PRINTOUT

JOSEPH B. SIDOWSKI

Products

Data Acquisition Device

DAD (Data Acquisition Device) is an instrument which presents question images on a 15 x 11.5 in. screen from a programmed Carousel slide projector. Response selections and numerical data are entered into a self-contained IBM card keypunch. Digital Nixie tubes display data or card column input. Integrated circuit logic controls and sequences operating relationships within the instrument. Response data is synchronized with the appropriate card column, and FORTRAN programs are available to provide data analysis. DAD is a stand-alone system designed to provide card output for batch processing.

The instrument can project a series of questions onto the screen, with an appropriate group of answer statements. The S indicates which answer is correct, or which condition pertains to him by pressing one or all of the buttons positioned alongside the screen. A "next question" control button activates the card punch and slide projector. The console is equipped with "don't know" and "don't understand" buttons for use if appropriate. There is also an "erase" button to change a response when necessary. Systematic test data can be entered by an auxiliary built-in keyboard. DAD is 22 in. long, 28 in. deep, and 22 in. high.

Pelam, Inc.
40 South Clay St.
Hinsdale, Ill. 60521

Data Digitizing System

ANAGRAFIC computerized systems are designed for digitizing and processing many types of graphic data, including: strip charts, graphs, drawings, photographs, negatives, and data on CRT displays and microfilm readers. The basic system combines the acoustic tablet and stylus with a PDP-8 minicomputer. The digitizing tablet permits its use in any position, and entering data is simply a matter of touching the stylus to the points to be digitized (no crosshairs or knobs to manipulate). The tablet is light enough to be mounted on the framing face of a CRT.

ANAGRAFIC operates in two basic modes. In the discrete mode, it will acquire a new data point only when the stylus is depressed on the face of

the tablet. The operator is free to move the stylus or delay acquisition of the next point indefinitely. In the continuous mode, ANAGRAFIC automatically samples data at a rate of about 200 points/sec. The stylus point need be depressed only twice: once to signal the computer to begin data acquisition, and once to signify termination. Data values are automatically read as the pen is traced along the curve to be digitized. Absolute accuracy (resolution) in both modes is advertised as better than 0.007 in.

The system's software permits expansion to operate with a range of output devices, including DECtape, magnetic tape, disks, and x-y plotters. In some modes, the PDP-8 may be used to process the digitized data with programs in FORTRAN, FOCAL, Basic, or other PDP-8 languages. The manufacturer claims that setup times between quite different jobs is minimal and that the system provides unconstrained use of the PDP-8 as a general-purpose computer when ANAGRAFIC is not needed.

System 1 is priced at \$17,500 (lease at \$372 per month) and includes the PDP-8/E computer with 4K core, the GP-2 Graf/pen controller with 14 x 14 in. tablet, an ASR-33 Teletype, and the AGI/E interface. System 2 is \$22,050 and has an additional Tennencomp magnetic tape recorder, Model TP-1371, with controller. System 3, at \$31,500, differs to the extent of having a 20 x 20 in. digitizing tablet and an Ampex IBM-compatible magnetic tape unit with Eclectic 640 controller. For current PDP-8 owners, or other users, there is an ANAGRAFIC Performance Pak which is a plug-in package that provides the same capability and functions as the full System 1. The Pak components consist of the discrete mode software system, digitizing tablet and stylus, and PDP-8 hardware interface. Price: \$9,995 or lease at \$212 per month.

Input Output Computer
Services, Inc.
138 Mount Auburn St.
Cambridge, Mass. 02138

Electrophysiology

Mentor Corporation markets a number of instruments for biomedical systems. One of their most recent products is the S-15 implantable

electronic stimulator, which weighs ½ oz and measures 30 mm in diam and 7 mm thick. It is suitable for "permanent" surgical implantation and requires no batteries or transcutaneous wires. The device is activated and powered by an external radio frequency transmitter. A light, flexible antenna coil from the transmitter is placed over the skin, external to the subdermally implanted device. A choice of electrodes is provided.

Pulse amplitude (externally controlled) is 0-15 V (biphasic pulse into 500 ohms); pulse frequency is 0-500 pps; pulse duration is 0.05-3.4 msec.

The ST-11 battery-powered transmitter is priced at \$550; the ST-21 laboratory transmitter is \$740. The S-15 stimulator with electrode is \$250.

Mentor Corporation
2512 Delaware St., S.E.
Minneapolis, Minn. 55414

Telecomputer

The Model 109 Telecomputer converts any standard TV set or video monitor into a full service input/output visual display terminal by a simple clip lead attachment to the antenna leads. A built-in telephone acoustic coupler operating through regular (voice grade) phone circuits permits instant dial-up access to computer services on remote time-shared computers. The unit generates a 64-alphanumeric character set on a 32-character by 8-line field. Page rollup, line cursor, Teletype keyboard, parity, and switch selectable rates of 10 and 30 cps are standard features. Numeric or alphabetic keyboard configurations are available. The unit is portable (fits into a briefcase) and can be used anywhere that a telephone, 117-V power, and a TV set are available. Price: \$960 in single quantities.

Digi-Log Systems, Inc.
666 Davisville Rd.
Willow Grove, Pa. 19090

Subminiature Motor

The AMY6 subminiature synchronous motor measures 23 mm in diam x 6.5 mm and has a rotor speed at 50 Hz of 250 rpm; at 60 Hz, it is 300 rpm. The standard version is 24 V, but 6 and 12 V are available at

50 Hz or 60 Hz. Minimum running torque, referred to 1 rpm, is at least 150 g-cm. The AMY-10 has a running torque of 2,500 g-cm at 1 rpm and measures 46 x 13 mm.

Landis & Gyr, Inc.
4 Westchester Plaza
Elmsford, N.Y. 10523

Fetal Detector

The Chrono-log Heart-Tone Fetal Heart Beat Detector uses the Doppler principle to detect beats and includes transducer, self-contained loudspeaker, and earphones at a cost of \$595.

Chrono-log Corp.
2583 West Chester Pike
Broomall, Pa. 19008

Operant Conditioning Unit

Ralph Gerbrands Co. recently announced a new line of operant conditioning demonstration units featuring solid state control boxes, 3-A 24-V dc power supplies, pulse formed outputs, and cabinets with combination handle stands. The control box has a program selector knob (exp, parallel, and series), a response indicator, stimulus light control, and remote operating plug-in switch, as well as a connecting strip panel. The units are available in pellet dispenser, dipper feeder, and pigeon feeder models.

Ralph Gerbrands Company, Inc.
8 Beck Rd.
Arlington, Mass. 02174

Electrophysiology Equipment Catalogs

Transidyne General recently issued a complete catalog covering their electrophysiological merchandise. Included are microelectrodes, preamplifiers, and signal conditioning equipment, positioning and stereotaxic instruments, and raw materials for making your own microelectrodes. Write: Transidyne General Corporation, 462 South Wagner Rd., Ann Arbor, Mich. 48106.

Biotronex Laboratory issues a Cardio-Vascular Instrumentation Catalog Summary covering blood flowmeters, flow probes, blood pressure monitors, pressure gauges, and cardio-vascular computers. Write: Biotronex Laboratory, Inc., 9153 Brookville Rd., Silver Spring, Md. 20910.

Circon is distributing a new catalog containing their entire line of microsurgical products, including surgical instruments and telemetry systems. Copies may be obtained from Circon Corporation, Santa Barbara Airport, Goleta, Calif. 93017.

Printer for Minicomputers

The 880D prints 80 columns wide at up to 400 lines/min and it has a full line buffer memory. With built-in interface to the PDP-8, HP-2116, Varian 620/i, or the Honeywell 316/516 minicomputers, the line printer is priced at \$7,600. The printer costs \$6,800 with interfacing for other minis.

Vogue Instrument Corp.
Shepard Division
131 St. at Jamaica Ave.
Richmond Hill, N.Y. 11418

Cassette Recording System

The 4100 Communications Terminal, priced at \$1,650, is a cassette recording system plug-compatible with CRTs, keyboard printers, and datasets. The standard model has dual speed to 300 baud; 1,200-baud speed is offered as an option. The unit has RS-232B interface, USASC II coding, and is priced at \$1,650. Options include: remote code control, high-speed search, edit, Teletype current interface, and DTL/TTL parallel interface.

Techtran Industries, Inc.
580 Jefferson Rd.
Rochester, N.Y. 14623

Video Tape Recorder

The VT-100 is portable and uses 1/4-in. tape. The video tape recorder system is priced at \$695 for the recorder and \$420 for the video camera with built-in microphone. Weight of the VTR unit is 10.1 lb; the camera weighs 4.1 lb.

AKAI America, Ltd.
2139 E. Del Amo Blvd.
Compton, Calif. 90220

Histogram Analyzer

The new Ortec Histogram Analyzer computes time probability plots automatically and operates in five modes. In interval mode, the analyzer measures successive intervals between events (the crossing of a present discriminator threshold). A latency or poststimulus time histogram analyzes the intervals between stimulus and response pulses, or the intervals between the pulses of a response train. Dwell mode measures the duration of that portion of a physiological signal (EKG, EMG, EEG, etc.) either below or above the selected threshold level. Period mode sums the dwell times above and below the discriminator level, resulting in a total time or period histogram. In frequency distribution mode, a researcher can plot a distribution of above threshold pulses

occurring in successive time periods.

The static MOS memory consists of 128 addresses (7 bits) by 255 data points (8 bits); time base is variable from 5 microsec to 20 sec/channel in 21 steps.

Manager, Life Science Products
Ortec Inc.
5445 Midland Rd.
Oak Ridge, Tenn. 37830

Electronic Digital Stopwatch

The DEKA split action electronic digital stopwatch has an accuracy of 1/10,000 sec/sec. Single event times may be displayed, and, through the use of the SPLIT switch, any number of successive times may be stored and displayed for recording or computing time differentials without affecting the continuation of elapsed time. Time may be selected as it is running, or for any split or event as selected by the display switch. The unit is 3.1 in. high, 7.3 in. deep, and 6.3 in. wide and is priced at \$495.

Deka Products
2423 Old Middlefield Way
Mt. View, Calif. 94040

Kits

Phase Corporation markets a number of kits at reasonable prices. The TPG-200 triggered pulse generator has a continuously adjustable repetition rate, pulse width, and amplitude that is triggered by your sine or square wave generator. Rise time is less than 20 nsec into 400 ohms load. Kit price: \$64.65.

The TBG-200 time base generator provides a digital generated, crystal controlled, square wave output with a frequency coverage of 1 Hz-1 MHz. Rise time is less than 50 nsec. Price: \$74.75.

The ASG-200 audio sweep generator provides a source of audio frequency functions: sine, square, triangle, positive sawtooth with variable negative slope, and negative sawtooth with variable positive slope. Frequency is variable from 0.02 Hz to 20 kHz. Price is \$84.85. The ASG-100 is similar to the ASG-200, except that it is battery operated and designed for hobbyists. Price: \$54.55.

The RPS-800 regulated power source kit has an output of 1-30 V, 0-1 A. Price: \$39.40.

Phase Corp.
315A Boston Ave.
Medford, Mass. 02155

Photoelectric Reader

The Mini-Reader reads standard eight-level 1-in. tape at 0-200 char/sec. The unit has the following features:

stop on character, unidirectional, DTL outputs, and end-of-tape sensing. The reader is priced at less than \$500 in quantities; the price is over that amount for single-unit purchases.

Electronic Engineering Co.
of California
1441 E. Chestnut Ave.
Santa Ana, Calif. 92701

Neurophysiological Ratemeter

The RT 682-L provides readings of rate, integrating the rapid firing of muscle cells in EMG recording and nerve cells in neurophysiological recording. The rate reading is displayed on a meter mounted on the front panel; it is also available as a voltage proportional to rate at a recorder output terminal. Ranges provided: 0-100, 0-200, 0-400, and 0-800 pulses/sec. Input voltage is 1.0 V; input impedance is 1 megohm. Price: \$385.

EKEG Electronics Co., Ltd.
P.O. Box 310
Station A
Vancouver 1, B.C., Canada

Isolated Shock Source

The Model 102-K isolated shock source includes a high safety factor for the human behavioral laboratory. Characteristics include: double isolation-transformer plus chopper, output currents to 12 mA, internal series impedance adjustable from 25-125 kilohms, integral chopper failure alarm, and isolated control circuit and monitor contacts. Price: \$99.

Scientific Prototype
615 W. 131 St.
New York, N.Y. 10027

Solid State Switch

The MicroSwitch magnetically operated Series ISS solid state switches utilize a combination of a Hall sensor with a trigger and amplifier, in a single silicon integrated circuit as the switching element. Switching operation is produced by a magnetic field from either a permanent magnet or electromagnet. These switches are not rate sensitive and operate at any speed up to their maximum. The digital output signal is 3 V at 10 mA. An application manual is available: "Magnetically operated solid state switches operation notes."

Micro Switch
Freeport, Ill. 61032

IC Kits

The No. 181 no-bounce pushbutton project is connected as a set-reset type of flip-flop. Cost: \$5.90.

The No. 183 binary counter consists of a 3-IC four-transistor system. Each time the count button is pushed, the counter advances to the next number in the BCD, or 8421 system. Price: \$8.90.

The universal digital instruments package has a mainframe with a 3½-digit readout (\$39.50) with over range indicator and a power supply (\$19.55). The power supply provides all voltages needed by the various plug-in modules available. The digital volt-ohmmeter plug-in kit costs \$29.95 and measures up to 2,000 V; input impedance is not less than 10 megohms. Ranges: 0-1, 0-10, 0-100, 0-1,000 V dc. A frequency counter plug-in kit (FC-2) is priced at \$29.95; a time period module is \$38.75. The latter instrument has full scale ranges of .01, .1, 1, 10, 100, and 1,000 sec to measure time intervals.

Southwest Technical
Products Corporation
219 W. Rhapsody
San Antonio, Tex. 78216

Multipurpose Perceptual Device

The Model PR-27 can be utilized to demonstrate and study visual brightness discrimination, beta movement (phi phenomenon), and critical flicker fusion frequency. Individual control of the intensity of two light sources makes it possible to determine differential thresholds. Control over light source intensity, proportion of light (ON) and dark (OFF) phase time, permits demonstration of the beta movements. Adjustment of the linear distance between the stimuli and variety of stimulus objects (12) makes possible the study of apparent movement thresholds and verification of Korte's laws. Electromechanical arrangement permitting the presentation of only one number of the stimulus light pairs and control over area, intensity, and flash rate permits study of factors affecting the critical flicker fusion frequency. Price: \$435.

Research Media, Inc.
4 Midland Ave.
Hicksville, N.Y. 11801

Minicomputer Products

The OMNIROM family of plug-compatible, electrically alterable, read-only plated-wire memories allow users to reconfigure their ROM by

keyboard or paper-tape entry. The memories have nonvolatile storage and will retain data indefinitely, even through power shutdown. Omnitrom units are available for the Nova, Supernova, Interdata 2, 3, and 4, the CIP 2000, and the Micro 800. Price: approximately \$2,000.

Memory Systems, Inc.
3341 W. El Segundo Blvd.
Hawthorne, Calif. 90250

Interdata recently introduced two new computers. The Model 80, to be delivered beginning summer 1972, can be microprogrammed from the buyer's teletypewriter terminal. The 80 has a 16-bit word size with a memory range from 16-64K bytes, a memory cycle time of 350 nsec, and execution times from 400 to 800 nsec. Maximum transfer rate is 4.5 million 16-bit words/sec. There are 113 standard instructions. Price: \$16,000 for the 16K-byte system with teletypewriter interface. The Interdata Model 70 is a 8-64K processor with 1-microsec memory cycle time. It has 16 general registers and an interleaved data channel. Also included are floating point hardware, list processing instructions, automatic input/output, and a 76-bit multiplex bus. A 16K system with teletypewriter interface is \$10,500.

Interdata
2 Crescent Pl.
Oceanport, N.J. 07757

Tennecomp recently introduced a minitape system (TP-1375) at \$1,490 for all PDP-8 family computers. The tape stores up to 256,000 12-bit words on a heavy-duty four-track cartridge. The TP-1371 is for users of Honeywell, Nova, Hewlett-Packard, and PDP-11 computers.

Tennecomp Systems, Inc.
795 Oak Ridge Tp.
Oak Ridge, Tenn. 37830

Impact Printer

The Printer 100 is a serial-impact printer priced at approximately \$1,800. The printer features: 100 char/sec print rate, up to six-part printout on standard paper, and parallel and serial interfaces. Throughput of the unit is 35 lines/min (132 col) and 55 lines/min (72 col). Number of characters, 64-26 alphabetic, 10 numerals, and 27 symbols plus "space."

Printer Technology, Inc.
Sixth Road
Woburn, Mass. 01801

Temperature Control Unit

The TCU 691 enables E to keep anesthetized animals at a constant physiological temperature over long periods. This model is battery operated internally to provide flexibility and to prevent power line interference. An external 12-V automotive battery (not supplied) is required to provide power for the heating pad. Principle of operation is as follows: a special temperature-sensing probe is inserted rectally into the animal and the animal is laid on a specially designed warming pad (supplied). Control temperature is selected by means of a dial on the front panel. If the S's temperature begins to fall, power is automatically supplied to the pad to maintain the body temperature at the selected value.

In some neurophysiological research, the sensing probe may be placed in contact with the brain. A special fine probe can be provided for deep brain insertion. Price: \$285.

EKEG Electronics Co., Ltd.
P.O. Box 310, Station A
Vancouver 1, B.C., Canada

Dual-Channel Stimulator

Ortec has introduced a complete bench-type or rack-mounting multifunction pulse generator designed specifically for use as an electrical stimulator in electrophysiology instruction and research. Repetition rate is variable from 1 msec to 110 sec, delay 0-11 sec. Train duration is 1 msec to 11 sec; pulse duration, 1 microsec to 11 sec; train period, 100 microsec to 1.1 sec; output amplitude variable, between 0 and 150 V. Price: \$970.

Ortec Inc.
203 Midland Rd.
Oak Ridge, Tenn. 37830

Data-Input Device

The Model 401 (\$1,495) is a compact data-input CRT device with a 132-char CRT and a 63-char ASCII keyboard. The 132-char display consists of four lines of 33 char each. In on-line operation, the unit has parallel transmission of up to 75,000 char/sec. Serial transmission at 9,600 baud is optional. The device can be used off-line also.

Centronics Data Computer Corp.
One Wall St.
Hudson, N.H. 03051

Memories for PDP-11

The ExpandaCore 11 series memory enables PDP-11 users to expand from 4K to 32K of memory in 4K or 8K single-card increments. Priced at a

minimum of \$5,600 for a basic 8K expansion module to \$15,000 for 24K of add-on memory.

Cambridge Memories, Inc.
Newtonville, Mass. 02160

Texas Instruments Minicomputer

The 960A is the newest addition to the Texas Instrument computer line. Basic price of the 960A includes the power supply, a direct memory access (DMA) channel, automatic parity checking, and a lockable front panel. The new 750-nsec semiconductor memory is expandable to 32K in the basic chassis at \$1,500 for each 4K increment. The basic chassis contains space for 512 input/output lines that are expandable to 8,192 I/O lines. The CPU with 4K memory costs \$2,850; 8K is priced at \$4,350; and 16K is \$7,350.

Computer Products
Texas Instruments
P.O. Box 144
Houston, Tex. 77001

Analog Computer Kit

AC1 is an inexpensive, modular, analog computer, designed to introduce students or Es to analog techniques. The unit contains one operational amplifier module (Type 741 IC amplifier with seven input resistors plus a voltage reference), two coefficient pot modules (each has two pots for a total of four pots), one null indicator module, and all required hardware and patchcords plus instruction manual. Values to be added, subtracted, multiplied, or divided are entered on the coefficient pots; the answers will be taken from one of these pots. The null indicator module uses a 741 IC to tell when two inputs are equal (via a light bulb). This is the equal sign of an equation. Price: \$45. The unit can be expanded as much as you wish, and analog and digital modules mixed to make hybrid systems, signal generators, etc.

Scientific Measurements, Inc.
2945 Central
Wilmette, Ill. 60091

Chartviewer

A new motorized, back-lighted chartviewer is for viewing charts between 1 and 12 in. wide. Speed is variable and a full chart can be rewound in a minute.

Walker Scientific
Rockdale St.
Worcester, Mass. 01606

Infrared Viewer

The Find-R-Scope is hand-held,

light weight, with wide angle monocular vision (focus range, 6 in. to infinity) for greater vision in the dark. It can be used to observe animals in natural or laboratory experimentation without being seen.

FJW Industries
215 E. Prospect Ave.
Mt. Prospect, Ill. 60056

Terminal with Graphics

The Series 300 terminals include a standalone display with TV-compatible CRT, keyboard, vector generator, controls, and serial interface. Over 30 interfaces are available for most computers. FORTRAN-based software is furnished for plotting, formatting, editing, windowing, and interfacing with user's programs. Hard-copy output and graphic input are available as peripherals. The system allows the user an unlimited number of vectors; over 1,000 characters can be displayed and edited. A combined display of vector graphics, alphanumeric data, and TV images may be generated.

Computek, Inc.
143 Albany St.
Cambridge, Mass. 02139

Teletype Attachment

Attached to the Teletype Model 33, the TM/33 automatic tape handling system can eliminate tape damage. The unit mounts directly to the Teletype and may be used to simultaneously feed and collect tape after perforating. Price: \$99.

Data Specialties, Inc.
1548 Old Skokie Rd.
Highland Park, Ill. 60035

Light Chopper

The new PAR Model 191 Variable Speed Light Chopper is for research requiring light modulation and operation at more than one frequency, or for varying the operating frequency during the experiment. Range: 5 Hz to 5.5 kHz, at a cost of \$1,195. If a variable frequency chopper is not required, the Model 125 has a range of fixed frequencies between 2.1 Hz and 2 kHz, at \$575.

Princeton Applied Research Corp.
P.O. Box 2565
Princeton, N.J. 08540

New Products

TEAC Corporation of America recently introduced the MT-5, a relatively inexpensive (\$595) cassette-type digital magnetic-tape memory system which provides external storage for use with data acquisitions systems, minicomputers,

etc. The system has a capstan drive that operates at a tape speed of 7.5 in./sec and employs 800-bit/in. packing density to provide a storage of 2 million bits.

Teledyne-Geotech of Garland, Texas, is marketing the RM-100 Flexicorder, a low/intermediate speed, multichannel magnetic tape recorder-reproducer that features 100-to-1-range recording speeds. It can operate unattended for up to 33½ days when recording at its slowest speed, 0.03 in./sec.

A voltage-controlled generator/noise generator (Model 132) is being offered by Wavetek at \$795. The unit provides signal-to-noise and noise-to-signal operating modes; the user may select the noise level to be added to an analog or digital signal. Sine, square, or triangle output waveforms are available with frequencies ranging from 200 mHz to 2 MHz. Digital sequences at clock rates variable over a 160-Hz to 1.6-MHz range can be generated with sequence lengths as great as $2^{20} - 1$ true bits.

RTOS is the latest entrant in the new real-time operating systems for minicomputers. The system is for Nova and Supernova machines (Data General). It resides in 1K core and can be implemented with as few as 4K words of total core memory and no disk. RTOS is aimed at users with modest interrupt requirements and handles I/O timing, data buffering, priority handling, and task scheduling. A real-time clock is required.

Briefs

High-Density Recorder

Lockheed Missiles and Space Co. claims a magnetic tape recorder with the highest recording density yet achieved. The Type 30 recorder stores 15,000 bits on 1 linear in. of seven-track tape, a total of 1.6 billion bits per reel. Recording speed is 256,000 bits/sec, and playback is 512,000 bits/sec.

Time and Motion Study Equipment

Lafayette Instrument Co. (P.O. Box 1279, 52 By-Pass, Lafayette, Ind. 47902) recently issued a new time-motion study equipment catalog illustrating a variety of camera drives and camera controls for several cameras. Also illustrated are special 16-mm time-motion study projectors.

Minicomputer Population

The annual Diebold Computer Census found a 1-year increase of 41% in the number of minicomputers installed in the U.S. The minipopulation rose by 9,278, from 22,700 installations to 32,020 (the

total U.S. computer population is 83,500, up 11.5% from last year). All but 1,500 of these minicomputers were sold by 23 companies.

Fall Joint Computer Conference

Several interesting items were exhibited at the recent FJCC meetings. Garrett Mfg. Ltd., Rexdale, Ontario, Canada, showed a line of minis that begins with the 16-bit 3.2-microsec Model P85, selling for approximately \$2,000 with 500 words.

United Telecontrol Electronics of Asbury Park, N.J., offered do-it-yourself core memory stacks with the electronics in kit form. Cost for the assembled memory is estimated at 0.8 cents per bit. The same company showed a palm-sized core memory stack (RAM) claimed to be the world's smallest with 4K words of 12-18 bits in a 0.4 x 4 x 4.5 in. space. Cycle time of the stack is 650 nsec; the price is \$700.

A four-color CRT display system was shown by Data Disc of Sunnyvale, Calif. The system uses a Varian 620/i minicomputer for both graphic processing and process control.

A number of tape cassettes were exhibited. Kybe Corp. of Waltham, Mass., offered a dual-transport unit operable at 750 char/sec. The "Kydek" is available with interfaces for making paper-tape replacements for the PDP-8 and other small computers and is priced at \$3,495. Cipher Data Products of San Diego showed the C-2000 cassette which features read after write, backspacing, and bidirectional search. Cost is \$2,450 with interface and software driver for most minicomputers.

Data General

Data General Corp. (Southboro, Mass. 01772) delivered its 2,000th minicomputer early in December 1971, 9 months after it delivered its 1,000th. The first NOVA was shipped February 1969.

The three new NOVA computers are the 1210, 1220, and 820. The NOVA 1210 is 5¼ in. high and costs \$4,350 with 4K of core memory and \$5,750 with 8K. The NOVA 1220 is an expandable version and costs \$5,250 for 4K and \$6,650 with 8K of memory. Both have cycle times of 1,200 nsec. The Model 820 has an instruction execution time of 800 nsec and costs \$6,450 for 4K of core memory and \$7,850 with 8K.

New additions to the Data General minicomputer line include an 8K core memory module, a turnkey front panel that is interchangeable with the standard programmer's console, a bipolar read-only memory with a capacity of from 256 to 1,024 words, and a 1,024-word core memory module.

Minicomputer in Development

Control Data Corporation is developing a minicomputer and a full set of peripherals. The Minneapolis division will engineer the mainframe, and the CDC controls group in La Jolla, Calif., is developing the peripherals.

Audio Cassette Appraisal

The November 1971 issue of Electronics Illustrated contained an appraisal of new audio cassettes.

The Ampex 361 (price: \$2.25) was found to have good high-frequency response with some hiss; bass and midrange were adequate. Audiotape C-60 (\$2.65) had a good overall frequency response and low noise. Norelco 100 (\$2.65) rated a minimum hiss with excellent highs and lows. RCA Red Seal C-60 (\$2.75) was found excellent for general recording. Sears Silvertone C-60 (\$2.29) had high noise level and hiss; frequency response was adequate. Sony C-60 was average with some noise, but good frequency response. Scotch C-60 (\$2.75) showed higher than average hiss and average high and low frequency response.

In the premium cassettes, the Sony UHF C-60 had excellent overall frequency response and low noise. The Norelco 300 C-60 (\$2.65) was generally good. Memorex C-60 (\$2.19) was judged mushy and the sound faded. Scotch C-60HE played back 5 dB louder, but the sound was clean and undistorted. Ampex 362 (\$2.95) had some wow and hiss, but good frequency response. Audio Magnetics QHFC-60 (\$1.50) had average sound overall, but some muddiness in bass.

Miniature Analog Tape Recorder

A miniature analog tape recorder has recently been announced by Oxford Instrument Corp. of Annapolis, Md. The four-channel unit can record data for up to 24 h and uses standard compact cassettes. It is battery operated and small enough to be carried in a shirt pocket.

Humidity Measurement

Humidity indicates the water vapor content of a gas mixture. Relative humidity provides a measure of the degree of air saturation, expressed as percent RH, where RH is the ratio of the vapor pressure of H₂O in a gaseous mixture to the saturation vapor pressure, at that temperature. Specific humidity is provided by the ratio of amount of water vapor to the amount of dry carried gas.

Hygroscopic humidity sensors may have value in behavioral research, since they contain a material the property of which changes when moisture is absorbed. For example, the hair of animals and humans elongates as a result of absorbed moisture. These

hygroscopic elements may be coupled directly with indicating or recording instruments for humidity measurement. The technique is relatively simple and inexpensive, but the response is slow.

Psychometers are often used when humidity measurements are necessary to monitor or control ambient conditions, e.g., in a building. Psychometers consist of pairs of temperature sensors, one maintained dry, the other covered with a wet sleeve (rate of evaporation from sleeve depends on relative humidity, RH). This evaporation is monitored by temperature decreases at the wetted temperature. A pair of wet/dry bulb temperatures expresses the measurement which is converted. Since a flow of air is generally required for psychometer operation, a small fan is supplied or the sensing unit is spun through the air.

Tables of zero-, first-, second-, and third-order letter approximation to English and French

(Submitted by:
J. GERARD MUISE and
RENAUD S. LeBLANC
University of Moncton
Moncton, N.B., Canada)

Investigators studying the effects of degree of letter approximation to English on perception, memory, and motor abilities may often need large letter samples at the zero-, first-, second-, and third-order of approximation. Obtaining these samples would entail keypunching approximately 100,000 characters from English prose, from which frequency counts of the symbols, bigrams, and trigrams would be tabulated. A pseudorandom number generator would subsequently be used to generate characters according to the lower-order sequential dependencies of the language. Studying the interlanguage differences would require the same amount of work for each language.

We have been engaged in research involving the differential use of sequential dependencies of the French and English language in bilinguals, and in French or English monolinguals, in various tasks. Such tables are available for both languages.

The frequency counts are based on two tests of 100,000 characters each, chosen from a popular magazine published in both French and English. Single-letter words, digits, and punctuation were eliminated. A random number generator, using the

power-residue method, was employed to generate a sample of 24,000 characters (26 letters and a blank, the latter being coded as a dot), 75 per line for a total of 320 lines at each order of approximation for each language. The zero-order approximation to French and English is, of course, neither French nor English, but in fact doubles the sample available for random letters which may be useful for a control condition, depending on the experiment proposed.

Eight tables of eight pages each present the 24,000 characters of generated text at each order of letter approximation to both French and English. A punched deck and a listing of these are available from the Department of Psychology, University of Moncton, Moncton, N.B., Canada, for a fee of approximately \$5.00 plus shipping charges. Order Document 71-1.

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A note on a sturdy, inexpensive, linear displacement apparatus

(Submitted by:
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Some of the current research on short-term motor retention has dealt with the acquisition and retention of a simple linear movement. Research has been reported, using meter sticks with plastic slides or blocks of wood, while those with a more sophisticated bent have constructed ball-bearing slides that move along stainless steel tracks. The piece of equipment described in this brief is inexpensive and easy to make, and might prove useful in student laboratories.

Take a length of angle iron made of galvanized metal. A 4-ft segment (sufficient for most research of the type described above) may be purchased at most hardware stores. A 3-in. segment is then cut off one end and serves as the slide (i.e., this piece will ride smoothly along the top of the larger piece). A handle may then be attached to the top of the slide, and a marker may be attached on one of the sloping sides. In order to define specific movements, cut notches along the top of the larger piece at specified intervals. A thin piece of metal (we have used a metal ruler) may then be placed in the notch to restrict further

movement of the slide. If desired, both slide and track may be lined with Teflon tape to further reduce friction. A scale may be constructed on a piece of paper and placed under the track. The total cost is under \$3.00.

A versatile and easy-to-use relay system

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The purpose of this note is to describe briefly a relay programming system which appears to be relatively unknown to psychologists. IBM manufactures a line of relays and accessories which are extremely convenient for both small and large relay control systems, and possibly for relay interfaces from solid state and computer systems.

The relays are plug-in devices with replaceable wire contacts. The system's feature most convenient for laboratory use is the taper-pin receptacles on the relay socket. Each contact on the relay and the coil connections is represented on the socket by two taper-pin receptacles (amp type). Taper-pin wiring is easy and fast (comparable to "Nu-Way" snap wiring), and the use of two receptacles per contact point allows "daisy-chaining" from any one point to any other by simply continuing jumper leads from hole to hole. Virtually no soldering is necessary in setting up relay logic.

A very wide range of relays is available, ranging from 4-pole double-throw, to 4-pole latching, to 12-pole double-throw. Also, units with extra holding and bucking coils are available. Prices are competitive with conventional relays.

All the usual relay techniques are usable with these relays [e.g., diode OR, pulse limiting with capacitors, simple pulse forming (Saslow, 1964)]. And, the packing density of the relays is high. For example, 26 four-pole double-throw units can be mounted in a 19-in.-wide x 2½-in.-high relay rack space. Timing and counting functions may be accomplished with commercially available units (steppers, timing modules) or by binary counting relay techniques (Appels & Geels, 1966). Short-interval (± 1.0 sec) timing can be done with tantalum capacitors in simple RC networks if a regulated power supply is used.

The relays have a long life with a rating of 100×10^6 operations at moderate loads. One limitation, however, is contact loading. Contacts

are rated to switch 500 mA. This is sufficient for nearly all control applications. However, some care in arranging contact loading is required.

Two controllers using these relays have been in operation for some time in our laboratories. Typically, we use several mounting channels (Part No. 238211, \$.80 each) attached directly to an open relay rack and four-pole double-throw relays (Part No. 769011 or No. 196208 with holding coil; \$.40 or \$.50 each). Ready-made taper-pin leads are available from IBM for \$.10 each. For making special leads, a crimping tool such as Waldon-Molex No. 1560-1561 (\$.435) is useful. It is necessary to solder arc suppression diodes onto the coil leads. Dust covers are available and probably should be used when relays are mounted in the open.

Two publications describing these devices and their usage, "IBM Wire Contact Relays" and "Wire Contact Relay Maintenance Manual," are available from IBM Industrial Products, 1271 Avenue of the Americas, New York, New York 10020.

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Notes

Inexpensive FET audio switch

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Gating of an audio oscillator's output to an amplifier can be constructed with a minimum of parts. Cost of the unit will not exceed \$12.00. I advise that the input signal not exceed 1 V rms. Logic requirements are "1" logic signal of between 0 and -0.8 V and "0" logic signal of -6 to -12 V. The logic drive requirements are quite low (refer to Fig. 1).

The FET is an inexpensive depletion type (75c). Applying a negative voltage of sufficient amplitude to the gate interrupts the flow of electrons through the device. When the potential at the gate returns to 0 V or close to that level, the input applied to Point A goes directly to the output, B. The analogy would be -12 to gate causes switch to be open; 0 V causes switch to close. The speed of turn-on-turn-off is less than 10 microsec. The rapid turn-on and -off of the circuit will cause a problem of clicks. The introduction of a capacitor between

Logic input

"1" = 0 to -0.8 V

"0" = -6 to -12 V

*Refer to Text

Q 1 = 2N 5163

Fig. 1. The schematic.

the gate and ground will suppress this problem. The capacitor integrates the turn-on/off pulse. Integrating this pulse allows for the slow turn-on-turn-off rate by causing the output signal to be amplitude

modulated. A .47 microF works quite well. An E can modify the turn-on/off by using a smaller or larger capacitor. The unit does not suffer from a problem of dc offsets as do transistor-type switches.

Factors affecting electroshock seizure thresholds in rats*

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In an exploration of the interrelationships of stimulus intensity, duration, waveform, and frequency in the production of an electroconvulsive seizure (ECS), Woodbury and Swinyard (1952) reported that the lowest seizure thresholds (13.6 mA) were obtained with an alternating sine wave current at 120 cps. When stimulus frequency was increased to 4,000 cps, seizure threshold increased to 42.5 mA. There was no apparent correlation between the seizure threshold and the body weight of the rats used in this study.

The role of S parameters in the response to ECS stimuli is not entirely clear. For example, in contrast to the study just cited, a more recent report (Wooley et al, 1960), using the Tryon "maze-bright" and "maze-dull" strains of rat, suggested that seizure threshold was affected by S body weight, sex, and strain.

The purpose of the present study was to further delineate the interrelationship between the ECS stimulus parameters of current frequency and intensity, and the S parameters of sex and body weight in the determination of ECS seizure threshold.

METHOD

The Ss were 40 albino rats, 11 to 14 months old, 20 males and 20 females of Wistar-derived stock. Female Ss weighed 290-425 g; male Ss weighed 425-610 g. The Ss were housed in wire mesh cages and allowed free access to food (Purina Lab Chow) and water.

The shock stimulus was generated by a Hewlett-Packard electroanesthesia instrument (No. 3380B) with a maximum current output of 100 mA. This apparatus produced a dual sine wave current, with a constant low-frequency component of 100 Hz, added linearly to the high-frequency component, which ranged from 1,000 to 10,000 Hz. The amplitude of the low-frequency component was a constant proportion (10%) of the high-frequency component.

Seizure thresholds were determined at 10 equally spaced frequency levels, ranging from 1,000 to 10,000 Hz. Each experimental group, one group for each frequency level, was

Fig. 1. Electroshock seizure thresholds plotted as a function of stimulus frequency for male and female albino rats.

composed of two male and two female rats. The groups were arranged so that no group contained littermates. The Ss were strapped to a cork board prior to shock administration, so that the head and body were immobilized while all limbs were free. Seizures were induced by administering the current through alligator clips applied to the S's pinnae. For each group, the stimulus frequency was held constant and the intensity was gradually increased in increments of 0.5 mA until the seizure threshold was reached. Current was administered for approximately 0.5 sec at each intensity level. The stimulation was then terminated. One tonic-clonic seizure was elicited from each S.

RESULTS

The range of mean seizure thresholds, representing measurements at 1,000 and 10,000 Hz, was as follows: males, 10.0 to 33.5 mA; females, 7.2 to 27.5 mA. At each frequency level, the mean threshold for males was higher than that for females, with an average difference of 3.9 mA. The seizure threshold between sexes was statistically significant ($F = 29.97$, $df = 1/20$, $p < .001$). Further tests suggested that body weight, not sex, was the significant variable in the production of the male-female threshold difference.

Analysis of variance on the pooled male and female data showed the differences in threshold between frequency groups to be significant ($F = 23.78$, $df = 9/30$, $p < .001$). The data indicated also that the current intensity necessary to produce a

seizure varied directly with the level of the frequency, with 93% of the variation in thresholds predictable from a linear regression equation (see Fig. 1). All tests for nonlinearity proved insignificant.

DISCUSSION

As might be expected, the parameters of the shock stimulus appear to be the major determinant of seizure threshold. At low-frequency values, low-current values are required to produce a seizure (e.g., males, 1,000 Hz, 10.0 mA), while at high-frequency values, high-current values are required e.g., males, 10,000 Hz, 33.5 mA).

The major organismic parameter which appears to have an effect on seizure threshold is body weight. While the sex of the S may contribute to the response, in this study body weight differences accounted for most of the observed sex variability.

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Stabilized construction of a Hebb-Williams maze

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It is convenient to build the Hebb-Williams maze in such a fashion that the internal walls may be moved about to construct different pathways from startbox to goal. Such an arrangement is far less cumbersome than building a separate maze for each problem. To facilitate moving the walls about, they should be constructed from some light-weight material, but this also increases the probability that a wall will be knocked out of place by the test animal. It is possible to stabilize the maze by constructing grooves in the floor into which the walls are inserted, but this makes the maze very difficult to clean. An alternative method is to construct an interlocking device along the edge of each wall; a cheap and easy way to build such a device is shown in Fig. 1. The materials required are 3/4 x 3/4 x 1/8 in. aluminum angles and 1 x

Fig. 1. Horizontal cross-section through two abutting walls in a Hebb-Williams maze showing a configuration of aluminum fittings (cross-hatched) which will form a tight-fitting corner.

1/4 in. aluminum bars obtainable in most hardware stores.

A piece of aluminum angle is placed along the edge of a wall as shown in the top sketch of Fig. 1. The lip of this angle extends beyond the edge of the wall by a distance just barely large enough to accommodate the thickness of one of the bars. Then a bar is affixed along the edge of another wall which will abut the first one. As shown in the bottom sketch of Fig. 1, this bar extends beyond the edge of the wall by a distance equal to the thickness of the materials from which the walls are constructed. When joined at right angles, these two walls will interlock to form a very snug corner. As these fittings become loose with repeated usage, snugness of fit may be restored by rapping the edge of the aluminum angle with a hammer.

It is clear that several extra walls will have to be constructed with the aluminum angles and bars placed on different sides in order to allow assembly of all possible turns needed in a series of maze problems, but the number of such extra walls required is, in actual practice, quite small. If the maze is intended for use with species such as the rat, which have a powerful tendency to explore protuberances of any sort, an additional modification may be convenient. The walls may be constructed substantially higher than would be required to retain the animal, so that the aluminum fixtures need be placed only along the upper portion of each wall, well out of the animal's reach.

A superior method for constructing a shock grid for rats

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It is obvious that the use of electric shock as an aversive stimulus is widespread and that a great deal of attention has been devoted to the techniques of shocking rats. For example, characteristics of the shock source (Campbell & Masterson, 1969), electrodes (Azrin, Hopwood, & Powell, 1967; Campbell & Moorcroft, 1970), and shock scramblers (Barlow, 1961; Markowitz & Saslow, 1964; Snapper, 1966) have been considered.

An equally important component in the situation, the grid itself, has received less attention. Dinsmoor (1958) suggested using only a few large grid bars, positioned longitudinally, while Walker and Bitterman (1968) favored a special resistive surface rather than the traditional grid arrangement.

At present, almost all shock boxes arrange the grid as shown in Fig. 1. That is, the straight, stainless steel rods are positioned in a piece of Teflon or Plexiglas and thus are isolated from the box as well as from each other. There are, of course, several problems with such an arrangement. First, urine and fecal material flow onto the plastic surface, creating a partial electrical short across the rods (at arrow). This can produce a severe change in the shock intensity. Second, it is extremely awkward to clean the inner Plexiglas surface. Dirt and fecal material may accumulate there. In some cases, cleaning requires dismantling the entire apparatus.

These problems may be virtually eliminated if the grid rods are arranged as shown in Fig. 2. Each rod is bent 90 deg before being secured in a block of $\frac{3}{4}$ -in.-sq Plexiglas. The distance between the angle and the Plexiglas is about 1 in. Due to this feature, urine cannot easily reach (and therefore spread across) the plastic surface. Secondly, because the surface is exposed, cleaning is extremely easy. It is therefore possible to prevent the buildup of dirt and fecal material.

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Fig. 1. Traditional grid arrangement in which straight rods are positioned in plastic. Fecal material can accumulate (at arrow) and create partial shorts.

Fig. 2. Superior grid arrangement in which the rods are bent, reducing the problem of partial shorts and of cleaning.