PRINTOUT

JOSEPH B. SIDOWSKI

SERVICES

Tracking Controls Bibliography

The 1967 edition of the Measurement Systems, Inc., Tracking Controls Bibliography is now out of print. A new edition is due early in 1969. Copies may be obtained by writing to Measurement Systems, Inc., 523 West Ave., Norwalk, Conn. 06850. (203) 838-5561.

Refurbished Computers

Mutual Computer Systems refurbishes used computers to manufacturer's specifications for sale or lease. The advertising brochure cites the LGP-30 at \$9,500, and the G-15 at \$8,500. The company has access to many other makes and models.

Mutual Computer Systems
11920 W. Jefferson Blvd.
Culver City, California 90230
(213) 870-8547

PRODUCTS

Square Wave Generators

H-P Models 220A and 221A are small, solid-state square-wave generators. Source impedance is 50 ohms and risetime less than 15 nsec. Amplitude of the Model 220A is continuously variable from 0 to -5 V into 50 ohms; the Model 221A is continuously variable from 0 to +5 V into 50 ohms. Both models may be operated as voltage-controlled oscillators by supplying a dc voltage to a rear panel connector.

Price: \$195.00, either model.

Hewlett-Packard
1501 Page Mill Road
Palo Alto, California 94304

Physiological Monitors

The Tektronix Type 410 physiological monitor is a small, portable instrument (battery- or ac-powered) that displays ECG, EEG, or related waveforms on a 5-in. screen. A direct-reading heart rate scale is provided along with an audible heartbeat monitor with automatic alarm that starts within 4 sec after the loss of an ECG signal. An Input Selector determines display mode, and the Sweep Speed control permits selection of 25, 50, or 100 mm/sec sweeps. The monitor weighs 12½ lb and is 15-3/8 x 9-1/8 x 12-7/8 in. Price: \$825.00.

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

The BL-850 monitor oscilloscope is a new addition to the Biotronix product line. Eight inputs can be displayed and each input can be independently positioned. Five vertical marker

reference or baseline traces are provided; positioning of the traces can be adjusted from the rear of the instrument. Sweep speeds are 1, 2.5, 5, 10, 25, and 50 cm/sec. A high-sensitivity instrument, the unit is 7 x 16 x 13 in. and weighs only 25 lb. Price: \$2950.00 for 115 V ac, 60 Hz.

Biotronix Laboratory, Inc.
9153 Brookville Road
Silver Spring, Maryland 20910
(301) 588-6400

Pulse Rate Indicators

Bio/Systems, Inc., is now the exclusive distributor of Diginetics Pulse Rate Indicators and Monitors. The Model A-11B allows visual monitoring of beats-per-min from a meter, and audible monitoring through a speaker or earphone. Measurements are obtained from a S's finger inserted into a 4-oz sensor. The unit is portable and powered by a single 9-V battery. A 1-week trial evaluation is available without cost. Price: \$175.00.

The Model C-1 Monitor incorporates all of the same functions plus stroke/volume indication and recording output of 0-9 V from a 5-kohm resistive source impedance. Price: \$225.00. Model C-2 can be powered alternately by 115-V ac or dc battery. Price: \$300.00. Model PRS-1 Pulse Rate Sentinel incorporates adjustable upper and lower alarm limits (visual) plus a secondary alarm output for remote on special command. Spurious alarms from short-term arrhythmias are avoided by a 10-sec alarm delay. Price: \$550.00.

Bio/Systems, Inc.
3220 Olympic Blvd.
Santa Monica, California 90404
(213) 394-2757

New Grason-Stadler Computer Interface System

Grason-Stadler Co., Inc., manufacturer of instruments for the life sciences, has announced the publication of a brochure describing a new computer interface system. The system is designed to facilitate control of laboratory experiments and data acquisition from these experiments by means of a DEC PDP-8/I general-purpose computer.

The system consists of hardware and software necessary to give the researcher conversational, time-sharing, real-time control of multiple independent experiments, and consists of level converters, device selectors, counters, clocks, storage and logic devices, and a multiplexer—all designed to expedite real-time control and data acquisition with a minimum amount of computer involvement. The software for the system is SCAT, a program written expressly for the interface hardware, and designed to permit the user to write control programs, to start or stop experiments independently, examine and/or modify experimental parameters, output data in a variety of raw and condensed forms,—and to do all of this in an easily-remembered format on a teletypewriter.

Control Computer

Computer Automation, Inc., manufactures two small computers designed for on-line data acquisition, control, and monitor applications. The earlier model is the 808 with 4096 x 8 bit memory (expandable), 73 instructions, three priority interrupts, and DTL interface. Price: \$6600.00 with 4k memory, console, and power. The more recent Model 816 is a 16-bit machine expandable from 4,096 to 16,384 words in 4,096 word plug-in, core-stack modules. Add or subtract speed is 16 μ sec; full cycle is 8 μ sec.

Computer Automation, Inc.
895 West Sixteenth Street
Newport Beach, California 92660
(714) 642-9630

Small Logical Computer

Model LC44 is a small logical computer for the study of Boolean relationships. Each of four outputs may be programmed to be any Boolean function of the four inputs. Variable logic programming, and feedback when required, is accomplished by a 100-point pinboard mounted on the front. The total logic is a 4 x 4 translation so there are 64 of the points used for the logic control. The system may be used in multiples to provide a series of 4 x 4 translations driving each other in serial. Dimensions: 19 x 5 1/4 x 10 in. Indicators: Power, I/O Registers, Clock bits. Price: \$695.00.

DVC
64 East Dixon Ave.
Dayton, Ohio 45419
(513) 293-8740

Paper Tape Punch

Model 1560 is an inexpensive, small, solenoid-actuated, asynchronous perforator capable of punching 5-, 6-, 7-, or 8-channel tapes. Punching rate ranges from 0-60 characters per second. Optional control electronics include a sequencer card, two solenoid driver cards, and a power supply.

Digitronics Corp.
1 Albertson Ave.
Albertson, L. I., New York
(516) 484-1000

Midgi-Lites, Midgi-Coder, and Midgi-Counter

Pinlites, Inc., is advertising the world's smallest incandescent lamps, digital readouts, and micromodules. The Midgi-Lites Alpha Lites provide direct-reading, low-voltage, 7-light-bar filament digital readouts. Six digits occupy as little as 5/16 x 1 in. of panel space. Weight: 1 to 3 g. Display speed: as fast as 10 msec. Price depends on the model. In quantities of 0-9 Midgi-Lites Alpha Lites range from \$30-\$75.00. The "M" models (\$64-\$75.00) are extremely thin, 3/16 in. from front to back. Digits occupy only 1/6 sq in. of panel space and alpha-numerics 1/5 sq in.

Pinlites, Inc.
1275 Bloomfield Ave.
Fairfield, New Jersey 07006
(201) 226-7724

Digital Voltage Controlled Generator

The Model 113 Digital VCG is a precision source of sine, square, triangle, and ramp waveforms that provides ease of selection, accuracy, and repeatability. It offers pushbutton control of frequency, function, and amplitude plus voltage

control of frequency by external input. Amplitude is controlled by a 50-ohm attenuator that offers 10-dB steps from 0.1 V to 10 V, peak-to-peak. Vernier controls allow overlap between digitally selected values for both frequency and amplitude. For frequency search, frequency pushbuttons may be switched over to a 1-turn knob control. Price: \$595.00.

Wavetek
8159 Engineer Road
San Diego, California 92111

Solid State Numeric Display

The H-P solid state numerical display utilizes gallium arsenide phosphide diodes and an IC driver/decoder chip to deliver bright red numerals. The size of the unit is 1 x 1/2 x 1/10 in. and requires less than 5 V. No driver elements or special interfacing is necessary. Input is four-line 8-4-2-1 BCD.

Hewlett-Packard
1501 Page Mill Road
Palo Alto, California 94304

Infrared Products

Designed for use with a solid state transistor amplifier and a sensitive relay, a glass fiber optic is available with infrared detector for \$2.95. Catalog No. 92CU987 combines a glass fiber sensor 1/16 in. diam to a dual-element microsize infrared detector wired for micro transistor circuitry.

The combination detector-sensor and amplifier is priced at \$6.95 (Catalog No. 92CU988).

Poly Paks
P.O. Box 942
South Lynfield, Massachusetts 01940

Microminiature Relays

Series MA and MS Microminiature relays weigh 2.9 g and 4.5 g, respectively. Rated load is 1 A at 32 V dc. Available only in DPDT contact configurations.

Hi-G, Inc.
Spring Street & Route 75
Windsor Locks, Connecticut 06096
(203) 623-2481

Multiplexers

Multiplexers of various types are manufactured and/or supplied by the following firms:

Acton Labs
Div. Bomar Instr. Corp.
531 Main St.
Acton, Mass. 01720

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

Amperex Corp.
Science Accessories
65 Station St.
Southport, Conn. 06490

Analogic Co.
Div. Gordon Engineering Co.
296 Newton St.
Waltham, Mass. 02154

Aritech Corp. Aero Space Research 130 Lincoln St. Brighton, Mass. 02135	Datum, Inc. 170 E. Liberty Ave. Anaheim, Calif. 92801	Howell Instruments, Inc. 3479 W. Vickery Blvd. Ft. Worth, Tex. 76107
Astrodata, Inc. 240 E. Palais Rd. Anaheim, Calif. 92805	Digital Equipment Corp. 146 Main St. Maynard, Mass. 01754	Information Instruments, Inc. 62 Enterprise Dr. Ann Arbor, Mich. 48103
Astrosystems, Inc. 6 Nevada Dr. New Hyde Park, N.Y. 11040	Dorsett Electronics, Inc. 1143 S. 71st E. Ave. Tulsa, Okla. 74112	Instrumentation Technology Corp. 18811 Napa St. Northridge, Calif. 91324
Automation Dynamics Corp. 35 Industrial Parkway Northvale, N.J. 07647	Dynamic System Electronics 1040 W. Alameda Dr. Tempe, Ariz. 85281	Instrument Products Div. 3M Co. 300 S. Lewis Rd. Camarillo, Calif. 93010
Avco Electronics Div. 2630 Glendale-Milford Rd. Cincinnati, Ohio 45241	Dynamics Instr. Co. 583 Monterey Pass Rd. Monterey Park, Calif. 91754	Intercontinental Instrs., Inc. 500 Nuber Ave. Mt. Vernon, N.Y. 10550
Beckman Instruments, Inc. 2200 Wright Ave. Richmond, Calif. 94804	DynaPlex Div. Teledyne Telemetry Co. Box 341 Princeton, N.J. 08540	Interstate Elect. Corp. 707 E. Vermont Ave. Anaheim, Calif. 92805
Binary Electronics of California 1429 N. State College Blvd. Anaheim, Calif. 92806	Dytro Corp. 63 Tec St. Hicksville, N.Y. 11801	Ithaco, Inc. 413 Taughannock Blvd. Ithaca, N.Y. 14850
Burr-Brown Research Corp. P.O. Box 14400 International Airport Ind. Pk. Tucson, Ariz. 85706	EMR-Telemetry Weston Instruments, Inc. Box 3041 Sarasota, Fla. 33578	Janus Control Div/Tyco 296 Newton St. Waltham, Mass. 02154
Cimron Div. Lear Siegler, Inc. 1152 Morena Blvd. San Diego, Calif. 92110	Electro-Mechanical Research, Inc. P.O. Box 44 Princeton, N.J. 08540	Lancer Electronics Corp. 1416 W. Main St. Norristown, Pa. 19401
Control Equipment Corp. 19 Kearney Rd. Needham Hgts., Mass. 02194	Electronic Engineering Co. of California 1601 E. Chestnut Ave. Santa Ana, Calif. 92701	Leeds & Northrup Co. Sumneytown Pike North Wales, Pa. 19454
Control Logic, Inc. 3 Strathmore Rd. Natick, Mass. 01760	Electronic Modules Corp. P.O. Box 141 Timonium, Md. 21093	Monitor Systems, Inc. 401 Commerce Dr. Ft. Washington, Pa. 19034
Cunningham Corp. 10 Carriage St. Honeoye Falls, N.Y. 14471	Garrett Corp. 9851 Sepulveda Blvd. Los Angeles, Calif. 90045	Navigation Computer Corp. Valley Forge Indl. Pk. Norristown, Pa. 19403
Data-Controls Systems, Inc. E Liberty St. Danbury, Conn. 06810	General Electric Comm. Prods. Dept. Box 4197 Lynchburg, Va. 24502	Non Linear Systems, Inc. P.O. Box N Del Mar, Calif. 92014
Data Device Corp. 100 Tec St. Hicksville, N.Y. 11801	Gulton Industries, Inc. Metuchen, N.J. 08840	North Atlantic Industries, Inc. 200 Terminal Dr. Plainview, N.Y. 11803
Data Systems Div. 15000 Central Ave. S.E. Albuquerque, N.M. 87112	Hewlett-Packard 1501 Page Mill Rd. Palo Alto, Calif. 94304	Optron Corp. 335 S. Salinas St. Santa Barbara, Calif. 93103
Datascan, Inc. 1111 Paulison Ave. Clifton, N.J. 07011	Honeywell Test Instr. Div. 4800 E. Dry Creek Rd. Denver, Colo. 80217	Pastoriza Electronics 385 Elliot St. Newton Upper Falls, Mass. 02164
		PPM, Inc. 7016 Euclid Ave. Cleveland, Ohio 44114

Preston Scientific, Inc.
805 E. Cerritus Ave.
Anaheim, Calif. 92805

RC 95, Inc.
9 E. 38th St.
New York, N.Y. 10016

RO Associates, Inc.
917 Terminal Way
San Carlos, Calif. 94070

Radiation, Inc.
Control Div.
Box 430
Melbourne, Fla. 32901

Raytheon Computer Div.
2700 S. Fairview St.
Santa Ana, Calif. 92704

Redcor Corp.
7800 Deering
Canoga Park, Calif. 91304

Republic Adv. Tech. Sys. Group
9754 Deering Ave.
Chatsworth, Calif. 91311

The Roback Corp.
1000 Buck Rd.
Huntingdon Valley, Pa. 19006

Rosemount Engineering Co.
4900 W. 78th St.
Minneapolis, Minn. 55435

Scientific Data Systems
555 S. Aviation Blvd.
El Segundo, Calif. 90245

Solid State Electronics Corp.
15321 Rayen St.
Sepulveda, Calif. 91343

Space & Tactical Systems Corp.
1 Garfield Circle
Burlington, Mass. 01813

Systems Engineering Labs, Inc.
P.O. Box 9148
Ft. Lauderdale, Fla. 33310

Technical Apparatus Builders
109 Liberty St.
New York, N.Y. 10006

Teledyne Telemetry
9320 Lincoln Blvd.
Los Angeles, Calif. 90045

Theta Instrument Corp.
Fairfield, N.J. 07006

Towson Laboratories, Inc.
3500 Parkdale Ave.
Baltimore, Md. 21211

United Aircraft
Norden Div.
Street Road
Trevose, Pa. 19047

United Systems Corp.
918 Woodley Rd.
Dayton, Ohio 45403

Vidar Corp.
77 Ortega Ave.
Mountain View, Calif. 94040

Sensitive Movement Recorder

The Ballistocardiograph measures less than 1 Å of motion. An egg cup transducer is sensitive enough to measure the heart rate of a chick embryo after only 3 days of incubation. The unit is designed to measure 3-100 cps, but special electronic circuitry can be provided to measure outside this range. A circular modified cage is available as a transducer for measuring the movement of live insects or small animals. The Ballistocardiograph comes complete with two preamplifiers and amplifier unit with switchable band pass filter. Price: \$2,375.

United States Technical Development Sales Co.
3620 G Street
Philadelphia, Pa. 19134
(215) 426-9400

Miniature Switch

Oak Mfg. Co. is marketing a rugged switch that can be used for printed circuit (PC) board applications. Switching can be accomplished on the board with no necessity for running leads to a standard-size switch at a remote point. The switch stator has a center pin contact and 10 outer pin contacts molded in. A ball rotor attached to an activating shaft makes contact between the center pin and the desired outer pin. The pins extend through the stator and act as leads that can be dip soldered to a PC board. The switch is activated by either an extended or screwdriver slotted shaft.

Type: 1 pole-10 positions (continuous rotation). Also available with stops limiting rotation to 2 through 10 positions.

Rating: Up to ½ A at 28 V dc; 0.10 A at 120 V ac noninductive.

Size: .687 in. L from top of extended shaft to ends of outer pin contacts. Without extensions, .406 in. Diam: .300 in.

Oak Manufacturing Co.
Crystal Lake, Ill. 60014
(815) 459-5000

Digital Multimeter

The X-3A Digital Multimeter is a solid-state device with VTVM capabilities specifically designed to replace moving-needle analog meters with an easily read digital display. The instrument has wide capabilities.

dc V: 10 µV to 1K in six ranges (to 30 KV with optional HV Probe).

ac V: 0.5 V to 300 V in three ranges.

Ohms: 100 milliohms to 2000 megohms in nine ranges.

Current: 10 picoA to 200 mA in eight ranges (to 2 A with optional shunt).

The X-3A features 2000 digits per range, full input protection on all ranges and function, overload indicator, power supply output (40 V, 200 mA), all NIXIE readouts, and a scaled analog output. The latter is scaled 3 mV/digit 1 mA signal that may be used to drive a strip chart recorder or other recording device,

producing a permanent log of measurements.
Price: \$695.00.

Non-Linear Systems, Inc.
Del Mar, Calif. 92014
(714) 755-1134

Transducers, Acoustical

Acoustical transducers of various sorts are available from the following:

Acoustica Associates, Inc.
5331 W. 104th St.
Los Angeles, Calif. 90045

Audiosears Corp.
South St.
Stamford, N.Y. 12167

B & K Instruments, Inc.
5111 W. 164th St.
Cleveland, Ohio 44142

Bendix Corp.
Electrodynamics
11600 Sherman Way
North Hollywood, Calif. 91605

Don Bosco Electronics, Inc.
Littell Rd.
Hanover, N.J. 07936

CBS Laboratories
227 High Ridge Rd.
Stamford, Conn. 06905

Electronic Research Assoc., Inc.
67 Sand Park Rd.
Cedar Grove, N.J. 07009

Empire Scientific Corp.
1055 Stewart Ave.
Garden City, N.Y. 11530

Endevco
Div. Beckman, Dickinson
801 S. Arroyo Parkway
Pasadena, Calif. 91105

General Radio Co.
300 Baker Ave.
West Concord, Mass. 01781

Gilmore Industries, Inc.
3355 Richmond Rd.
Cleveland, Ohio 44122

Gulton Controls & Instr.
1644 Whittier Ave.
Costa Mesa, Calif. 92627

Gulton Industries, Inc.
Metuchen, N.J. 08840

Hewlett-Packard
1501 Page Mill Rd.
Palo Alto, Calif. 94304

Honeywell Test Instr. Div.
4800 E. Dry Creek Rd.
Denver, Colo. 80217

Ithaco, Inc.
413 Taughannock Blvd.
Ithaca, N.Y. 14850

Kaman Corp., Nuclear
Garden of Gods Rd.
Colorado Springs, Colo. 80907

Kistler Instrument Corp.
8947 Sheridan Dr.
Clarence, N.Y. 14031

Massa Div.
Dynamics Corp. of America
280 Lincoln St.
Hingham, Mass. 02043

Miles Reproducer Co.
598 Broadway
New York, N.Y. 10012

PCB Piezotronics, Inc.
Box 33
Cheektowaga, N.Y. 14225

Rohde & Schwarz Sales Co.
111 Lexington Ave.
Passaic, N.J. 07055

Sonotone Corp., Div. Clevite
Old Saw Mill River Rd.
Elmsford, N.Y. 10523

Straza Industries
790 Greenfield Dr.
El Cajon, Calif. 92020

Whittaker Corp.
Instr. Sys. Div.
9601 Canoga Ave.
Chatsworth, Calif. 91311

BRIEFS

Ultrasonic Blood Velocity Indicating Instruments

Several manufacturers are marketing instruments for measuring blood velocity that utilize Doppler shift principles. Basically the Doppler effect refers to an apparent change in frequency of electromagnetic or sound vibrations of a source when the source is moving relative to the observer. The manner in which this effect is used in blood velocity measurement is exemplified by the Magnaflux MD-500 ultrasonic diagnostic instrument used for monitoring fetal heartbeat, and arterial blood surveys (Magnaflux Corp., Medical Division, 7300 West Lawrence Ave., Chicago, Ill. 60656). An ultrasonic beam is directed diagonally through a blood vessel and a small percentage of the sound beam is reflected by moving particles in the blood. Some of the reflected sound, which is at a different frequency from the transmitted beam, is picked up by a receiving crystal in the transducer probe. This reflected sound and the transmitted frequency are then mixed. A

beat frequency is produced that is related to the velocity of the particles in the blood (the reflector). The beat frequencies are converted into audible sounds, unlike those heard by a stethoscope. Higher blood velocity produces higher frequency (and subsequent pitch judgment) of the audible sound. The pulsing sound of arterial flow apparently can be distinguished from the more continuous patterns of venous flow; and differences in heart rate of mother and fetus allow fetal flow signals to be recognized. Data presented by John J. Barton, MD, to the Chicago Gynecological Society, April 21, 1967, show that measured from the start of the last menstrual period, fetal life can be detected with 35% accuracy after 10 weeks, 80% after 12 weeks, and approximately 100% after 16 weeks.

Although ultrasonic blood velocity indicating instruments are convenient and useful, the experimental study of a phenomenon such as fetal heart rate is not a simple matter. Methods of study with references are covered by Welford, N. T., and Sonntag, L. W. "Recording fetal heart rate as a behavioral measure." In J. B. Sidowski and S. Ross (Eds.), *Instrumentation Issue*, American Psychologist, in press.

Biological Power Sources

In recent years a great deal of effort has been directed to the development of bioelectric power supplies that use chemical reactions within the animal to generate power. Biological fuel cells have been researched, and platinum electrodes embedded in the heart have been used to obtain voltage outputs of .25 V. Now scientists at G.E. have developed a method for implanting zinc and platinum electrodes within the body to produce 50 μ A at 0.8 V. A rabbit has been generating power for a transmitter implanted in its body for over 9 months, apparently with no biological damage from chemical reactions.

Transistor Troubleshooting

The Tektronix Service Scope No. 51 recently cited hints for checking transistor resistance with an ohmmeter that are worth repeating.

First, be sure that the ohmmeter's voltage source and current are kept within safe limits, 1½ V and 2 mA. On most meters voltage and current below these values will be provided if the 1-k scale is selected. The following normal resistance readings can be expected using a R x 1-k Ω range with an unconnected transistor. (Connect the ohmmeter test leads to the transistor, and then reverse the connections. This allows you to observe the effects of the polarity reversal of the voltage applied from the ohmmeter to the transistor.)

Emitter-Collector: High readings should be expected both ways, approximately 100 k Ω to 500 k Ω . Emitter-Base: 200 k Ω or more one way, low readings the other (approximately 400 Ω to 3.5 k Ω). Base-Collector: High reading one way and low the other, approximately 200 k Ω or more and 400 k Ω to 3.5 k Ω , respectively.

Multicolor Display

A multicolor video cathode ray tube has been developed by Sylvania to display information in red, orange, green, and yellow. Data of all kinds can be displayed on the tubes that range in size from 1-27 in. The electron tube features a green phosphor, a "rare earth" europium red phosphor, and a single electron gun. The beam of the gun activates the phosphors, the layers of which are separated by a special barrier on the face of the display. The red phosphor is activated by a low-voltage electron beam; higher voltage stimulates the green. The low voltage used for activating the first phosphor is prevented from activating the second by the special barrier. Red and green are presented simultaneously by switching from high to low voltage at a very rapid rate. By

activating the phosphors at steps between the voltage extremes, yellow and orange are added.

Instrument to Test Infant Hearing

Zenith has developed a compact electronic screening instrument (size of a flashlight) reported to detect infant hearing difficulties within hours after birth. The Neo-meter is a hand-held, battery-powered device weighing 10½ oz. Test signals resemble the tweet of a bird. Four pushbuttons control individually calibrated levels of sound.

Evoked Response Audiometer

A system for evaluating auditory activity in infants, small children, mentally defectives, and uncooperative adults has been produced by workers at the Princeton Applied Research Corp., Princeton, N.J. The system consists of an audiometer, a solid-state EEG amplifier, and an analog-type signal-averaging computer. These instruments operate to average electroencephalographic responses to a series of auditory stimuli. Critical parameters offered are: intensity level, tone frequency, pulse duration, pulse repetition rate, rise and fall times, integrating time constant, and others. Price is reported to be approximately \$9,300.

Computer Languages

Information Control Systems, Inc., of Ann Arbor, Michigan, has developed two languages for the PDP-8 series computers. ICS-extended Fortran is a noninterpretive, standard Fortran II compiler that features fast compilation and relocatable object code. ALICS (Assembly Language by ICS) offers automatic paging, relocatable object code, and one tape-pass assembly.

Hairless Mice

Charles River Breeding Labs., Wilmington, Mass., recently took advantage of a spontaneous mutation and, with selective breeding, produced bald mice.

Transistor Symbols

I_b = Base current
 I_c = Collector current
 I_e = Emitter current
 I_i = Input current
 V_b = Base voltage
 V_c = Collector voltage
 V_i = Input voltage
 P_i = Input power
 P_o = Output power
 R_i = Input resistance
 R_o = Output resistance
 A = Power gain
 A_e = Voltage gain
 A_i = Current gain
 α = Current gain of the common base

Replacement for the LINC-8 Computer

The new PDP-12 computer system replaces the LINC-8 for laboratory applications. The PDP-12 laboratory configuration includes a central processor with a 4,096-word memory expandable to 32,768 words, two mag-tape storage units, a 7 x 9 in. CRT display, a data terminal, a 16-channel analog to digital converter and multiplexer, and a paper tape reader and punch. Forty-three basic instructions are inherent to the system.

The display shows the last 32 lines of any program being developed and if a correction is needed, the cursor need only be pointed at the error. Assembly, editing, and monitoring programs are separate in the system; however, they appear as one, using common commands.

Digital Equipment Corp.
146 Main St.
Maynard, Mass. 01754
(617) 897-8821

Computer Automatically Reads Hand Printed Data

At the recent meetings of the Human Factors Society in Chicago, Dr. D. B. Devoe of the Sylvania Applied Research Lab. reported on an automatic computer recognition system. The computer is "hand fed" by an electronic ballpoint pen that simultaneously transmits data to the computer for storage or analysis as it writes. The pen and its electronic note pad enable an individual to communicate with a computer through written symbols and diagrams. Since computers can recognize printed material only when each letter and number conforms to exact specifications, an operator must be trained and the rules or

constraints determined by the computer's recognition logic imposed. Immediate visual feedback from a display allows the operator to see the material as printed and to make corrections immediately. Apparently, teaching individuals to print clearly enough for accurate identification is relatively simple.

Radio Frequencies

Very low frequencies	(VLF)	3-30 kc
Low frequencies	(LF)	30-300 kc
Medium frequencies	(MF)	300-3,000 kc
High frequencies	(HF)	3-30 Mc
Very high frequencies	(VHF)	30-300 Mc
Ultra high frequencies	(UHF)	300-3,000 Mc
Super high frequencies	(SHF)	3,000-30,000 Mc
Extremely high frequencies	(EHF)	300,000-3,000,000 Mc