

PRINTOUT

by JOSEPH B. SIDOWSKI

Products

Digital Multimeter Kit

Heathkit is marketing a VOM at \$229.95 in kit form which is accurate enough to serve as a calibration standard for other shop instruments. The Heathkit IM-102 provides five ac and dc voltage ranges (200 mV to 1,000 V with 500 V maximum for ac) and six resistance ranges (from 200 ohms to 20 megohms). The IM-102 has three display tubes with 0-9 digits and a neon lamp to provide a "1," the half-digit. Most of the circuitry is on one large printed circuit board. This digital multimeter allows you to read ac voltages down to 100 microV, or resistance values of 0.1 ohm. With poor calibration, the worst accuracy will be approximately $1\% \pm 1$ digit.

Heath Company
Benton Harbor, Mich. 49022

Inexpensive Electronic Calculators

Heathkit's IC-2008 desk-top calculator costs \$129.95 in kit form. The unit handles subtraction, addition, multiplication, and division, with up to eight-figure totals displayed on $\frac{1}{2}$ -in. seven-segment readout tubes. The 2008 accepts positive and negative numbers and solves problems in either chain or constant operations. The kit has only two circuit boards to solder. Building time is said to be about 8 h. There are, of course, other calculators selling for less than \$200. Bowmar Industries and the Craig Corp. jointly market a pocket-size unit for around \$200 which uses an LED display. The Ragen Precision Industries' electronic calculator utilizes ordinary batteries and has an eight-digit capacity with a liquid crystal display for \$99.95. Litton's Royal Digital III pocket calculator has eight-digit capacity and requires a special stylus pen. The unit uses rechargeable batteries and costs \$139.95. Micro Instrumentation and Telemetry Systems (Albuquerque, N. Mex.) markets an electronic calculator in kit or assembled form at \$160.

The Hewlett Packard HP-35 pocket calculator displays answers to 10 significant digits plus sign and two-digit exponents of 10. The 9-oz package handles logarithms, exponents, and trigonometric functions, each with one keystroke. Values can be entered in either

floating point or scientific notation. Price: \$395.

Dial Potentiometers

Bourns, Inc. has reduced prices on the integral dial/potentiometers. Unlike separate digital dial and potentiometer combinations, the Bourns dial and potentiometer are integral in one $7/8$ -in.-diam unit with no screws, nuts, or bushing to mess with. The unit is merely snapped into a panel and the terminals connected. The Model 3610 has a power rating of 1.5 W and a resistance rating of 100-250,000 ohms. The Model 3600 has a clockface readout and measures $\frac{3}{4}$ in. in diam.

Bourns, Inc.
Trimpot Products Division
1200 Columbia Ave.
Riverside, Calif. 92507

CCTV Camera

A deluxe closed-circuit TV camera (the TV-132) is advertised by Olson Electronics at a price of \$200 plus \$1 for postage and handling.

Olson Electronics
Dept. 15
260 S. Forge St.
Akron, Ohio 44308

Blood-Chemistry System

The Accu-Stat System enables you to perform accurate blood-chemistry determinations simply and rapidly in your own laboratory. The calibratable system provides direct reading results and test capabilities for: hemoglobin, true glucose, urea nitrogen (BUN), cholesterol, bilirubin, uric acid, total protein, albumin, alkaline phosphatase, LDH, calcium, and SGOT.

Clay Adams
Division of Becton, Dickinson & Co.
Parsippany, N.J. 07054

Minicomputer Disk

Iomec, Inc. is marketing a $7 \times 19 \times 23$ in. tabletop disk data storage system for minicomputers. The IODISC Series One provides noncontact, flying-head recording on an 8-in.-diam flexible disk that provides a data capacity of approximately 250 kilobytes. Average access time and data transfer rate are rated at 60 nsec and 1.2 megabits/sec, respectively. Storage systems, configured with controller, read/write,

and interfacing electronics can support up to 8 drives and store from 11 to 18 million bits. Prices compete favorably with cassette storage. OEM single-drive units are priced at \$2,500, and software-supported minicomputer storage systems are \$6,500. Cartridge prices are about \$20.

Iomec, Inc.
345 Mathew St.
Santa Clara, Calif. 95050

Noise-Tone Generators

Microtronics Noise-Tone Generators are primarily intended for psychological experiments which require a source of masking noise and auditory stimuli. There are four models to choose from: Model 100 (\$95) is a white noise generator only and is capable of producing noise over the frequency range of 20 Hz to 20 KHz ± 1 dB. Model 200 (\$105) contains an input mixer for mixing an external tone or audio signal with the white noise. Model 300 (\$130) provides white noise and a built-in tone generator capable of producing two tones of either 400 or 1,000 Hz. Tones of any two other frequencies can be provided upon special request. The tones are programmable, making it possible to present each tone automatically with either relay or digital equipment. Model 400 (\$140) also contains the built-in programmable tone generator plus an auxiliary input for external audio signals. All units are capable of producing up to 1 W rms of white noise into an 8-ohm load. Models having a 3-W rms output rating are available, as are cut-off frequencies of 5, 10, and 20 KC.

Microtronics Corp.
P.O. Box 95
Carrboro, N.C. 27510

Coordinate Measuring System

The Elograph Coordinate Measuring System provides accurate coordinate values in analog form for input to X-Y plotters, X-Y work tables, or other analog devices. In view of its function (which is the reverse of an X-Y plotter), it might be called an "unplotter." With accessory equipment, it also provides digital coordinate displays and may be interfaced to Teletypes, computers, tape storage, etc. Operation is straightforward: the point whose X and Y coordinates are desired is

chosen, and the stylus point is used to pierce through the chart or pattern into the sensor.

Both coordinate values are immediately available, to an accuracy of better than 0.4 mm (0.015 in.). The zero of coordinates can be set arbitrarily over the entire working area, and X and Y scales can be set independently of the zero settings and of each other.

Prices: Elograph, Model E100B, with sensor is \$995. The digital readers (interfaced to the Elograph E100B) are \$395 and \$695, respectively, with the cheaper Model R101 having single DVM bipolar 3½-digit BCD outputs. The R102 is dual bipolar.

Elographics, Inc.
P.O. Box 388
Oak Ridge, Tenn. 37830

Cardiotachometer

The Microtronics Cardiotachometers are completely self-contained, requiring only a write-out device. The Model MTH (\$600) is for use with humans, dogs, and cats and incorporates an R-wave detector to eliminate data loss. Input range of the MTH is 40-400 bpm, 1.5 sec-150 nsec. Model MTS (\$495) has an input range of 40-600 bpm rate and 1.5-100 nsec. Input sensitivity is 100 microV minimum. Both models have built-in calibrator, output baseline control, output level control, rate/time selector, tach/direct selector, and direct monitor jack.

Microtronics Corp.
Box 95
Carrboro, N.C. 27510

Paper Tape Reader

The Addmaster Model 601 Paper Tape Reader is priced at \$250 each. The reader has a stepper motor drive and reads any standard tape at speeds up to 120 char/sec asynchronously. All signals to and from the reader are TTL type. Power requirements are +5 V at 200 mA and +28 V at 500 mA. User-furnished signal is a positive-going pulse which advances the tape at the negative-going edge, and it may be used to strobe the output data. The unit runs asynchronously up to 120 clocks/sec.

Addmaster Corp.
416 Junipero Serra Dr.
San Gabriel, Calif. 91776

Teleprinter

The Series 30 Teleprinter operates asynchronously at print speeds of 10, 15, and 30 char/sec on an operator-selectable basis. Receive only (RO at \$1,650), KSR (\$2,100), and ASR (\$3,000) versions are available.

The keyboard permits ASCII code generation, and the 80-column impact page printer produces 64 printable uppercase characters and symbols by means of a 5 x 7 wire matrix print-head. One original and two copies can be prepared. Function or sprocket-fed, roll or fan-fold paper may be used without parts interchange. The Teleprinter may be operated half or full duplex, as required. Interface prices are as follows: parallel TTL, no charge; serial TTL, \$225; Serial current loop, \$315; serial EIA RS 232-C, \$315. The Printer Mechanism, without logic and power modules, costs \$900; logic and power is \$600.

International Teleprinter Corp.
493 Washington Ave.
Carlstadt, N.J. 07072

Brain Lesions

The Quartec Model CLM-2 produces brain lesions by delivering constant dc current. The generator is connected to internal 4,700-ohm load to enable presetting current level. If resistance between leads is less than 500,000 ohms, a Z-contact panel lamp indicates the point at which the electrode touches the brain surface. A timer starts when a push-button is depressed and energizes external leads with preset current level for selected duration.

Quartec
1662 Donne Rd.
Columbus, Ohio 43221

Videodisc Recorder

The Videodisc Recorder records from two TV cameras simultaneously and displays the two views on a split-screen TV monitor instantly. Each image is centered on its screen automatically.

Data Memory, Inc.
1255 Terra Bella Ave.
Mountain View, Calif. 94040

Programmer-Timer

The Model 3100 Programmer-Timer can control up to 10 independent operations on a 24-h basis. This is accomplished by placing strips of opaque tape on a continuous Mylar belt. The programmer allows any number of operations of any duration to be set up on each track. The output of each track has a set of single-pole/double-throw relay contacts.

Washington Instrument Corp.
7819 Old Highway 99
Marysville, Wash. 98270

Digital Printer

The DM-500 series prints 3 lines/sec and up to 21 columns. The unit can be supplied minus case and power supply, or without print mechanism. The latter includes one pc board with all drive electronics and power supply. Price for 21 columns with case is \$720; without case, \$625.

Keltron Corp.
224 Crescent St.
Waltham, Mass. 02154

Hard Copy Recorders

A pair of "push to print" recorders from Alden provides instant hard-copy paper records of graphics from slow-scan TV, data, and CRT terminals. The Model 600 is plug-to-plug compatible with and interfaces to Tektronix's 611, 612, and 16C storage display units. The Model 400 interfaces with Robot Research, Inc.'s Model 800 voice-band TV cameras. Both recorders work at 30 lines/sec, using flying spot facsimile recording techniques. The 600 and 400 cost \$2,500 and \$1,500.

Alden Electronics &
Impulse Recording Equipment Co.
Westboro, Mass. 01581

Blood Vessel Occluders

Models VO-3 and VO-3B Blood Vessel Occluders are hydraulically actuated devices used in chronic or acute preparations for the occlusion of intact blood vessels. They are available in four nominal sizes: 2-, 3-, 4-, and 6-mm lumen diam. Advantages cited for the devices include the following: occlusion is accomplished without displacement of surrounding tissues or traction on the vessel; the actuating tube can be exteriorized via a path remote from the occlusion site; and the units function reliably after implant. Model VO-3 sells for \$20; VO-3B is \$30.

Rhodes Medical Instruments
21044 Ventura Blvd.
Woodland Hills, Calif. 91364

Sleep Analyzer

The SCI sleep analyzer is basically an amplitude weighted frequency meter which is used for automatically scoring stages of sleep. High-gain low-noise EEG/EOG preamplifiers precondition signals for use by the analyzer. The gain potentiometer is present such that automatic compensation is made in variations in characteristics of the EEG. No setup adjustments are required. Simply apply EEG and EOG electrodes and insert the preamplifier connector in the receptacle located on the rear

panel of the MM-3000A analyzer, and it is ready for automatic scoring. Lamp displays on the unit indicate instantaneous levels of sleep and a meter displays an analog of depth of sleep. An instrument with a built-in strip chart recorder, Model MM-3000AR, is also available. This technique was chosen by NASA for automatic sleep analysis of the astronauts in Project Skylab.

Input impedance: greater than 1,000 megohms. Common mode rejection: 90 dB minimum. Electrode/skin potential compensation (dc): ± 600 mV. Frequency response: 0.5-150 Hz. Percent scoring accuracy is claimed to be 70%-80% depending on the human. Price: \$6,700, with the optional strip chart recorder selling for \$395.

SCI Electronics, Inc.
8330 Broadway
Houston, Tex. 77017

Super Detecta

The Super Detecta is a photoelectric instrument which can detect the movement of your meter or gauge indicator needle and transform the information into a relay output that can activate something else. This transformation of mechanical or electromechanical indicators into an 'electro-optical meter relay' is accomplished without disturbing the existing installation or interfering with the movement of the indicator needle. The Super-Detecta may be set up without difficulty on all pointer instruments, indicating or recording, electrical or mechanical. The instrument comprises a scanning pick-up sensor equipped with a lamp and two photoresistive cells and a subsidiary box containing the amplification and flip-flop circuits and the output switching relay. Price is \$65 plus \$6.50 for duty and handling. The instrument is a product of Commerciale Chauvin Arnoux, Paris, France. Order from Importronics, P.O. Box 526, Alamo, Calif. 94507.

Adhesive

Zipbond is an alpha cyanoacrylate liquid adhesive which bonds similar or dissimilar materials in less than 60 sec. It requires no mixing and is easily dispensed manually or mechanically. Almost all materials can be joined including ferrous and nonferrous metals, plastics of most types, glass, wood, porcelain, and "exotic" metals. Bonding time is as follows:

Materials	Seconds
Aluminum to aluminum	60
Copper to copper	20
Glass to glass	15

Steel to steel	60
Aluminum to copper	45
Steel to natural rubber	20
Rigid PVC to wood	60
Nylon to copper	45

Price: \$14.95/oz in individual quantities; \$8.95/oz in quantities of 6-24.

Tescam Corporation
Instrument Division
2600 Niagara Lane N.
Minneapolis, Minn. 55441

KlocKounter and Interval Timer

The new Model 220C KlocKounter by Hunter is priced at \$315. The counter is a precision clock and event counter with all solid-state circuits, 0.001-sec increments, digital output (BCD), and remote control of all functions.

The Model 127 Interval Timer is priced at \$135 with a relay output, 4 PDT contact terminals, +5-V output signals to interface with other solid-state equipment, 0.1-99.9-sec time interval (presentable by front panel knobs), and accuracy of 0.1 sec over the entire range.

The Model 131 Interval Timer has three time ranges and multiple functions at \$259. The 131 includes plug-in and terminal strip relay connections and may be used as a preset counter or timer. A BCD output is available.

Hunter
P.O. Box 6066
Coralville Branch
Iowa City, Iowa 52240

Graphics Display Monitor

The Conograph-12 graphic display system has the ability to selectively erase and update any portion of the display screen, and it is fully compatible with standard TV signals for video mixing. Capability is provided for vectors and points and for general (conic) curves, circles, and ellipses. A scan-conversion memory refreshes the 525-line TV monitor display; higher resolution monitors are available up to 1,229 lines. Any portion of the image may be magnified up to 10 times its normal size by an operator-controlled zoom. The system comes with complete software, and interfaces are available for most popular minicomputers. The Conograph-12 can be expanded to include color displays. Price: \$10,900.

Conographic Corp.
380 Green St.
Cambridge, Mass. 02139

Rewinder for Punched Paper Tape
Bromgard markets an electrically

operated, compact, desk-top tape rewriter that handles any size tape up to 3 in. in diam and 70 ft long. Price: \$36.

Bromgard Enterprises, Inc.
7180 W. 14th Ave.
Lakewood, Colo. 80215

Noise Meter

The Model 80 has a range of 85 to above 115 dBA on a single scale indicating maximum allowable exposure time. A ceramic mike is mounted in a retractable boom for omni-directionality and frequency response of 20 Hz to 10 kHz.

Babbitt Industries, Inc.
2946 Scott Blvd.
Santa Clara, Calif. 95050

Miniature Computer

The MCS-4 is a totally self-contained 4-bit general-purpose computer in component form that consists of four basic elements packed in an economical 16-pin DIP package. The central processor has 45 instructions. ROM stores data and programs in a 256 x 8 bit format; the RAM has 320 bits of read-write memory, and the 10-bit serial-to-parallel register expands the output ports. A functional microprogrammed computer can be built with one CPU and one ROM. A system with 4,096 8-bit bytes of ROM storage and 5,120 bits of RAM storage can be built using no circuitry other than ICs from this family. The systems interface with keyboards, switches, displays, teletypewriters, readers, printers, and converters.

Intel Corp.
3065 Bowers Ave.
Santa Clara, Calif. 95051

Add-On Memory for PDP-11

The MTI-311 is an 8K system with power supply and rack monitoring for \$4,990. Speed is 450 nsec for read access, 600 nsec for read cycle, 800 nsec for write cycle, and 400 nsec for write portion of a read/modify/write cycle. Storage is available from 4K words by 16 bits, up to 28K in a single 7-in.-high enclosure.

Memory Technology, Inc.
83 Boston Post Rd.
Sudbury, Mass. 01776

Alphanumeric Display (80-Char)

The Burroughs Self Scan display comes in a single-line panel supplied with all necessary drive electronics and provides 0.2-in.-high characters on an 80-char position single-row format. An optional second character generator may be added to increase from 64 to 128 char.

Briefs

Battery Eliminators as Power Supplies

Very low-cost battery eliminators may be purchased in 6-, 9-, and 12-V models. These are electronically voltage-regulated and may serve as compact and inexpensive power supplies for experimental projects. When purchased, the output cable is merely fitted with a pair of clips acting as positive and negative leads. Available at local supply houses.

Anesthesia in Three Monkey Species

The April/May, 1972, issue of *The Practicing Veterinarian* provides an evaluation of methoxyflurane anesthesia in three species of nonhuman primates by H. H. Hughes and C. M. Lang (Milton S. Hershey Medical Center of Pennsylvania State University). The 33 adult male monkey Ss included 10 *Cebus albifrons*, 12 *Macaca mulatta*, and 11 *Macaca arctoides*. No preanesthetic medications were given and food was withheld for 18 h prior to anesthesia.

Methoxyflurane is a halogenated ethyl methyl ether which is anesthetically potent, nontoxic, and relatively nonmetabolizable. It has low vaporization pressure, and therefore it is virtually impossible to build up lethal concentrations at room temperature.

In this evaluation, 3% methoxyflurane in oxygen was delivered from a calibrated Kinet-O-Meter 2,000 with Vernitrol vaporizer (Ohio Medical Products, Madison, Wis. 53701). Induction was through a face mask. Intubation was carried out when the gag reflex was lost. The nonbreathing technique of administration was used, and general anesthesia was maintained for 30 min. Recovery time was defined as the time in minutes necessary for the animal to regain its righting reflex. The results indicated induction times to be significantly shorter and recovery time longer in *C. albifrons* than in the other two species. Maintenance concentrations required by all three species were significantly different. Mean induction times in minutes were 4.7 ± 0.8 (*C. albifrons*), 14.0 ± 4.7 (*M. mulatta*), and 19.0 ± 4.6 (*M. arctoides*). Recovery times were 50.6 ± 7.3 min (*C. albifrons*), 16.5 ± 3.0 (*M. mulatta*), and 20.3 ± 6.9 (*M. arctoides*). The authors believe that the differences are related to varying amounts of adipose tissue in the three species (*M. arctoides* highest

and *C. albifrons* the lowest) and not to differences in susceptibility to methoxyflurane. Methoxyflurane is highly soluble in ventral body fat, so a slower buildup would be expected in the more obese animals. In subsequent research, the authors used sodium thiopental for induction with methoxyflurane. Thiopental is an ultra-short-acting barbiturate which cuts the induction period, thus eliminating the problem of restraint with larger monkeys. General anesthesia has been maintained in the *M. mulatta* for up to 8 h with no adverse effects.

Used Minicomputers

The Computer Price Guide published by Time Brokers, Inc. (500 Executive Blvd., Elmsford, N.Y. 10523) provides updated price information covering various used computer systems. A recent issue indicates the availability of a Digital PDP 8/I 4K System with TC-1 tape control unit, TV-55 DECtape control and transport units, ASR-33, KSR-35 Kleinschmidt Character Teleprinter, KW 8/I-A real-time clock, and DW-08B, KP 8/I, PTO 8B Binary Loader. Price of the system was cited as \$20,000 (original cost, \$40,000). A Hewlett-Packard 8K system (H-P 2114A), with Telex ASR Teletype and Duplex Register Interface for I/O, was priced at \$8,000 (\$15,000 original cost). A MICRO 810 computer with 8404 real-time clock, 256-word ROS, board unprogrammed, and 8502 system control panel was listed at \$2,400. A Potter Chain Printer 3502 (300 LPM) with control electronics and full line buffer had an asking price of \$4,500.

A/D Converter

The Datel Systems, Inc. (1020 Turnpike St., Canton, Mass. 02021) ACD-Econo Verter costs \$22.95 and features 50-microsec conversion time. The same company markets modular 16-channel data acquisition systems from \$395 (8-bit) to \$595 (12-bit). These systems contain multiplexer, system programmer, I/O control logic, sample and hold, A/D converter, and all necessary mounting hardware.

Minicomputer Rentals

American Used Computer Corp. (15 School St., Boston, Mass. 02108) is advertising a rental rate of \$6.66 per day for a DEC PDP-8/L with 4K. The cited cost is based on a 24-month lease period, unfortunately.

Minicomputers

General Automation, Inc. (1055 S. East St., Anaheim, Calif. 92805) has expanded its minicomputer family. Three 8-bit units (SPC-21 models)

have a cycle time of 2.3 microsec and memory sizes ranging from 4K to 16K words. Standard features include a 12-bit parallel adder, six addressing modes, eight 12-bit hardware registers, and 52 basic commands. Prices start at \$2,890. The Model SPC-16/40 and five other SPC-16 machines (/45, /60, /65, /80, and /85) are 16-bit machines priced at \$3,950 to \$8,550. The six 16-bit machines offer 78 instructions and 16 hardware registers, and provide extensive software, including four operating systems and over 125 interface and control devices. The basic SPC-16 systems include 4K memory (ranging up to 65K) with cycle times ranging from 1.4 microsec to 800 nsec and data transfer rates of 0.7 to 1.2 million words/sec. The 800-nsec cycle times on the 16/80 and 16/85 models are achieved through the use of Schottky-clamped TTL.

Varian Data Machines has cut the prices of the 620/f and 620/L minicomputers by including in the base price some options which previously had cost \$1,500-\$1,900. The \$5,400 620/L formerly cost \$6,900 with these options, so the reduction is about 22%; it is 10% on the costlier 620/f.

Data General lost a court fight to stop Digital Computer Controls (112 Industrial Rd., Fairfield, N.J. 07006) from marketing its D-116 mini, said by DCC to "second source" Data General's NOVA Line. The D-116 is plug, program, and mechanically interchangeable with the series "1200" machines and has a 1.2-microsec core cycle time. Logical or arithmetic instructions can be executed in 1.35 microsec. The standard D-116 has a direct memory access channel and allows a DMA operation to occur at 1.2 microsec. The logic processor in the D-116 is organized around four 16-bit general-purpose registers. Price: \$2,400.

Univac (Sperry Rand) is marketing the UNIVAC 1616 small-scale general-purpose 16-bit computer. The 4K memory is expandable to 65K words and cycle time is 750 nsec. Standard features include: two's complement arithmetic; 8-bit byte, 16-bit and 32-bit operands; 16 high-speed registers, program status register; 4-level interrupt processing (hardware serviced); 16-bit and 32-bit instructions, in any mix; indexing via general registers; up to 16 I/O devices, multiplexed. Multiply or divide time is 4.15 microsec.

Phillips Data Systems (100 E. 42nd St., New York, N.Y. 10017), a division of NV Phillips in The Netherlands, is marketing the P850, P855, and P860 16-bit minicomputers and related peripherals. The P850 has a full cycle time of 3.2 microsec and in a 1/2K word

configuration sells for approximately \$2,000 (in large quantities). The P855 has a 1.6-microsec memory cycle time, and in a 4K word configuration sells for \$3,400 in OEM quantities. The P860 is priced at \$4,350 and has an 840-nsec cycle time. Software available includes 8K FORTRAN, basic monitor, real-time monitor, and others.

Motors

Herbach and Rademan, Inc. (401 E. Erie Ave., Philadelphia, Pa. 19134) publishes "This Month," a good source of information on electronic and electrical instruments. Sales citations covering various types of motors are especially fine. The May-June 1972 issue cites specs and reasonable prices for constant-speed gearmotors (RMS), various types of sync motors, Brevet slow-speed motion units, reversible motors, reciprocating motors, torque units, spring wound, timing, gear reducing, and others. Write to the address cited above to be placed on the mailing list.

Ultra Low-Pressure Sensor

The Fairchild (75 Mall Dr., Commack, N.Y. 11725) ultra-low-pressure switch is being offered at an introductory price of \$2. The switch actuates at less than 2 in. of water (.07 PSI) and is snap-acting, single-pole double-throw. Rated at 3A 120 V ac, the sensory can be used to directly start motors, solenoids, etc.

Graphic Terminal Products

Information pertaining to graphic terminal products may be obtained from the following manufacturers:

Adage, Inc.
1079 Commonwealth Ave.
Boston, Mass. 02215

Bunker-Ramo
Business & Industry Div.
445 Fairfield Ave.
Stamford, Conn. 06904

Computek, Inc.
143 Albany St.
Cambridge, Mass. 02159

Computervision Corp.
South Ave.
Burlington, Mass. 01803

Conographic Corp.
6 Gill St.
Woburn, Mass. 01801

Control Data Corp.
8100 34 Ave. So.
Minneapolis, Minn. 55804

Data Disc Inc.
686 W. Maude Ave.
Sunnyvale, Calif. 94086

Digital Equipment Corp.
146 Main St.
Maynard, Mass. 01754

Evans & Sutherland
3 Research Rd.
Salt Lake City, Utah 84112

Hazeltine Corp.
59-25 Little Neck Parkway
Little Neck, N.Y. 11362

Honeywell Information Systems, Inc.
60 Walnut St.
Wellesley Hills, Mass. 02181

IBM
1133 Westchester Ave.
White Plains, N.Y. 10604

Imlac Corp.
296 Newton St.
Waltham, Mass. 02154

Information Displays, Inc.
333 N. Bedford Rd.
Mt. Kisco, N.Y. 10549

Information International Inc.
12435 W. Olympic Ave.
Los Angeles, Calif. 90064

ITT Data Equipment & Systems
157 E. Union Ave.
East Rutherford, N.J. 07073

Lundy Electronics & Systems, Inc.
28 Park Pl.
Paramus, N.J. 07652

Monitor Systems
401 Commerce Dr.
Ft. Washington, Pa. 19034

Princeton Electronic Products
P.O. Box 101
N. Brunswick, N.J. 08902

Sanders Data Systems, Inc.
Daniel Webster Hwy.
So. Nashua, N.H. 03060

Sperry Rand Corp.
Univac Div.
P.O. Box 500
Blue Bell, Pa. 19422

Systems Concepts, Inc.
524 Second St.
San Francisco, Calif. 94107

Systems Engineering Laboratories
6901 W. Sunrise Blvd.
Ft. Lauderdale, Fla. 33313

Tasker Industries
4561 Colorado Blvd.
Los Angeles, Calif. 90039

Tektronix, Inc.
P.O. Box 500
Beaverton, Ore. 97005

Vector General, Inc.
8399 Topanga Canyon Blvd.
Canoga Park, Calif. 91304

Xerox Data Systems
701 S. Aviation Blvd.
El Segundo, Calif. 90245

Core Memory

The Ecom F-11 core memory is being marketed as a PDP-11, plug-to-plug compatible package in sizes of 4K or 8K increments. Cycle time is 750 nsec, and the unit may be purchased in its minimum capacity (\$4,500) and upgraded by insertion of single-card digital stacks. The unit is sold by Standard Memories, Inc., 2801 E. Oakland Pk. Blvd., Ft. Lauderdale, Fla. 33306.

Printed Circuit Relay

The Printact magnetic latching and nonlatching relays plug directly into your module. Precious metal-plated PC pads mate with shorting bar contacts on the pivoting armature, which is the single moving part. Held by a permanent magnet, it eliminates return springs, pigtaills, electrical and mechanical connections. Available from Executone, Printact Relay Div., P.O. Box 1430ED, Long Island City, N.Y. 11101.

Electronics: Surplus and Small Parts Supplies

Catalogs and bulletins may be obtained from:

Baynton Electronics Corp.
2709 N. Broad St.
Philadelphia, Pa. 19132

Delta Electronics Co.
Box 1
Lynn, Mass. 01903

Edmund Scientific Co.
380 Edscorp Bldg.
Barrington, N.J. 08007

G & G Radio Supply Co.
45 Warren St.
New York, N.Y. 10007

Herbach and Rademan, Inc.
401 E. Erie Ave.
Philadelphia, Pa. 19134

John Meshna, Jr.
P.O. Box 62
Lynn, Mass. 01904

Poly Paks
P.O. Box 942
S. Lynfield, Mass. 01940

Surplus Center
P.O. Box 82209
Lincoln, Nebr. 68501

Psychological Equipment

Quartec (1662 Doone Rd., Columbus, Ohio 43221) is advertising several pieces of psychological apparatus. A small animal activity monitor is priced at \$207.50 (SPDT relay output), at \$235 (8 six-digit connector output), and also at \$242.50 (both of the above outputs). Features include a nonmoving platform (any nonconductive cage may be used), adjustable sensitivity control, and others. The same company offers a constant-current lesion maker at \$265 and autoranging logarithmic dc GSRs at \$330; a simpler logarithmic dc GSR unit sells for \$195.

Testan Scientific Instruments (P.O. Box 267, Davis, Calif. 95616) lists a goldfish shuttlebox at \$200 with a student laboratory kit (shuttlebox in easily stored and carried case) at \$400. A double student lab kit costs \$625. The latter device controls two goldfish shuttleboxes and enables the second box to be run independently of the first or yoked to the first. A rat shuttlebox is priced at \$180; with logic control (printed circuit card), the box costs \$225.

Notes

A simple tail removal procedure for studying the role of the tail rattle in mouse aggression

M. K. MORGRET

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Tail rattling (rapid shaking of the tail) is an unusual behavior associated with fighting in mice. If the tail happens to strike some object such as the side of the cage, a rattling sound is heard. The behavior is related to aggression and has even been used as part of a formula devised to be a primary measure of aggression in mice (Beeman, 1947); however, the actual function of the behavior is in question. Crowcroft (1966) hypothesized that the tail rattling occurs when a conflict exists within a S, and Scott and Fredericson (1951) state that it

appears to be a warning signal which occurs when a mouse is hesitating between attack and escape. Scott (1966) also suggests that it is a signal conveying a warning or threat, but Scott also states: "... there is no evidence that other mice react to it in this way." The question seems open as to what function this behavior serves or even if it affects other mice. One way to approach this question experimentally would be to surgically remove the tail from some Ss and observe possible changes in the behavior of their fighting partners. Surgical removal has several problems associated with it (i.e., deep anesthesia is required, excessive bleeding, chewing of stitches by the Ss, and danger of infection). Therefore, the purpose of this paper is to present a simpler manner of tail removal for research on the function or effects of the behavior of tail rattling.

SUBJECTS

Seven Swiss Webster white mice served as Ss. They were of mixed sexes, and all were approximately 4 months old.

PROCEDURE

S was anesthetized with ether and placed with its tail through a small hole in a piece of cardboard. Then liquid nitrogen was poured over the tail. Following the initial freezing period, Ss were observed daily for signs of pain, infection, and for the general condition of the tail. Each S received one of the following periods of application of liquid nitrogen: 1, 3, 4, 10, 10, 10, or 15 sec.

RESULTS AND DISCUSSION

No behaviors were observed which would suggest the presence of pain, except that one S was seen to bite the cage top following recovery from the anesthesia. This was observed only once and for only a very few seconds.

The 1-sec application of liquid nitrogen resulted in no frosting, but about 2 days later, a small discoloration appeared; however, no deterioration occurred. With the 3- or 4-sec application of the liquid nitrogen, the tail was frosted on the top side only. Five to 6 days later, there was some burn-like tissue

damage, but the tail did not sever. The Ss receiving 10 or 15 sec of exposure showed solid frosting, stiffness, and clean separation lines between the frosted and nonfrosted areas. The total tail fell off between 5 and 13 days following freezing. At the time of severing, the stub was well scabbed over and healing was in progress. Although no prophylactic doses of antibiotics were given, no signs of infection were noticed. The entire process appeared to be nonstressful. Two mice delivered healthy litters approximately 19 days after the freezing treatment. Both litters were cared for normally, which would tend to indicate normal conditions. About 8 weeks of recovery resulted in a fully healed tail stub.

The question of control procedures for the tail removal would appear to be a difficult one. Freezing periods too short for complete removal may be a control; however, there is the possibility that the complete freezing procedure may destroy the nerves in the tail, resulting in the lack of pain, while partial freezing might destroy only some of the nerves. From the present observations, it would appear that partial freezing procedure would be acceptable, since there were no signs of pain from any of the Ss during recovery.

An alternative control procedure would be to freeze the tip of the tail completely. This would allow for similar effects on the S, while allowing the behavior of tail rattling to be unimpeded.

The advantages of the freezing procedure include: lack of bleeding, lack of danger of infection, minimal stress to the organisms, and simplicity of operation.

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