave signal distortion is less than 0.1% from 10 Hz to 20 kHz. A meter, calibrated in both volts and dB, monitors the sine wave output. Peak-to-peak square wave output levels are 0.1 V and 10 V into a load of 2000 ohms or greater. Risettime is only 50 nanoseconds.

**Kit IG-5218**  
**Assembled SG-5218**

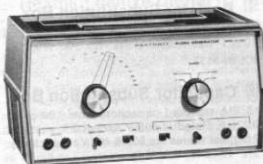
**IG-5218 SPECIFICATIONS:** SINE WAVE OUTPUT: Output voltage: 8 ranges, 0.003 to 10 V rms (full-scale) with 10 k ohm or higher external load. 6 ranges, 0.003 to 1 V (full scale) with 600 ohm internal or external load. dB ranges: -62 dB to +22 dB, -12 dB to +2 dB on meter and -50 to +20 dB on amplitude switch in 10 dB steps. +2 dB max. into 600 ohm load. (0 dB=1 mW in 600 ohm). Output variation: +1 dB 10 Hz to 100 Hz. Output indications: Two voltage and one dB scale on meter. Output impedance: 10 V range: 0-1000 ohm; 3 V range: 800-1000 ohm; 1 V range and lower, 600 ohm. Meter accuracy:  $\pm 10\%$  of full scale with proper load termination. SQUARE WAVE OUTPUT: Output voltage (peak-to-peak): 0.1, 1, 10 V into 2000 ohm load or higher. Output impedance: 0.1 V and 1 V ranges: 52 ohm; 10 range: up to 220 ohm. Power requirement: 105-125 or 210-250 VAC, 60/50 Hz, 6 watts.

## Low-Distortion Audio Frequency Generator

The Heathkit IG-1272 provides a low-distortion sine wave output over a frequency range from less than 5 Hz to 100 kHz. It's perfect for the testing requirements of the serious audiophile, audio service shop or the audio designer. Pushbuttons select the first three significant digits of the desired frequency and also control the frequency multiplier and output attenuator. The IG-1272 can also be operated in a continuously-variable frequency mode. A level meter on the front panel allows accurate monitoring of the output. A BNC output connector helps keep noise level approximately 70 dB below signal output level. A buffered sync signal, for use with an oscilloscope or frequency counter, is available at the rear panel BNC. Includes cable, BNC, and clip leads.

**Kit IG-1272**  
**Assembled SG-1272**

**IG/SG-1272 SPECIFICATIONS:** Output Voltage: .003 to 10 volts RMS. Output Load: 600 ohms. Hum and Noise: .01% or less. Frequency Range: 5 Hz to 100 kHz. Output Flatness (referenced to meter) Pushbutton Mode: Within  $\pm 1.1$  dB from 5 to 20 Hz; within  $\pm 2$  dB from 20 Hz to 100 kHz. Output Flatness (referenced to meter) Variable Mode: Within  $\pm 2.5$  dB from 10 Hz to 100 kHz. Frequency Accuracy: Pushbuttons:  $\pm 4\%$ ,  $\pm 1$  Hz, typical  $\pm 1.5\%$ . Variable: Depends on accuracy of counter being used. Distortion: 10 to 40 Hz;  $\leq 1\%$  or less. 40 Hz to 20 kHz; 0.04% or less. 20 kHz to 100 kHz; rises to 0.1% at 100 kHz. Attenuation: Pushbutton combination selected, 10 to 70 dB. Attenuation Accuracy:  $\pm 0.2\%$  dB. Selector Accuracy:  $\pm 1$  Hz  $\pm 4\%$ . Power Requirement: 120 VAC or 240 VAC, 50 or 60 Hz. 10 watts maximum. Dimensions: 5 1/8" H x 11 7/8" W x 12 1/2" D. Weight: 9.5 lbs.

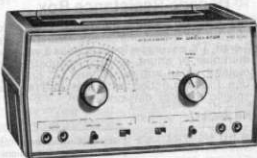


## Add this versatile Audio Generator to your bench

Frequency coverage is in four ranges, from 10 Hz to 100 kHz, in either sine or square wave modes. Use as an audio signal tracer or, with the appropriate associated equipment, use the sine wave output for audio stage gain and distortion analysis. The square wave output is ideal for checking frequency response and harmonic distortion. Construction is easy with single circuit board assembly. See also page 36.

**Kit IG-5282**

**IG-5282 SPECIFICATIONS:** Frequency: 10 Hz to 100 kHz in four ranges. Sine Wave Output Voltage: 0.3 volts rms. Square Wave Output Voltage: 0.3 volts peak. Power Requirements: Two 9-volt batteries or IPA-5282-1 power supply. Dimensions: 5 1/8" H x 11 7/8" W x 1 1/2" D.

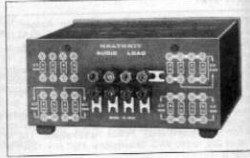


## 220 MHz RF Oscillator

The IG-5280, which includes probes, is suitable for alignment of tuned stages in AM, FM, and television receivers. It covers 310 kHz to 110 MHz in five bands and in addition features an extra 10 to 220 MHz band of calibrated harmonics. Internal modulation is 1000 Hz. This signal, available at front panel sockets, is ideal for tracing and isolation of circuit defects in receiver audio stages. See also page 36.

**Kit IG-5280.**

**IG-5280 SPECIFICATIONS:** Frequency Range: 310 kHz to 110 MHz in five bands, 100 MHz to 220 MHz in calibrated harmonics. Output voltage: 100 mv approx. Internal Modulation: 1000 Hz. AF Output: Frequency: 1000 Hz. Output Voltage: 2.0 volts rms (open circuit). Power Requirement: Two 9-volt batteries or IPA-5280-1 power supply. Dimensions: 5 1/8" H x 11 7/8" W x 1 1/2" D.



## Heathkit Audio Load

• Provides loads of 2, 4, 8, 16 or 32 ohms  
Provides the correct loading required for audio amplifiers under test in accordance with manufacturers published specifications. Eliminates "special order" load resistors for each amplifier you want to test. Provides audio loads of 2, 4, 8, 16 or 32 ohms (1% tolerance) depending on the connections made at the five-way binding posts. Available loads are four 8-ohm, 60W; two 16-ohm, 120 W; one 32-ohm, 240 W; one 2-ohm, 240 W; one 8-ohm, 240 W. Jacks are provided for connecting a voltmeter, oscilloscope or other test instrument at the load in use. Includes four 3-ft. test leads, spade lugs and jumper links. 4" H x 9" W x 9" D (102 x 229 x 229 mm).

**Kit ID-5252**

# Generator for ANY Service Need!

## IG-1275 Deluxe Lin/Log Sweep Function Generator

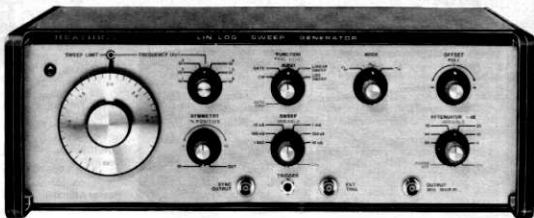
- Sine, square and triangle wave outputs
- CW, burst, linear sweep and log sweep
- Variable symmetry, variable offset, VCG input

The IG-1275 is a reliable lab-grade function generator that provides sine, square and triangle waveforms PLUS swept-function waveforms for convenient frequency response tests. Also has pen lift and chart control signals for use with Heath chart recorders and others. Six operational modes; Continuous output (CW); gated CW; a burst mode that completes a variable integral number of output cycles; linear and log sweeps for a 1000:1 sweep range. Stop and start frequencies are set independently; sweep modes can also be triggered externally providing one sweep for each trigger, and stops for an integral number of cycles. Other features include: A 50 dB switch attenuator variable between ranges; adjustable symmetry from 5% to 95%; analog, sweep and sweep gate outputs for convenient system control.

### Kit IG-1275,

Factory assembled and tested version of above:

### SG-1275,

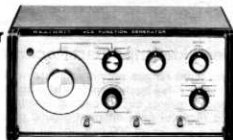


## IG-1273 Lin/Log Function Generator

Has the same fine features and specifications of the IG-1275 above, but does not offer swept-function capability.

### Kit IG-1273,

Kit SG-1273, Factory assembled and tested version of above.



**IG/SG-1275 SPECIFICATIONS:** Output: 50-ohm source - short circuit protected,  $\pm 10$  volts open circuit.  $\pm 5$  volts into 50-ohm load. Output Flatness:  $\pm 0.1$  dB to 300 kHz,  $\pm 0.5$  dB to 3 MHz. Output Waveforms: Sine - Triangle - Square. Symmetry continuously variable 5% through 95% to 300 kHz. Frequency: 0.003 Hz through 3 MHz in 6 range steps on primary decade. Sine Distortion: Less than 1%,  $\times 10^3$ . Less than 0.5%,  $\times 10^2$ , 10% Less than 0.75%,  $\times 10^1$  harmonics 30 dB down  $\times 10^0$ . Triangle Linearity: No deviation greater than 1% to 300 kHz. Square-Wave Rise and Fall: Less than 60 nS. Dial Accuracy:  $\pm 3\%$  of full scale. Attenuator: 0 to -50 dB in 10 dB steps. Variable control 0 to -20 dB. DC Offset: Signal plus offset, limited to  $\pm 10$  volts open circuit or  $\pm 5$  volts into 50-ohm load. Time Symmetry: Within 1% of full period through 300 kHz. Sweep Generator: 6 ranges, 10  $\mu$ s to 100 sec. Each range may be extended by 100 with the variable control. Sweep Output: Supplies 0 to 4.5-volt linear ramp at sweep generator rate from a 1000-ohm source. Sweep Gate Output Connector: Supplies high TTL level for duration of sweep or burst. Analog Out-

put Connector: Supplies 0 to 6 volts DC for 3 decade span. Less than 100-ohm source. Sync Output Connector: Supplies 1.5-volt (minimum) peak-to-peak signal from a 50-ohm source. Voltage Control Input Connector (VCI): 0 to  $\pm 5$  volts signal for a 3-decade span. 8 k $\Omega$  input impedance. External Trigger Input Connector:  $\pm$  (250 mV to 4 volts) with 10 k $\Omega$ . Triggers on positive slope. Operating Temperature: 0° to 40° C ambient. Power Requirements: 100 to 135 volts, 50-60 Hz, 20 watts maximum. Switch selectable for normal or low line. (200 to 270 volts; 50-60 Hz; switch selectable.) Fuse Requirements: 1/4-ampere, slow-blow, 120/240 VAC operation. Dimensions: 15" wide, 11 1/2" deep, 5 1/2" high, 36.1 cm wide, 30.2 cm deep, 13.7 cm high.)

\*Applicable only on top decade of each frequency range.

\*NOTE: All specifications except those for swept functions also apply to IG/SG-1273 above.

The IG-1275 and IG-1273 require a triggered sweep oscilloscope for calibration.



- 0.1 Hz to 1 MHz range
- Sine, square or triangle waveforms

## Heathkit Stereo Generator provides fast & accurate FM/FM stereo alignment

Provides audio or composite stereo signal for multiplex adaptor adjustments...RF carrier modulated by these signals for tuner & receiver adjustments...phase test function for subcarrier transformer adjustment...a variable level crystal-controlled 19 kHz pilot signal for checking receiver lock-in ranges...plus built-in sweep and marker signals for RF & IF alignment. With

test leads.

### Kit IG-5237

**IG-5237 SPECIFICATIONS:** RF Signal frequency: 100 MHz adjustable by approx.  $\pm 2$  MHz. Pilot modulating frequency: 10 kHz  $\pm$  2 Hz. FM modulation: Left channel (stereo), right channel (stereo). Phase Test (left plus right channel in phase). Monophonic FM Deviation: Adjustable to 75 kHz. Sweep rate: used for RF and IF alignment. 60 Hz. Power requirements: 120/240 VAC, 50/60 Hz, 35 W. Dimensions: 5 1/2" H  $\times$  13 1/2" W  $\times$  9" D.

## Heathkit Function Generator

Generates highly accurate sine, square or triangle waveforms over a frequency range of 1 Hz to 1 MHz. The six-position frequency multiplier and the larger front panel tuning control set any frequency fast and easy. The short-circuit-proof output amplifier supplies a 10 volt (p-p) signal into a 50 ohm load. A calibrated step attenuator adjusts from 0 to 50 dB (10V p-p to 30 mV p-p) in 10 dB steps. An attenuator control provides up to 20 dB additional attenuation for each step for total attenuation of 70 dB. A triggered oscilloscope is necessary for calibration.

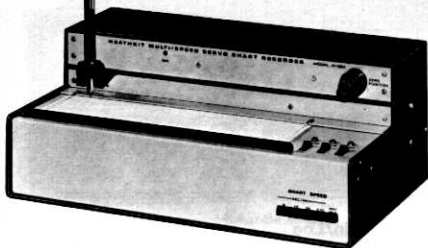
### Kit IG-1271

### Assembled SG-1271

**IG-1271 SPECIFICATIONS:** Frequency accuracy:  $\pm 3\%$  of full scale on dial. Functions: Triangle waveform: Nonlinearity, 5% maximum. Symmetry within 10% of 50% duty cycle. Square waveform: 100 nanosecond maximum rise or fall time. Symmetry within 10% of 50% duty cycle. Sine waveform: Harmonic distortion: 3% max, 5 Hz to 100 kHz. Power requirement: 105-130 volts, 210-260 volts, rms, 60 W  $\times$  15 watts max. Operating temperature: 0 to 40°C. Dimensions: 3" H  $\times$  7 1/2" W  $\times$  8 1/2" D (with handle removed). Net weight: 4.2 lbs.



# Get Heathkit Instruments for Value and Reliability



## Heathkit Strip Chart Recorder

Two input ranges permit accurate voltage measurements to 1 mV or 10 mV full scale (selected during assembly). High input impedance prevents circuit loading. Floating input is useful when source and recorder have different ground potentials. Twelve chart speeds from 5 sec./in. to 200 min./in., all pushbutton selected. Chart motor drive circuitry is synchronized with the line frequency for accurate speeds. The pen holder accepts many different types of pens (a standard cartridge-type fountain pen is supplied). Multi-coloured plots are made by changing pens. Paper width is 10", marked 0-100 right to left. The tip-back-top makes paper loading fast and easy. For slow chart speeds (100 sec./in. or longer), SU-445-17 chart paper is recommended.

Individual POWER, SERVO and CHART switches operate the servo mechanism and chart drive independently. Coarse and fine zero position controls. Reference voltage supply is zener-regulated. Other features include a light-operated modulator for comparison of input and reference voltages and a gearless servo drive system.

### Kit IR-18M

EUA-445-19, chart paper 140 ft roll

SU-445-17, chart paper, 120 ft roll

## Laboratory Breadboard for experimenters



### Kit ET-3300

Assembled ETW-3300

The ET-3300 makes basic circuit designing easy. Solderless sockets and a built-in power supply makes hook-up and teardown quick and easy. It can even be used to test electronic components. You'll find dozens of other users for it. A great kit for the electronics experimenter. Holds up to 24 14-pin IC's.

ET-3300 SPECIFICATIONS: Outputs: +5 VDC @ 1.5 amps; +12 VDC @ 100 mA; -12 VDC @ 100 mA. Regulation: Load: Less than 2% variation from no load to full load on all supplies. Current Limiting: Fixed current limiting of each supply at rated current provides short-circuit protection. Power Requirement: 120/240 VAC 60/50 Hz 30 watts at full load. Size: 3 1/2" H x 12" W x 12" D.



## Bi-Directional RF Wattmeter

Covers the 100 MHz to 1 GHz spectrum, without costly "slugs" or elements. Power is measured on three forward scales (30, 75 and 300 watts) and three reflected (3, 7.5, and 30 watts). Capable of withstanding full power overloads on both of its lower ranges due to its unique "meter driving" FET amplifier.

Both the RF sensing bridge and power calibration "pots" are matched, factory aligned and tested. Equipped with N-type coax connectors, and supplied with N to PL-



- Gun Meters
- Heater Voltage Meter
- Cutoff/Power Control
- Heater Adjust Control
- Pushbutton Operation

Restore Indicator

## Heathkit IT-5230 CRT Tester/Rejuvenator

- Tests IN-LINE GUN Colour CRT's
- Individual meters for each colour gun
- Clean and rejuvenate modes for each gun
- Heater/Cathode short indicator

The IT-5230 will help you test, rejuvenate and clean almost all popular CRT's, including the new IN-LINE GUN CRT's. Features simplified pushbutton operation for all test, rejuvenation and cleaning operations, individual grid current meters for each colour gun, a separate heater voltage meter to allow precise settings of heater voltage on the CRT. Has lamp to indicate shorts in the CRT, heater voltage and cutoff controls. A special GUN REL/LIFE pushbutton provides an indication of the life remaining in the tube.

The restore indicator glows brighter as the rejuvenating current level is increased for an easy visual indication of rejuvenation. Transformer power supply assures safe, reliable operation even at low line voltages. The IT-5230 can also be used to clean and rejuvenate computer terminal and oscilloscope CRT's.

### Kit IT-5230

Assembled ST-5230

IT-5230 SPECIFICATIONS: Sockets Supplied: 14-pin for 90° colour tubes, 13-pin for inline colour tubes, 8-pin for black-and-white tubes, 7-pin for black-and-white tubes. Heater Supply Voltage: Variable from 2 volts to 12 volts at 1 ampere. Test Cables Supplied: 4' heavy duty. Power Requirement: 120/240 VAC 60/50 Hz (50 watts maximum at 60 Hz). Dimensions: 5 1/2" high x 13 1/4" wide x 10" deep.

## Heathkit 40 kV High-Voltage Probe Meter



Makes TV tube voltage measurements fast and convenient. Measures DC voltages up to 40 kV with ±3% accuracy. The on-off switch on

handle protects the meter during hook-up and when the probe is not in use. Easy operation, easy assembly. 1 1/2" H x 1 1/4" W x 15" D (38 x 48 x 381 mm).

### Kit IM-5210

259 adaptors. Has metal D-ring for belt attachment and is ideal for tower antenna tuning and alignment. Requires 9-volt battery (not supplied).

### Kit IM-4190

Assembled SM-4190

IM/SM-4190 Specifications: Power Ranges: Forward: 30, 75, and 300 watts; full scale. Reflected: 3, 7.5, and 30 watts; full scale. Frequency Range: 100 MHz to 1 GHz. Impedance: 50 ohms. Accuracy: ±5% of full scale (30, 75 and 300 watt ranges); ±7.5% of full scale (3, 7.5, and 30 watt ranges). Size: 4.5" H x 4.25" W x 4.625" D (114 x 108 x 117 mm). Power Requirement: 9-volt battery, PPS.



# Heath has the VALUES in Test Instruments



- Linear scales for both volts and dB.
- High sensitivity 0-1mV full-scale range.
- Excellent frequency response of 10Hz to 1MHz.
- Rear panel outputs proportional to both voltage and dB.
- dB offset control changes the reference voltage over a 10dB range.

## Heathkit IM-5238 Deluxe AC Voltmeter

AC volts are measured in 12 ranges from 0-1 mV to 0-300 VAC. High sensitivity and a full-scale 0-1 mV range make it ideal for extremely low AC voltage measurements; its wide frequency response is excellent for a variety of AC voltage measurements. Measures phono cartridge, amplifier and tuner outputs, power supply ripple and noise. The linear dB scale provides less crowding of divisions, so there's no dropoff in resolution when reading at the high end. dB measurements can be made from -70 to +40 dB in 12 ranges. The meter is calibrated to read standard dBm (0 dBm = 1 mW into 600 ohms = 0.775 V rms). A dB offset control changes the reference voltage over a 10 dB range, so you can set any reference voltage you need.

Kit IM-5238  
Assembled SM-5238

IM-5238 SPECIFICATIONS: Voltage Range (full scale): 1 millivolt to 300 volts AC, 12 ranges. Decibel Range: -70 dB to +40 dB, 12 ranges in 10 dB steps with variable offset. Input: 10 megohms, 30 pF, negative input grounded to chassis. Frequency Response: Voltage Range, 10 Hz to 1 MHz; -2 dB, 10 Hz to 500 kHz  $\pm 1$  dB range, 10 Hz to 250 kHz  $\pm 1$  dB. Outputs: DC (proportional to input volts), 1 volt full scale DC (proportional to log of input volts), 3 volts full scale AC (amplified output), 1 volt peak, full scale. Scales: 0-10 volts, 0-3.16 volts; -20 to +10 dB. Accuracy: Voltage Ranges, 4% of full scale at 1 kHz plus accuracy of calibration standard; dB ranges,  $\pm 0.5$  dB at 1 kHz plus accuracy of calibration standard. Operating Temperature Range: +10° C to +40° C. Power Requirement: 100-135 VAC, 200-270 VAC, 50/60 Hz, 20 watts. Overall Dimensions: 5 3/8" W x 6 3/4" H x 10 3/8" D.



- 9-ranges AC and DC voltage measure from 0.1 to 1000 volts.
- 6-ranges AC and DC current measure from 0.01 to 1000 mA.
- 7 ranges measure resistance from 1 ohm to 1 megohm.
- High and low voltage checking ohms ranges for checking semiconductor in and out of circuit.
- LED's indicate DC input polarity.

## IM-5225 Bench Model FET Multimeter

The IM-5225 is a stable and accurate FET multimeter. It will measure AC and DC voltages from 0.1 to 1000 volts and DC and AC currents from 0.1 to 1000 mA. Resistance from 1 ohm to 1 megohm may be measured on its seven ranges. High and low voltage ohms ranges allow checking of semiconductor junctions out of circuit or in circuit without causing semiconductor conduction. Easy to use with a 24-position, continuous rotation range switch with concentric ohm-meter adjustment control and a 4-position pushbutton function switch. Front panel LED's provide automatic indication of input polarity on DC functions and also serve as a pilot light. Overload protection up to 700 VAC or 1000 VDC on the 1 volt to 1000 volt ranges and 220 VAC or 300 VDC on any other range. Input fuse, clamping diodes and transistors provide meter circuit protection.

Kit IM-5225

IM-5225 SPECIFICATIONS: DC VOLTMEASUREMENT—9 Ranges: 0.01 to 1000 volts full-scale in 1, 3, 10 sequence. Input Resistance: 10M $\Omega$ . Accuracy:  $\pm 2\%$  of full-scale. AC VOLTMEASUREMENT—9 Ranges: 0.01 to 1000 volts full-scale in 1, 3, 10 sequence. Input Resistance: 10M $\Omega$ . Accuracy:  $\pm 3\%$  of full-scale. DC MILLIAMMETER—6 Ranges: 0.01, 0.1, 1, 10, 100, 1000 milliamperes full-scale. Voltage Drop (Approximate at full scale): 0.1 volt (0.01 to 10 ranges), 0.15 volt (100 range), 0.35 volt (1000 range). Accuracy:  $\pm 2\%$  on 0.01 to 100 ranges,  $\pm 3\%$  on 1000 range. AC MILLIAMMETER—6 Ranges: 0.01, 0.1, 1, 10, 100, 1000 milliamperes full-scale. Voltage Drop (Approximate at full scale): 0.1 volt (0.01 to 10 ranges), 0.15 volt (100 range), 0.35 volt (1000 range). Accuracy:  $\pm 3\%$  on 0.01 to 100 ranges,  $\pm 4\%$  on 1000 range. OHMMETER—7 Ranges (5x 110 series scale): 0x10 to 0x1M $\Omega$  dB Ranges—9 Ranges (0 dB = 1 mV into 600 $\Omega$ ), -40 to +62. Power Requirement: 120/240 VAC, 50/60 Hz. Dimensions (Overall): 8 1/4" x 5 7/8" x 11 1/2" D.



## IM-5248 Intermodulation Distortion Analyzer

Measures distortion as low as 0.01% (plus residual). Built-in 60 Hz and 7000 Hz oscillators, external oscillator inputs for measurements at different frequencies. Built-in AC voltmeter.

Kit IM-5248  
SM-5248, Factory assembled version of above.

IM-5248 SPECIFICATIONS: IM METER. Ranges: 0.1 to 100% in a 1-3-10 sequence. Readable to 0.01% plus residual. Residual: Less than 0.01% with internal generators. Accuracy: 5% full scale. Input Impedance: 1 megohm. HF sensitivity: 100 mV minimum. Oscillator Frequencies: 60 Hz (line synchronous), and 7000 Hz. Generator Amplitude: Adjustable, 100 mV to 3 volts rms (50 mV to 1.5 volts into 600 ohms), with 60 Hz and 7000 Hz at  $\pm 4$  dB ratio. Impedance and Bandwidths of External Oscillator Outputs: 50  $\Omega$  = 3 k ohms, 10 to 500 Hz; 50  $\Omega$  = 15 k ohms to 25 k ohms; 2 kHz to 100 kHz. Impedance of Oscillator Outputs: 1000 ohms. Connectors: 5-way binding posts. AC VOLTMEASUREMENT: 10 mV to 300 volts in a 1-3-10 sequence. Input Impedance: 1 megohm. Accuracy: 5% full scale. Frequency Response: 5 Hz to 1 MHz, 3 dB. Power Requirement: 100-135 VAC or 200-270 VAC switch selected, 60/50 Hz, 15 watts. Dimensions: 5 3/8" H x 15" W x 11 3/8" D.



## IM-5258 Total Harmonic Distortion Analyzer

The Heathkit IM-5258 is a professional-grade total harmonic distortion (THD) analyzer with automatic null. Its outstanding sensitivity and bandwidth permit measurement of THD levels as low as 0.03%, over a frequency range of 5 Hz to 100 kHz. The IM-5258 also functions as an AC voltmeter with 12 switch-selected ranges from 1 mV to 300 V full scale. Also has dB scale.

Kit IM-5258  
SM-5258, Factory assembled version of above

IM-5258 SPECIFICATIONS: Frequency Range: 5 Hz to 100 kHz in 5 ranges: 5-10 Hz, 10-100 Hz, 100-1000 Hz, 1-10 kHz and 10-100 kHz. Distortion Range: reads from 0.3% to 100% full scale in 6 ranges with a 1-3-10 sequence. Residual Distortion: 0.03% or less. Input Impedance: 1 megohm/70 pF maximum. Required Input Level: 316 mV for distortion measurements. Voltmeter: 1 mV to 300 V in 12 ranges with a 1-3-10 sequence. Accuracy: 5% of full scale. Output: 100 mV for full scale meter deflection. Power Requirement: 100-135 VAC or 200-270 VAC switch selected, 60/50 Hz, 12 watts. Dimensions: 5 3/8" H x 15" W x 11 3/8" D.

# Heath has the VALUES in Oscilloscopes



## DC to 5 MHz Oscilloscope with complete triggering controls including TV coupling

- Mu-metal CRT shield
- Regulated LV power supplies

The Heathkit IO-451 is a triggered scope with controls and features that are not found in other scopes in this price range. A stable triggering circuit is used for solid waveform displays. Trigger controls include selection of normal or automatic modes, switch controlled AC or DC coupling and front panel input of external triggering signals. All front panel trigger controls are clearly labelled for "no mistake" operation. A special TV position on the trigger selector control allows for low frequencies to pass while rejecting the high frequencies, so the 451 will easily trigger on the vertical component of a complex TV signal.

Any one of seven calibrated time bases, from 200 ms/cm to 0.2  $\mu$ s/cm can be selected by the time/cm switch. A variable control provides for settings between steps. The horizontal amplifier will accept external inputs from DC to 100 kHz.

Vertical input sensitivity of 20 mV/cm and nine calibrated vertical attenuator positions, up to 10 V/cm, will accommodate a broad range of input signals. A variable gain control gives precise control between settings.

Both vertical amplifier and horizontal sweep circuit power supplies are regulated to provide stable voltages to all circuits under varying line voltage conditions. Mu-metal shielding helps eliminate display error.

### Kit IO-451 Assembled SO-451

**IO-451 SPECIFICATIONS:** VERTICAL: Bandwidth: DC to 5 MHz;  $\pm 3$  dB. Attenuator: 1, 2, 5 sequence, calibrated and variable. Rise Time: 70 ns. Overshoot: 5% at 1 kHz. Impedance: 1 M $\Omega$ /38 pF. Sensitivity: 20 mV/cm. SWEEP: Type: Triggered. Range: 200 ms - 2  $\mu$ s, 7 steps plus variable. Trigger Source: Int/Ext/Line. Trigger Modes: AC/DC/TV. +/- - Slope. Auto/Norm. HORIZONTAL: Sensitivity: 25 V/cm. Bandwidth: DC to 100 kHz. Impedance: 1 M $\Omega$ /50 pF. Ext. Horiz. Input: X1 and X10 attenuator. GENERAL: CRT: SDCP31F, 8 x 10 cm, green, medium-persistence phosphor, 5" round, flat-face tube. Accelerating Potential: Approx 1.5 kV. Graticule: Painted, 8 x 10 cm. Power Requirements: 110-130 VAC or 220-260 VAC, 50/60 Hz, 35 watts. Dimensions: 8" H x 13" W x 17" D.



## Heathkit IO-4550—Dual-Trace, DC to 10 MHz

input channels are displayed, chopped or alternate, as selected by the time base switch. A trigger select switch and level control allow the time base to be precisely triggered at any point along the positive or negative slope of the signal. The digitally controlled time base provides automatic triggering, so no stability control is necessary and fewer adjustments are required.

The fully regulated high voltage power supply assures operation to specifications on standard line voltages from 100 to 270 volts. Complete mu-metal shielding prevents display error caused by interference from stray magnetic fields.

Improved circuitry and just 4 printed circuit boards make the IO-4550 an easy kit to assemble. Calibration requires a precise source of square waves such as IOA-4510-1 (with additional 6-volt power source) or IG-4505.

### Kit IO-4550 Assembled SO-4550

**IO-4550 SPECIFICATIONS:** VERTICAL: Deflection Factor: Sensitivity: 10 mV/cm to 20 V/cm. Attenuator: 11 steps in 1-2-5 sequence. Variable: Continuous between steps to approximately 60 V/cm. Accuracy: Within 3%. Vertical Response: DC Coupling: DC to 10 MHz. AC Coupling: 2 Hz to 10 MHz. Rise Time: 35 ns. Overshoot: Less than 5%. Vertical Input: Impedance: 1 M $\Omega$  shunted by 38 pF. Maximum Input: 400 V. HORIZONTAL: Time Base: Ramp: 0.2 s/cm to 200 ns/cm. Positions: 19 steps in 1-2-5 sequence. Variable: Continuous between ranges to approximately 0.6 s/cm. Accuracy: Within 3%. Magnifier: X5 (adds additional 2% to sweep accuracy). External: Sensitivity: 0.1 V/cm (approx.). Impedance: 100 k $\Omega$  (approx.). Frequency Response: DC to 1 MHz. Connector: BNC. TRIGGER: Internal: Automatic. Adjustable over 10 divisions. Normal: Adjustable over 10 divisions. Slope Selection: + or -. External: Automatic. Adjustable over 0.8 V. Normal: Adjustable over 0.8 V. Slope Selection: + or -. Impedance: 1 M $\Omega$  shunted by 40 pF. Connector: BNC. X-Y: Y Channel: Same as Vertical. X Channel: Same as vertical except response is limited to 1 MHz. Phase Shift: Less than 90° @ 100 kHz. GENERAL: CRT: Type: 5" round. Acceleration Potential: 1.8 kV regulated. Phosphor: P-31. Graticule: 8 x 10 cm. Power Requirements: 100-135 VAC/200-270 VAC switch selected, 70 watts at 120 VAC (240 VAC). Operating Temperature: 10°C to 40°C. 6.9" H x 12.9" W x 19.3" (without handle).

## Probes & accessories for Heathkit instruments

**1** PKW-105 scope probe has X1, Ref, and X10 slide switch and 12 metre cable. Bandwidth: X1, DC-15MHz, X10, DC-80MHz, input impedance: X1, 1M $\Omega$ /40pF, X10, 10M $\Omega$ /10.8pF. Risetime: X10, 4 ns. Complete with insulating tip, spring hook, trimmer tool, BNC adaptor & IC tip.

### Assembled PKW-105

**2** Low capacitance scope probe provides direct or X10 attenuated operation; options for 3.3 or 1 megohm input resistance. Banana plug/BNC wiring option.

### Kit PK-1

**3** Scope demodulator probe for distortion checks, RF & IF display, 30 V rms max, 500 VDC max; Banana plug/BNC wiring option.

### Kit 337-C

Accessory cables... for inter-connecting scopes, counters, etc. All cable is RG-58/U, 50 ohm impedance. Shpg. wt. (each), 1 lb.

### Assembled SU-501-3, 3 ft., BNC/BNC Assembled SU-501-6, 6 ft., BNC/BNC

### Assembled SU-503-3, 3 ft., BNC/Banana





## Single Trace, DC to 10 MHz, 10mV sensitivity

### • Regulated high-voltage power supply

A trigger select switch and level control allow the time base to be precisely triggered at any point along the positive or negative slope of the signal. The digitally controlled time base provides automatic triggering, so no stability control is necessary and fewer adjustments are required.

The fully regulated high voltage power supply assures operation to specifications on standard line voltages from 100 to 270 volts. Complete mu-metal shielding helps prevent interference.

Kit IO-4555

Assembled SO-4555

**IO-4555 SPECIFICATIONS:** VERTICAL: Deflection Factor: Sensitivity: 10  $\mu$ m/cm to 20 V/cm Attenuator: 11 steps in 1-2-5 sequence Variable Continuous between steps to approximately 60 V/cm Accuracy: Within 3% VERTICAL Response: DC Coupling: DC to 10 MHz AC Coupling: 2 Hz to 10 MHz Rise Time: 35 ns Overshoot: Less than 5% VERTICAL Input: Impedance: 1 M $\Omega$  shunted by 38 pF Maximum input: 400 V HORIZONTAL: Time Base: Ramp: 0.2  $\mu$ sec to 200 nsec. Position: 19 steps in 1-2-5 sequence Variable: Continuous between ranges to approximately 0.6  $\mu$ sec/cm Accuracy: Within 3% Magnifier: X5 (adds additional 2% to sweep accuracy) TRIGGER Internal: Automatic: Adjustable over 10 divisions Normal: Adjustable over 10 divisions Slope Selection: + or - External: Automatic: Adjustable over 0.8 V Normal: Adjustable over 0.8 V Slope Selection: + or - Impedance: 1 M $\Omega$  shunted by 40 pF Connector: BNC GENERAL CRT: Type: 5" round Acceleration Potential: 1.8 kV regulated Phosphor: P-31 Graticule: 8 x 10 cm Power Requirements: 100-130 VAC/200-270 VAC switch selected 70 watts Operating Temperature: 10°C to 40°C Dimensions: 6 9/16" x 12 9/16" x 19 3/8" (without handle)

## Dual trace, DC to 15 MHz, 1 mV sensitivity

### • 45 MHz typical triggering bandwidth

Digitally-controlled time base provides automatic triggering—no stability control is necessary. Baseline is generated when trigger signal is absent. Trigger Select switch and Level control precisely trigger time base at any point along + or - slope. The automatic position of level control triggers at zero crossing point. Time Base control provides 20 calibrated time bases from 0.2  $\mu$ sec/cm to 0.1  $\mu$ sec/cm in 1, 2, 5 sequence, continuously variable between switch positions. Sweep speed can be magnified five times.

Kit IO-4510

Assembled SO-4510

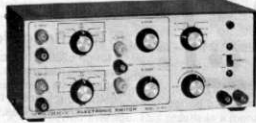
**IO-4510 SPECIFICATIONS:** VERTICAL: Deflection Factor: Sensitivity: 1  $\mu$ m/cm to 5 V/cm in a 1-2-5 sequence Variable: Continuous between steps to approx 15 V/cm Accuracy: Within 3% VERTICAL Response: DC Coupling: DC to 15 MHz AC Coupling: 2 Hz to 15 MHz Rise Time: 24 ns Overshoot: <3% Delay Line: Allows display of at least 20 ns of pre-triggered waveform VERTICAL Input: Impedance: 1 M $\Omega$  shunted by 40 pF Maximum input: 400 V HORIZONTAL: Accuracy: Within 3% Magnifier: X5 External: Sensitivity: 0.2 V/cm (approx.) Impedance: 200 k $\Omega$  (approx.) Frequency Response: DC to 1 MHz TRIGGER: Internal: Automatic: Zero crossing 0.5 cm Normal: Adjustable over 8 division Slope Selection: + or - External: Automatic: Zero crossing  $\pm$ 0.2V Normal: Adjustable over  $\pm$ 5 V Slope Selection: + or - Impedance: 1 M $\Omega$  shunted by 40 pF X-Y: Y Channel: Same as vertical X Channel: Same as vertical, except response limited to 1 MHz and no delay line Phase Shift: Less than 3° @ 100 kHz Operating Temperature Range: 10°C to 40°C Dimensions: 6 4/16" x 12 9/16" x 19 3/8" (without handle)



## 5 MHz, auto-triggering scope

Auto-triggering provides automatic, positive locking of the displayed waveform. The uncalibrated sweep speed control provides continuous adjustment from 20 ns/cm to 200 ns/cm. The DC to 5 MHz vertical bandwidth is more than adequate for general use. Maximum vertical sensitivity is 100 mV with a front panel switch for X1, X10 and X100 attenuation, AC or DC. External horizontal input has 250 mV sensitivity with DC to 100 kHz bandwidth. Dimensions and power requirements as IO-4541.

Kit IO-4560



## Dual trace function for your scope

Gives any single beam scope with ext. trigger input dual-trace versatility. Simultaneous display of two separate input signals.

Kit IO-4101

**IO-4101 SPECIFICATIONS:** Signal Gain: >10 times Maximum input signal: 600 VDC or 600 VAC p-p Input impedance: 1 megohm/50 pF Maximum signal output: 8 V p-p Output loading: 1000 ohm minimum Power requirement: 120-240 V, 60/50 Hz, 6 W Dimensions: 4 1/4" H x 10 1/2" W x 5 1/2" D

## Low-priced scope calibrator

Crystal controlled time base for scope calibration. Generates a square wave output in ranges from 1 kHz to 1 MHz. Output is at TTL levels and the 1 kHz output is adjustable from 0 to 4.7 V/pk.

Kit IOA-4510-1



## Deluxe scope calibrator

The IG-4505 is a practical oscilloscope calibrator at a sensible price. It provides all the waveforms necessary for complete and accurate oscilloscope calibration. Good for scopes with up to 35 MHz bandwidths. An excellent value for the bench.

Kit IG-4505

**IG-4505 SPECIFICATIONS:** TIME CALIBRATION: Range: 0.5  $\mu$ sec to 1  $\mu$ sec square wave accurate to within 0.1% Amplifier:  $\pm$ 200 mV peak Output: 50 ohm terminated cubic VOLTAGE CALIBRATION: Ranges: 1 mV to 10 V peak square wave Accuracy: To within 2% with 1M $\Omega$  load referenced to 1 V position Rise Time: <2  $\mu$ sec Frequency: DC, 2 Hz to 10 kHz Power Requirement: 120-240 Volts AC, 60/50 Hz, 12 watts

# A Low Cost Start!

Heath's 5280 series presents an excellent low cost way to assemble your first bench. Each instrument offers simplicity of construction, good performance, and important "hands-on" learning experience. Once completed, you'll have test gear that you can not only be proud of but also gear that really gets the job done!

## 1 Add this versatile Audio Generator

Frequency coverage is in four ranges, from 10 Hz to 100 kHz, in either sine or square wave modes. Use as an audio signal tracer or, with the appropriate associated equipment, use the sine wave output for audio stage gain and distortion analysis. The square wave output is ideal for checking frequency response and harmonic distortion. Construction is easy with single circuit board assembly.

Kit IG-5282

IG-5282 SPECIFICATIONS: Frequency: 10 Hz to 100 kHz in four ranges. Sine Wave Output Voltage: 0.3 volts rms. Square Wave Output Voltage: 0.3 volts peak. Power Requirements: Two 9-volt PP3 batteries or IPA-5280-1 power supply. Dimensions: 5 $\frac{1}{2}$ " H x 11" W x 7 $\frac{1}{2}$ " D

## 2 RF Oscillator meets your alignment needs

The Heath IG-5280 RF Oscillator, which includes probes, is suitable for alignment of tuned stages in AM, FM, and television receivers. It covers 310 kHz to 110 MHz in five bands and in addition features an extra 100 to 220 MHz band of calibrated harmonics. Internal modulation is 1000 Hz. This signal, available at front panel sockets, is ideal for tracing and isolation of circuit defects in receiver audio stages. Construction is simple.

Kit IG-5280.

IG-5280 SPECIFICATIONS: Frequency Range: 310 kHz to 110 MHz in five bands. 100 MHz to 220 MHz in calibrated harmonics. Output voltage: 100 mV approx. Internal Modulation: 1000 Hz. AF Output Frequency: 1000 Hz. Output Voltage: 2.0 volts rms (open circuit). Power Requirements: Two 9-volt PP3 batteries or IPA-5280-1 power supply. Dimensions: 5 $\frac{1}{2}$ " H x 11" W x 7 $\frac{1}{2}$ " D

## 3 Solid-State Multimeter

The IM-5284 solid-state multimeter gives you 4 different functions and a large easy-to-read panel meter housed in a tough plastic cabinet. Features include AC and DC voltage measurement to 1000 volts and DC current measurement of 1000 mA full scale. The Ohmmeter function is divided into four ranges, X1, X100, X10k and X1M $\Omega$  and accuracy is  $\pm 3$  degrees of arc. Test probes are included.

Kit IM-5284.

IM-5284 SPECIFICATIONS: DC Voltmeter: Ranges: 0-1, 10, 100, 1000 volts full scale. AC Voltmeter: Ranges: 0-1, 10, 100, 1000 volts full scale. DC Milliammeter: Ranges: 0-1, 10, 100, 1000 mA full scale. Ohmmeter: Ranges: X1, X100, X10k, X1M $\Omega$ . Power requirements: Two 9-volt PP3 batteries and 1 SP11 cell (not supplied) or IPA-5280-1 Power Supply and 1 SP11 cell. Dimensions: 11" x 5 $\frac{1}{2}$ " H x 7 $\frac{1}{2}$ " D (279 x 146 x 197 mm)

## 4 RCL Bridge for design and experimentation

A tough 5280 series cabinet houses the solid-state circuitry that lets you easily determine unknown values of resistance, inductance and capacitance. Resistance is indicated in three ranges from 10 $\Omega$  to 10M $\Omega$ , inductance in three ranges from 10 $\mu$ H to 10H and capacitance, also in three ranges, from 10pF to 10 $\mu$ F. Easy construction.

Kit IB-5281.

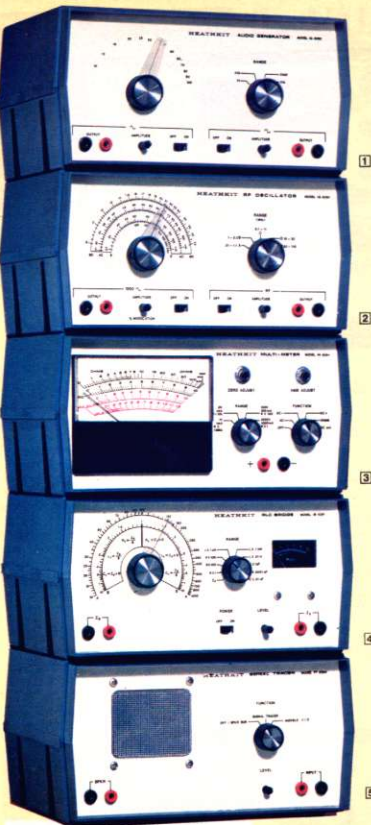
IB-5281 SPECIFICATIONS: Resistance Ranges: 10 $\Omega$  to 10M $\Omega$  in three ranges. Inductance Ranges: 10 $\mu$ H to 10H in three ranges. Capacitance Ranges: 10 pF to 10 $\mu$ F in three ranges. Oscillator Frequencies: 1 kHz, 10 kHz, 100 kHz. External Standard Range: 1:1 to 10:1. Power Requirements: Two 9-volt PP3 batteries or IPA-5280-1 power supply. Dimensions: 5 $\frac{1}{2}$ " H x 11" W x 7 $\frac{1}{2}$ " D

## 5 Signal Tracer speeds your trouble shooting

Lets you quickly trace receiver and transmitter circuits to reveal component and stage failures. Trace RF and AF signals and easily locate defective components and circuitry. In the Logic Tracer position, the IT-5283 becomes an "audible ohmmeter" which allows you to easily trace signal flow. Turn the IT-5283 off and its speaker is connected to panel sockets for a handy substitute speaker.

Kit IT-5283.

IT-5283 SPECIFICATIONS: Functions: Substitute speaker, AF signal tracing, RF signal tracing. Audible voltformmeter. Speaker: 3" permanent magnet. Power Requirements: Two 9-volt PP3 batteries or IPA-5280-1 power supply. Dimensions: 5 $\frac{1}{2}$ " H x 11" W x 7 $\frac{1}{2}$ " D



## 6 Bench supply for 5280 series test equipment

This supply furnishes the  $\pm 9$  VDC power requirements for all of the 5280 series test instruments. Features separate outputs for each of the five test instruments, full wave rectification, capacitor filtering and dual IC regulators to ensure correct voltage output.

Kit IPA-5280-1

IPA-5280-1 SPECIFICATIONS: Output Voltage:  $\pm 9$  VDC  $\pm 9\%$ . Maximum Output Current: 100 milliamps. Power Requirements: 120/240 VAC, 50/60 Hz, 7 watts. Dimensions: 6" H x 3 $\frac{1}{2}$ " W x 3" D

# Our Lowest-Priced Counter

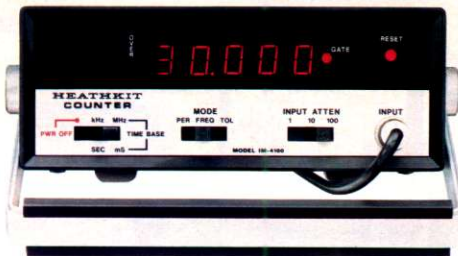
Counts frequency to 30 MHz, period to 99.999 seconds, events to 99,999

The Heathkit IM-4100 is an almost unbelievable counter value. It's a full five-digit frequency counter which also functions in period and totalize modes. It provides built-in input attenuation and 12-volt operation all in one compact package. The latest digital design and a stable 10 MHz crystal oscillator assure accuracy and precision on all measurements.

As a frequency counter, the IM-4100 is guaranteed to 30 MHz with 1 Hz resolution. Sensitivity is 15 mV from 50 Hz to 30 MHz, 50 mV below 50 Hz.

In the period mode, it measures intervals up to 99.999 seconds. Using the millisecond time base, it resolves to 1  $\mu$ sec! This mode can be used for low frequency measurements with high accuracy. Just position the TIME BASE switch to mS and the MODE switch to PER. Then solve the equation  $f = 1/\text{period}$ , using the displayed value.

The totalize mode will add up (totalize) event pulses up to a count of 99,999. Pushing the RESET button starts the count at zero. An inhibit signal can stop the totalize mode at any time, without loss of the displayed count.



A rear panel switch easily selects internal or external time base. The rear panel connector can be used as an input for an external time base signal, frequency ratio measurements, or as an output to check the internal 10 MHz time base, or to provide a conven-

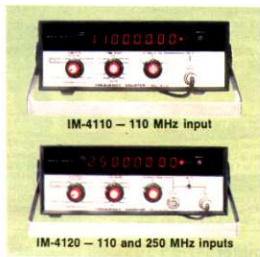
ient frequency standard of 1 MHz for bench use. The IM-4100 operates on 120/240 VAC, or 12-volt DC.

## Kit IM-4100

Factory assembled and tested version of above. SM-4100

**IM-4100 SPECIFICATIONS: FUNCTIONS:** — Frequency: 5 Hz to 30 MHz minimum. Period: 1  $\mu$ sec resolution to 99.999 sec. Totalize: 1-99,999 events. Sensitivity: 15 mV rms (50 mV, 5 Hz to 50 Hz). Period Pulse Width: 25 nsec minimum. Low Frequency Signal Rise-time: 1 msec for signals less than 10 Hz. Input Impedance: 1 megohm shunted by less than 35 pF. Protection: 240 volts rms at 60 Hz. Attenuator: X1, X10, X100 fixed compensation. **TIME BASE:** — Frequency: 10 MHz. Setability:  $\pm 1$  ppm. Temperature stability:  $\pm 10$  ppm, maximum 0° to 40° C ambient. Aging

rate:  $\pm 10$  ppm per year. **OSCILLATOR CONNECTION:** — External Input Frequency: DC to 20 MHz. External Input Sensitivity: TTL or 2.5 V rms from 50-ohm source. Internal Output: TTL signal at 1 MHz. **GENERAL:** — Gate Interval: kHz-1 sec. MHz-1 msec. Manual Gate: DC control in events mode using external OSC input connector. **Display Time:** 200 msec plus gate interval. **Power Requirement:** 105-130 or 210-260 VAC (switch-selected). 60/50 Hz, (at 25 watts), or 9-14 VDC at 1.25 amperes. Dimensions: 2 3/4" H x 7 1/4" W x 10 1/2" D (less handle).



IM-4110 — 110 MHz input

IM-4120 — 110 and 250 MHz inputs



IM-4130 — 110 MHz, 250 MHz and 1 GHz inputs

## High-Performance Counters

A switchable attenuator on the 110 MHz input divides the input signal x1, x10 or x100 to facilitate accurate measurements of large amplitude signals. The time base switch selects the gate time and the resolution of the display. The 4120 and 4130 time bases are controlled by a high quality TCXO (temperature-compensated crystal oscillator) with a temperature stability of  $\pm 1$  ppm and an aging rate of  $\approx 5$  ppm/yr for excellent stability. (The 4110's crystal oscillator has stability of  $\pm 10$  ppm and an aging rate of  $< 10$  ppm/yr.)

Separate 50-ohm inputs are used for frequency ranges above 110 MHz to maintain low VSWR, while inputs below 110 MHz are 1 meg shunted by less than 25 pF.

These counters include additional functions — events, period and period averaging. In events OP, the counting circuit increments for each input pulse with the resulting counts displayed. Events CL stops the events count and displays the accumulated total.

In the period mode, the readout displays a

single period of the signal.

In the period averaging mode, the counter displays the time of a single period based on a 1000-period average. This results in a more accurate and higher resolution measurement.

	IM-4110	IM-4120	IM-4130
Frequency Range	5 Hz to 110 MHz	5 Hz to 250 MHz	5 Hz to 1 GHz
Inputs	5 Hz to 110 MHz	5 Hz to 110 MHz, 5 MHz to 250 MHz	5 Hz to 110 MHz, 5 MHz to 250 MHz, 100 MHz to 1 GHz
Input Sensitivity	25 mV RMS	25 mV RMS	25 mV RMS
Input Impedance	1 meg shunted by < 25 pF	50 ohms, VSWR less than 1.5:1 110 MHz, same as 4110	50 ohms, VSWR, less than 2:1 110 MHz, same as 4110 250 MHz, same as 4120

**OTHER IM-4110, 4120 AND 4130 SPECIFICATIONS — FUNCTIONS:** Events: 1 to 99,999,999. Period Resolution, 0.1  $\mu$ s. Period Average, 1000 periods. Period Pulse Width, 100 nsec min. Low Frequency Signal Rise-time, 1 msec to signals less than 10 Hz. Attenuation, (110 MHz input) x1, x10, x100 fixed compensation. **TIME BASE:** Setability,  $\pm 0.1$  ppm. **OSCILLATOR CONNECTION:** External Input Frequency, 1 MHz. External Input Sensitivity, TTL or 2.5 Vrms for 50-ohm source. External Input Protection,  $\approx 5$  V peak to +10

## Kit IM-4110

Assembled SM-4110

## Kit IM-4120

Assembled SM-4120

## Kit IM-4130

Assembled SM-4130

V peak. Internal Output,  $> 1.5$  V p-p into 50 ohms at 1 MHz. TCXO Warmup, 10 minutes. **GATE INTERVAL:** Frequency, 1 mS to 10 S (4 mS to 40 S on 1 GHz input). Period, determined by period of input frequency. **Period Average:** 1000 periods of input frequency. **Display Time:** 200 mS to 20 S including a count hold position. **Power Requirements:** 105-130 VAC or 210-260 VAC (switch-selected). 50-60 Hz at 35 watts; or 9-14 VDC at 2.5 A max. with IMA-4130-1 accessory. Dimensions: 10 1/4" W x 13 1/4" D x 4 1/2" H (less handle). 37

# Heathkit Instruments for Value and Performance



## Heathkit IM-5218—our most popular, lowest-cost VVM

Features a single test probe that makes all measurements; seven practical AC, DC volts and ohms ranges; a precision 4½" colour-coded 200 µA meter; and a convenient size for portability. 1% precision network resistors provide excellent accuracy; wide ±1 dB, 25 Hz to 1 MHz frequency response permit a variety of AC measurements. Measures both rms and p-p AC volts. Separate full-scale ranges for 1.5 and 5 volts makes low-voltage readings really easy, ideal for work with solid-state and digital equipment. Easy printed circuit board kit assembly or you can order the unit factory assembled and tested. Can be wired for 120 or 240 VAC operation.

Kit IM-5218

Assembled SM-5218

**IMISM-5218 SPECIFICATIONS:** Meter Scales: DC & AC (rms) 0-1.5, 5, 15, 50, 150, 500, 1500 V full scale; AC peak-to-peak 0.4, 1.4, 4.2, 14.0, 42.0, 140.0, 420.0 V full scale; Resistance: 10 ohm centre scale; 1 × 10, 100, 1000, 10k, 100k, 1 meg. Measures 1 ohm to 100 megohm. Meter: 4½", 200 µA movement. Input resistance: 11 megohms (1 megohm in probe) on all DC ranges. 1 megohm shunted by 35 pF on all AC ranges. Circuit: Balanced bridge (push-pull) using twin triode. Accuracy: DC ±3%, AC ±5% of full scale. Frequency response: ±1 dB, 25 Hz to 1 MHz (600 ohm source). Battery requirements: 1.5 V, SP11 cell (not supplied). Power Requirement: 120/240 VAC; 50/60 Hz. Dimensions: 7½" H x 4½" W x 4½" D (187 x 119 x 108 mm).



## Heathkit IM-5228 Service Bench VVM

The one to have for day-in, day-out service and testing! The big 6" meter is really easy to read; separate 1.5 and 5 VAC scales make low voltage reading easy and accurate too. All calibration controls are conveniently adjustable from the front panel, so there's no need to remove the cabinet. Smooth adjustment is assured by the use of 10-turn vernier controls for Zero and Ohms adjustment. Has the same outstanding features and performance specifications of the IM-5218—7 AC, DC and ohms ranges, 1% precision divider resistors, extended frequency response. All measurements are made with a single probe, and the ground test lead has an alligator clip for added convenience. Can be wired to operate from 120 or 240 VAC.

Kit IM-5228

Assembled SM-5228

**IMISM-5228 SPECIFICATIONS:** DC VOLTMETER—Ranges: 0-1.5, 5, 15, 50, 150, 500, 1500 V full scale; up to 30,000 V with accessory probe. Input Resistance: 11 megohm (1 megohm in probe) on all ranges. Circuit: Balanced bridge (push-pull) using twin triode. Accuracy: ±3% of full scale. AC VOLTMETER—Ranges: 0-1.5, 5, 15, 50, 150, 500, 1500 rms scales. Frequency Response (5 V range): ±1 dB 25 Hz to 1 MHz (800 ohm source; referred to 50 Hz). Accuracy: 5% of full scale. Input Resistance & Capacitance: 1 megohm shunted by 40 pF measured at input terminals (200 pF at probe tip). OHMMETER—Ranges: Scale with 10 ohm centre. X1, X10, X100, X1000, X10k, X1 meg. Measures 0.1 ohm to 1000 megohms with internal battery. Meter: 6", 200 µA movement. polystyrene case. Battery: 1.5 V, SP11 cell (not supplied). Power requirement: 120/240 VAC; 60/50 Hz; 10 W. Dimensions: 5" H x 12½" W x 4½" D (127 x 322 x 121 mm).



## Solid-State Multimeter

• Solid-state design • Ease of operation makes it a pleasure to use

The IM-5284 solid-state multimeter gives you 4 different functions and a large easy-to-read panel meter housed in a tough plastic cabinet. Features include AC and DC voltage measurement to 1000 volts and DC current measurement of 1000 mA full scale. The Ohmmeter function is divided into four ranges, X1, X100, X10k and X1MΩ and accuracy is ±3 degrees of arc. Test probes are included.

Kit IM-5284.

**IM-5284 SPECIFICATIONS:** DC Voltmeter: Ranges: 0-1, 10, 100, 1000 volts full scale. AC Voltmeter: Ranges: 0-1, 10, 100, 1000 volts full scale. DC Milliammeter: Ranges: 0-1, 10, 100, 1000 mA full scale. Ohmmeter: Ranges: X1, X100, X10k, X1MΩ. Power requirements: Two 9-volt P9P batteries and 1 SP11 cell (not supplied) or IPA-5280-1 Power Supply and 1 SP11 cell. Dimensions: 11" H x 5½" W x 7¼" D (279 x 146 x 191 mm).



1) RF probe for RF measurements from 1000 Hz to over 100 MHz; 11 meg input; 1000 VDC max. at tip; 90 V rms max.

Kit PK-3

2) 30 kV High Voltage Probes... IMA-100-10 Probe multiplies DC ranges of any 10-megohm meter by 100, 1000 megohm input measures voltages as low as 1V in high-impedance circuits. Banana plug connector.

Kit IMA-100-10

IMA-100-11 Probe provides X100 measurement for meters with 11-megohm input impedance. (Incl. probe resistance). Phone plug, ground clip.

Kit IMA-100-11

IMA-1000-1 Probe provides X1000 attenuation for meters with 1-megohm input impedance. Banana plug connector.

Kit IMA-1000-1

# Heathkit DMM's - Easy to read and Accurate!

## Our lowest cost bench Digital Multimeter

- Four overlapping AC & DC voltage & current ranges and five resistance ranges
- 1% accuracy on DC volts, 1% on AC volts and AC/DC current, 1/3% on resistance
- IC circuitry for clear non-blanking 2 1/2-digit display
- Built-in calibration standards
- Overload protection on all ranges

Full-function capability includes AC voltage measurements up to 700 volts. Accuracy is 1% on DC volts, 1% on AC volts and AC/DC current, and 1/3% on resistance. Lighted front-panel indicators show overrange, + and - DC voltages and current at a glance.

A solid-state design uses IC circuitry for a clear non-blanking 2 1/2-digit display with automatic decimal positioning. It's ease of operation makes it a pleasure to use for both beginners and advanced technicians. The easy assembly makes it a great project for student electronics labs. And the exclusive Heath built-in calibration standards are all that's needed for initial and periodic adjustments.

Features overload protection on all ranges, 120 or 240 VAC operation, isolated floating ground, attractive heavy-duty case to withstand rugged use, universal banana jack inputs for easy testing



### Kit IM-1210

IM-1210 SPECIFICATIONS: Functions: DC volts, DC current, AC volts, AC current, Ohms, Resistance (Full Scale) DC volts: 0.2, 20, 200, 1,000 V; DC current: 0.2, 20, 200, 2,000 mA; AC volts: 0.2, 20, 200, 700 V rms (50 Hz to 10 kHz); AC current: 0.2, 20, 200, 2,000 mA rms (50 Hz to 10 kHz) Ohms: 0.200, 2k, 20k, 200k, 2M ohms; Overrange: 25% on all functions, within maximum input limits; Resolution (Low Range): Volts: 10 mV; Current: 10µA; Ohms: 1 ohm; Display: 2 1/2 digit, 7 segment, planar, LED (light emitting diode) with overrange and negative-input indicators; Accuracy (Full Scale, ±1 Digit): DC volts: ±1% DC current: ±1.5% AC volts: ±1.5% AC current: ±2% Ohms: ±1.5%; Input impedance: 1 megohm on all voltage ranges; 2-volt drop maximum on current ranges (except 2.5-volt drop on 2,000 mA range); Power Requirements: 100-135 VAC, 200-270 VAC 50/60 Hz, 8 watts; Fuse Requirements: Input 3AG, 3-ampere; Line 3AG, 5-ampere; slow blow for 240 VAC; Dimensions (overall): 3" H x 8 1/4" W x 10 1/2" D; 17.62 cm H x 21.07 cm W x 26.77 cm D

NOTE: Requires warmup time of 30 minutes to meet specifications



## Heathkit IM-2202 Portable Digital Multimeter

26 ranges — measures AC and DC volts, AC and DC current and resistance. Has 100% overrange capability, separate voltage and current inputs for circuit protection. All functions are protected against accidentally applied voltages up to 250 volts. Voltage ranges have high input impedance (10 megohm typical) for minimum circuit loading. Current ranges feature low voltage drop (100 mV typical) for high accuracy. Resistance ranges limit maximum test current to 1 mA. 2-volt full scale measurement on 1k, 10k and 1 meg range allow forward biased junction testing of semiconductor devices.

If a lab standard is used for calibration, DC accuracy is 0.2%. AC accuracy is 0.5% to 10 kHz. Internal standards (supplied) allow field calibration to 0.5% for DC and 1% for AC. Has 3 1/2-digit display with leading zero suppression and automatic polarity indication. Operates on four re-chargeable nickel-cadmium batteries (included), 120 or 240 VAC.

### Kit IM-2202

IM-2202 SPECIFICATIONS: DC VOLTAGE — Ranges: 100 mV, 1, 10, 100, 1,000 V AC VOLTAGE — Ranges: 100 mV, 1, 10, 100, 750 V DC CURRENT — Ranges: 100 µA, 1, 10, 100 mA AC CURRENT — Ranges: 100 µA, 1, 10, 100, 1,000 mA RESISTANCE — Ranges: 100 Ω, 1, 10, 100, 1,000 Ω GENERAL — Overrange Capability: 100% on all ranges except 1,000 VDC & 750 VAC; Display: 1999 maximum seven segment planar, 0.55" high digits; Power Requirement: 110 to 130 VAC, or 220 to 240 VAC; Internal selectivity: 60/50 Hz; 5 watts typical during charge; Size/overall including handle (folded to rear): 3" H x 8 1/4" W x 8" D



## Our finest 3 1/2-digit Multimeter for fast, easy and profitable service

Accurately measures AC and DC voltages and currents, and resistance with automatic polarity indication. Five overlapping ranges measure voltage from 100 µV to 1000 V on DC, 5 ranges cover 100 µV to 500 V on AC; 10 ranges measure 100 nanoamperes to 2 amperes on AC or DC, and 6 ranges of resistance measurement from 0.1 ohm to 20 megohms. An assembled precision DC calibrator is furnished with each IM-102. An internal circuit and a unique transfer method provides accurate AC voltage calibration.

### Kit IM-102

IM-102 SPECIFICATIONS: DC VOLTAGE — Ranges: 200 mV, 2V, 20V, 200V, 1000V; Input Impedance: Approx. 100 megohm on 200 mV, approx. 1000 megohm on 2 V, 10 megohm on all other ranges; Accuracy: ±0.2% ±1 digit with furnished DC calibrator; OHMMETER — 6 Ranges: 200 ohms with 1 mA test current; 2k with 100µA; 20k with 10µA; 200k with 1µA; 2M with 100nA; Accuracy: With DC calibrator: ±0.5% ±1 digit on 200, 2k, 20k, 200k ranges; ±1.5% ±1 digit on 2M and 20M ranges; AC VOLTAGE (Average responding rms calibrated) — 5 Ranges: 20 mV, 2 V, 20 V, 200 V, 1000 V; Input Impedance: 1 megohm @ 150 pF; Accuracy: With DC calibrator: ±0.75% ±1 digit for 40Hz-10kHz; DC AMMETER — 5 Ranges: 200µA, 2mA, 20mA, 200mA, 2A; Voltage Drop: 0.2V (nominal); Accuracy: With DC calibrator: ±0.5% ±1 digit for 2A, ±1.5% ±1 digit on all other ranges; AC AMMETER (rms calibrated) — 5 Ranges: 200µA, 2mA, 20mA, 200mA; Voltage Drop: 0.2V (nominal); Accuracy: With DC calibrator: ±1.5% ±1 digit on 2A, ±1% on all other ranges; GENERAL — Display: Maximum count: 1999; Power Requirement: 120 or 240 VAC, 60/50 Hz, 8 W nominal; Size: 3" H x 7" W x 7" D

NOTE: Accuracy specifications can be improved using laboratory standard references for calibration



## The HEATHKIT H9 VIDEO TERMINAL

One of the lowest-cost ASCII terminals available anywhere — features a bright 12" CRT display with twelve 80-character lines, 67-key keyboard, all standard serial interfaces, plus a fully wired and tested control board and a wiring harness for simplified assembly.

The H9 video terminal is a general-purpose peripheral designed for use with the Heathkit H8 or H11 computers. It provides keyboard input and a CRT for the convenient entry and display of computer programs and data. It can be used with any computer in dedicated stand-alone applications or in time-sharing systems.

**Character format** is standard upper case 5x7 dot matrix. The long form display is twelve 80-character lines. The short form display is forty-eight 20-character lines in four 12-line columns. An automatic line carry over feature executes line feed and return when line exceeds character count on both long and short-form displays. A built-in oscillator/speaker generates a 4800 Hz tone and serves as audible end-of-line warning.

**Auto-Scrolling** is featured in both long and short-form. In the long form, as the line enters at bottom, the top line scrolls off screen; in the short form, as the column enters from the right, the left column scrolls off screen. Auto-scrolling can be defeated with a front panel switch. The cursor mark indicates the next character to be typed for accurate posi-

tioning. Cursor controls include up, down, left, right and home. Serial data baud rates are selectable from 110-9600. Baud rate clock output and reader control are available on the rear panel connector.

**The erase mode** permits automatic full page erase or erase to end of line starting at cursor position. A transmit page function allows a full page to be formatted, edited and modified, then transmitted as a block of continuous data.

**The plot mode** permits graphs, curves and simple figures to be displayed. Plotting can be accomplished via the front panel keyboard or from external inputs.

**The H9 serial interface** provides EIA RS-232C levels, a 20 mA current loop and standard TTL levels. Parallel interfacing includes standard TTL levels, 8 bits input and 8 bits output and 4 handshaking lines for connection to H10.

**Ultra-compact size**, only 12½" H x 15½" W x 20¾" D, makes the H9 ideal for desktop or console applications. For 110 VAC, 60 Hz or 230 VAC, 50 Hz.

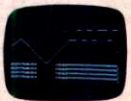
Kit H9



Long-form Display — Twelve 80-character lines



Short-Form Display — forty-eight 20-character lines in four columns



Plot Mode — Curves, graphs and simple figures

HEATH

Schlumberger

Prices and specifications subject to change without notice.



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