260 South Forge Street
Akron, Ohio 44308

Allied-Radio Shack

When Allied merged with Radio Shack, the new combined catalog was priced at \$1, the price being credited to a buyer with a minimum purchase. The Allied-Radio Shack catalog is now free.

Infant Monitor

The KDC IM-300 senses and monitors infant ECG and respiration through two biopotential electrodes. Electrodes are applied, and the connections inserted into the S's cable. When power is turned on, a green light comes "on," confirming continuity and an acceptable impedance level (1,500 ohms). If the lamp goes off, the electrodes have come off or pulled out of the cable, or the gel has dried. ECG and respiration traces are shown on a scope display. The IM-300 is advertised as displaying breaths as shallow as .2 ohm up to 10 ohms. Heartbeats are detected and are displayed from .25 to 4 mV. Additional traces may be specified to permit full screen display of other parameters, such as pulse, EEG, and blood pressure. The same company markets a ECG/respiration simulator.

KDC

1210 North Batavia Street
Orange, California 92667

Behavioral Research Equipment

Biomedical and behavioral research laboratory equipment are marketed by Predco. Animal units include a rat chamber (\$50-\$55), grain feeder (\$40), pellet feeder (\$80), rat lever (\$25), pigeon chamber (\$47-\$55), and pigeon key (\$25).

Predco

202 Temple Road
Waltham, Massachusetts 02154

Animal Operating Table and Accessories

The Model AOT-100 is an animal operating table priced at \$219.50. The unit is constructed of hard rock laminated maple and aluminum structural supports. Casters (5 in.) with foot brakes are standard. The finish is resin-sealed and easy to clean. The size of the AOT-100 is 24 in. wide, 48 in. long, and 40 in. high.

An animal Hold-Down Assembly permits a number of tie-down points around the work surface perimeter. Price: \$75. An Electrode Holder Assembly is \$25.

United Technical Corporation

West Concord, Massachusetts 01781

Digital Tape Cassette Recorder

The Raymond Cassette Digital Recorder Model 6404-01 is available in these configurations: ac or dc capstan drive, bidirectional or unidirectional operation, read only or read/write, read-after-write, packing density to 800 BPI (1,600 FCI), tape speeds 3-18 ips in transfer mode, start/stop time as low as 20 msec, and two-track redundant or two-channel recording. The new package incorporates two printed circuit boards, integral to the assembly, which contain sufficient circuitry to provide a consistently repeatable interface, regardless of variation in electromechanical components such as heads, motors, etc.

The Model 6406-01 recorder is priced as follows: bidirectional read and write, \$1,200; read forward only, \$1,060; and write forward only, \$1,040. For read-after-write, add \$70 per unit.

Raymond Engineering, Inc.

217 Smith Street
Middletown, Connecticut 06457

Animal Restrainers

Small-animal restrainers can be used for injections and infusions, surgery, patch testing, shaving, and certain types of perfusions. The Baruch guinea pig and rat Fastainers keep the Ss' legs secured by means of soft cotton ties passed through holes in the base and held there by pegs. The Fastainer base consists of a 9 x 20 in. base of durable, phenolic plastic. The animal is placed in a prone or supine position and its head is held securely by a hook and ring clamp. Price: \$75.

A rabbit Fastainer consists of a 15 x 30 in. base constructed of anodized aluminum. A plastic insert reduces skin chilling and makes cleaning easier. The base holds a padded body support and four adjustable padded leg clamps. The rabbit is also held by a Velcro belly band. The animal is positioned on its back with legs extended. Price: \$150.

Baruch Instruments Corporation

P.O. Box 1244
White Plains, New York 10601

Briefs

Name Change

Fabri-Tek Instruments, Inc., has changed its name to Nikolet Instrument Corporation, 5225 Verona Road, Madison, Wisconsin 53711.

Multiplex Switch

A monolithic 8-channel multiplex

switch by Siliconix, Inc. (2201 Laurelwood Road, Santa Clara, California 95054) includes a 1 out of 8 decoder on an IC chip with TTL-compatible logic input lines. The unit is designed for A/D converters and multiplexing in analog or digital data transmission systems and features enable control, zero offset voltage, and a high on/off ratio.

Data General User's Society

Data General, manufacturer of the NOVA and SUPERNOVA minicomputers, now sponsors biannual meetings of the users group, which now lists a large number of programs. Inquiries should be made of the Executive Secretary of the Data General Users Group Library, Data General Corporation, Southboro, Massachusetts 01772.

Solid-State Control

Lehigh Valley Electronics is distributing a workbook containing information covering the nature and use of solid-state programming equipment manufactured by LVE. Sections 1 and 2 of the four-section publication, however, contain information of more general instructional interest for those lacking technical knowledge of control equipment. The same company is developing a volume covering aversive electric shock with a similar format. Information may be obtained from Lehigh Valley Electronics, Box 125, Fogelsville, Pennsylvania 18051.

Semiconductor Replacements

For 25 cents, interested readers can obtain a 40-page publication listing thousands of semiconductor devices with their semitron replacements. The booklet is entitled "Semiconductor Replacement and Interchangeability Guide" and may be ordered from Semitronics Corporation, 15 Canal Street, New York, New York 10013.

Measuring Heartbeat

The Cryogenics Division of the National Bureau of Standards has devised a device for measuring heartbeat without direct physical or electrical connections. Basically, electrical signals are generated which are proportional to the heart's magnetic pulses when the device is placed near the heart. A magnetocardiogram of the heartbeat is provided by these signals when the instrument is used to drive a scope or a chart recorder. The magnetocardiogram is similar to an EKG. Of course, the unit has drawbacks. For example, measurements must be made away from magnetic fields produced by motors or lab equipment, and the

earth's magnetic field must be compensated for.

Psychological Equipment

Colne Instrument Co., Ltd. (51 Lion Road, Twickenham, Middlesex, England) markets psychological equipment.

Stepper Motor Terminology

Most of us are familiar with stepping relays, also called rotary stepping switches, that have contacts which move to successive positions each time the activating coil is energized. Stepper motors are less familiar.

Basically, a stepper motor is an electromagnetic device that transforms electrical input to mechanical form in discrete and equal increments of rotary shaft motion. These increments are called "steps." A drive circuit provides the usual motor excitation source and steps the motor in response to signal pulses applied to the circuit. There is a one-to-one correspondence between the motor steps and these pulses. Net shaft rotation is controlled by the number of pulses applied to clockwise and counterclockwise command drive circuit terminals. Shaft velocity is controlled by following a constant or varying series of pulses. This synchronous feature makes the motor an ideal integrator. It also permits operation of several motors in step with each other at remote locations if all are driven from the same circuit.

Three common types of stepper motors are the variable reluctance, the permanent magnet, and the hybrid (contains features of the first two). The principal distinguishing feature is rotor construction. Typical step angles for the magnet types are 90 and 45 deg. The variable reluctance and hybrid designs are attainable in smaller step angles; 15 and 7½ deg are common.

Terms used in describing performance characteristics or stepper motor operation are as follows: Phasing sequence—describes the electrical input required by a particular motor. Maximum response rate—the highest pulse rate an unloaded motor can follow from a standing start without missing a step. Start range—the range of switching rates within which a motor can start without losing steps. Pull-in rate—the maximum switching rate at which a frictionally loaded motor can start without losing steps. Pull-in torque—the maximum torque that can be applied to the motor shaft at pull-in rate. Slew range—the range of switching rates within which a motor can run unidirectionally and follow the switching rate, within a certain

acceleration, without losing steps, but cannot start, stop, or reverse on command. Pull-out rate—the maximum switching rate that a frictionally loaded motor can follow without losing steps. Pull-out torque—the maximum torque that can be applied to a motor shaft when running at pull-out rate. Holding torque—the maximum torque applicable to the shaft of a steadily excited stepper motor (zero pulse rate) in one phasing sequence step.

Stepper motors are considered a digital counterpart to the servo motor, but generally offer more torque without a corresponding increase in weight or size. The motors are used as incremental drive motors in chart recorders and tape drive units, as receiving elements in remote position indicating equipment, as digital-to-analogue converters, and as digital computing devices.

Guinea Pigs as Experimental Subjects

A few years ago, about 900,000 guinea pigs were used for research, three times more than were used 5 years before (1964). In the paragraphs to follow, I would like to present several bits of information covering the animal that might be of use to researchers contemplating its use.

The adult male pig weighs about 1,000-1,200 g; the female weighs 850-900 g. Female breeding age is approximately 4 months, give or take a month, and the male breeding age is about the same. The weight of the animals at this time is 500-550 g. Although the estrous cycle is questionable, the gestation period is 58-68 days. The average litter size is 1-6, with 4 being about average for healthy pigs. Age of weaning is about 10 days. Breeding life of the female and male is about 5 years.

The animals acclimatize slowly and one can expect that a period of 3 to 5 days will be needed for newly shipped animals to readjust to a new environment.

The guinea pig has a dietary need for ascorbic acid (Vitamin C) and a relatively high requirement for potassium, magnesium, folic acid, thiamin, and Vitamin A. The need for Vitamin D may be lower than that for some other animals.

The best means for minimizing the incidence of stillbirths appears to be regulating the fetus so that it is approximately 90 g at birth and an adequate and consistent consumption of water on the part of the dam during pregnancy. Daily water requirements for the adult animal of either sex is cited in several sources as 50-100 ml.

Recommended temperature is 70°-72° F, or so, with humidity at about 50%.

Notes

An improved technique for determining brain reward thresholds in primates*

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With few exceptions, the majority of studies of intracranial self-stimulation (ICSS) have relied upon relatively simple measures of rate of operant response as the primary dependent variable. In recent years, however, the inadequacies of simple rate measures have become apparent, and a number of alternative behavioral paradigms for studying the neurophysiological substrate of reinforcement have been suggested (Hawkins & Pliskoff, 1964; Hodos, 1961, 1965; Hodos & Valenstein, 1962; Stein & Ray, 1959; Valenstein, 1964; Valenstein & Beer, 1962; Valenstein & Meyers, 1964). One such paradigm is the threshold-measuring technique of Stein and Ray (1960), in which an animal's response on a primary manipulandum delivers ICSS while at the same time stepping the intensity of electrical stimulation downward by activating successive parts of a resistor network placed in series with the output of a stimulator. Responses on a secondary manipulandum reset the stimulation level to a maximum value chosen by the E. Thus, by determining the frequency distribution of the stimulus levels reached before being reset to maximum, an approximate determination may be made of threshold values for reinforcing brain stimulation at a given anatomic locus.

We have used this threshold technique during the course of several studies of ICSS in rats and rhesus monkeys. While it has proven to be a generally useful technique and is clearly sensitive to a variety of pharmacological and electrophysiological manipulations (Gardner, 1969; Stein & Ray, 1960), it is not without limitation. Its principal drawback consists of allowing an animal to adopt a perseverative alternating response pattern in which the primary and secondary manipulanda are repeatedly depressed in turn, thus keeping the stimulus intensity at its maximum level, even though the actual threshold value for

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