

PRINTOUT

by Joseph B. Sidowski

Products

Printed Circuits

Injectorall markets a printed circuit kit (Model 650) using photosensitive techniques for \$10.80. Photoetched printed circuit boards are made directly from magazine templates. The kit consists of two sensitized copper-clad boards, a developing lamp, a test negative, exposure glass, clamps, etchant, developer, trays, resist remover, and drills. No darkroom is required.

Injectorall
4 North Rd.
Great Neck, N.Y. 11024

Thumbwheel Switches

A. W. Haydon Co. of Waterbury, Conn., is marketing miniature thumbwheel switches which snap together side by side on 5/16-in. centers. Switch versions include decoders, encoders, decimal, and 1, 2, 4, and 8 bcd code, straight and complimentary.

Fiberscopes

Low-cost fiberscopes are used to look into hard-to-reach places or to relay an image from a remote area. Flexible glass fibers transmit images in good resolution, in sizes up to ¼ in. sq and lengths up to 4 ft. A "Peeperscope" is available as a sample of a low-cost fiberscope at \$39.95. It has a 7x eyepiece and a focusable objective lens. Length is 18 in.

American Optical Corp.
Fiber Optics Dept.
Southbridge, Mass. 01550

Tape System for Minicomputers

The CO-500 is a single-drive tape system with a transfer rate of 8,400 bytes/sec and direct access to any block to read, write, or verify data. It can interface with any minicomputer. Tape speed is 60 in./sec, and the access time is 8.7 sec. Tape format is 256 16- or 18-bit words/block at a packing density of 400 bits/in. Price: \$3,500.

Computer Operations, Inc.
10774 Tucker St.
Beltsville, Md. 20705

Cassette Tape Transport

The Canberra Model 2020 Cassette Tape Transport System is priced at \$6,900; this includes three tape drives, a general controller, interface and

cables for a particular computer, and operating system software. Interfaces and software are available for the DEC PDP/8 and PDP/11 series of minicomputers; NOVA interfaces should be available at the time of this printing. The Model 2020 can search bidirectionally, backspace a single record, and simultaneously read and write on separate cassettes. Directly addressable files may be reached in an average access time of 20 sec. A three-cassette system holds 900,000 bytes of data. Changing a single circuit card and cable mates it to any minicomputer data bus.

Canberra Industries
45 Gracey Ave.
Meriden, Conn. 06450

CRT/Cassette Terminal

The Hazeltine Terminal/Tape Cassette System features dual tape drives and paper-tape emulation. Operation is on RS-232B connections using Bell 103A or 202C Datasets or equivalents. The system may be hardwired to modern adaptors of communications controllers and minicomputers. Price: \$4,985.

Hazeltine Corp.
Greenlawn, N.Y. 11740

Printer System for Minicomputers

The 5096-960 printer system consists of a tape-to-printer controller with memory, an IBM-compatible magnetic-tape drive and an A. B. Dick 960 Videojet printer which operates at 300 char/sec and generates up to 200 char/line in variable formats. The system comes with a nine-channel 800 char/in. tape drive with 7-in. reels as standard. Optional models are available at higher speeds, channel compatibilities, and larger reels. For on-line minicomputer use, the system's computer adaptor is connected to the programmed input/output bus of the computer. Price: \$17,000.

Datum, Inc.
170 E. Liberty Ave.
Anaheim, Calif. 92801

Chart Viewer

Chartview is a motor-driven back-lighted variable-speed strip chart viewer which handles any chart between 1 and 12 in. on any size core up to 3 in. in diam. The Chartview operates vertically or horizontally. Price: \$265.

O. S. Walker Co., Inc.
Rockdale St.
Worcester, Mass. 01606

Time Delay Relay

The Model TDP is a panel-mounted solid-state time-delay relay. The SPDT output contacts are rated at 10 A: Operation on all ac and dc voltages from 24 V. Parallel inputs can control multiple timing functions, including automatic repeat of timing cycle with controlled delay.

Vanguard Relay Corp.
225 Cortland St.
Lindenhurst, N.Y. 11757

Relay Sockets

Eight- and 11-pin relay sockets have closed-back construction, top wired, permanently marked terminals, and eight inserts. No insulation is required for direct panel mounting.

Custom Connector Corp.
1738 E. 30th St.
Cleveland, Ohio 44114

Alpha 16 Minicomputer

The new Alpha 16 sells for \$3,550 as a stand-alone computer with 1,600-nsec full-cycle time and 4k core memory expandable to 32k. Alpha 16 is a 16-bit minicomputer with standard features that include: hardware multiply/divide, three vectored priority interrupts, two direct memory channels, and block I/O. The system includes 122 basic instructions. The Alpha processor and memory are on 15 x 16½ in. printed circuit boards. Since the \$3,550 price is for single orders, quantity orders rate discounts.

Computer Automation, Inc.
895 W. 16th St.
Newport Beach, Calif. 92660

Behavior Modification Equipment

The Pants Alert is a portable toilet training device consisting of an electronic alarm package and elastic belt designed to sound an alarm whenever the pants are wet. Price: \$39.

The Potty Alert consists of an electronic alarm package and potty bowl designed to sound an alarm whenever a urinary response is made while the subject is sitting on a toilet seat. Price: \$39.

Lehigh Valley Electronics, Inc.
Box 125
Fogelsville, Pa. 18051

DigiLab

DigiLab is completely portable with built-in power supplies: +28 V dc and -12 V dc. The unit uses standard 200 Series DigiBit Logic Modules hardwired at the factory to a 600 Point Vector Plugboard. Program changes from one experiment to another take place through the use of removable plugboard panels. All information for programming is given on a template located in the fold-down front of the console. Logic diagrams from specific programs are drawn with a grease pencil on plastic overlays which fit on top of the template. Overlays can be stored.

BRS Foringer
5451 Holland Dr.
Beltsville, Md. 20705

Solid-State Relays

The Model 640-1 Seren DIP is a fully isolated, bipolar output, solid-state relay housed in a TO-116 dual in-line package. It is a SPST device capable of bounceless switching up to 0.1 A @ 50 V ac or dc and at switching rates up to 100 kHz. The unit is TTL compatible and replaces DIP reed relays (on a pin-for-pin basis, in most instances) and FET analog switches, with the following advantages: low noise and low contact resistance, higher switching loads, essentially infinite life, no inductive coil kickback, higher output voltage, extremely high operating speeds, low open circuit capacitance, capable of withstanding overloads, and switches up to 5 VA resistive, inductive, or capacitive. Unlike DIP reed relays, the Seren DIP is said not to require diode suppression or bounce elimination supportive circuitry; nor does it require external power supplies such as required when using a FET analog switch. The unit is designed for analog and transducer switching, programmable gains for operational amplifiers, lamp drivers, A/O converters, series choppers, multiplexers, scanners, and other applications. It can be used to drive ICs directly. Single quantities sell for \$9.90.

Teledyne Relays
3155 W. El Segundo Blvd.
Hawthorne, Calif. 90250

Displays

The Data Lit 8 is a seven-segment gallium-arsenide-phosphide red-light-emitting diode numeric display. The Data Lit 81 is a polarity, colon, and overflow companion. Ease of mounting is assured by stagger-bent 0.100-in. centers of the lead spacings. The units are IC compatible, with high luminance (350 fL at 20 mA) and low power consumption (200 mW).

PDP/11 to IBM-360 Computer Interface

The CCS 371 interface unit is priced at \$9,500, including hardware and software, and provides interface between the DEC PDP/11 and the IBM-360 computer systems.

Custom Computer Systems
40 South Mall
Plainview, L.I., N.Y. 11803

Hydraulic Micropositioner

Ralph Gerbrands Co., Inc., recently introduced a new hydraulic microelectrode positioner for chronic recording of cellular electrical activity. Two-way action provides positive pressure drive in each direction (no return springs are used). The unit assures high stability in chronic preparations, and it is complete with built-in FET high-impedance differential input preamplifier.

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

Delay Amplifier Module

The new Ortec delay amplifier is advertised as permitting time to be normalized between two or more linear or logical signal paths to simplify coincidence and gating system adjustments. The 489 Delay Amplifier is suitable for any general-purpose delay function and consists of two independent and isolated 3-microsec-delay amplifier networks. Each consists of one dc-coupled input and two outputs. Inputs accept either positive or negative pulses up to 10-V amplitude. The amplifier can be used to delay one or two signals for 3 microsec to aid in making processed signals coincide for subsequent analysis. The networks can also be used in series to achieve a 6-microsec delay of a single signal. Price: \$275.

Ortec, Inc.
T445 Midland Rd.
Oak Ridge, Tenn. 37830

Animal Caging

Acme Research Products (formerly Acme Metal Products of Chicago) has an 80-page catalog covering caging equipment for rodents, rabbits, cats, monkeys, dogs, and chickens. Catalogs may be obtained free from Acme Research Products, 5500 Muddy Creek Rd., Cincinnati, Ohio 45238.

Surplus Electronics

Discontinued models of the Sharp Electronic Calculator, originally \$375, are priced at \$187.50. This hand-held model has been superceded by a pocket-sized unit.

Logic and NIXIE power supplies are available in the following

configurations: 5 V, 5 A, built by Bluline for integrated circuit applications, \$29.50. A 5-V 3-A supply with 170 V at 50 MA for NIXIES is \$29.50. A NIXIE readout decade counter kit, including 7490 and 7441 integrated circuits, readout tube, complete etched circuit, and instructions, is \$8.95.

B & F Enterprises
P.O. Box 44
Hawthorne, Mass. 01937

An Inexpensive 16-Bit Minicomputer

The P850, smallest of the Phillips line, has a 16-bit word, 3.2-microsec cycle time, 512-word memory (expandable) and is priced at \$1,800. Punched tape I/O, teleprinter, cardreader, display unit, and magnetic cassette tape units are all available. Transfer rates are up to 50,000 words/sec. Special options include interrupts, power failure/automatic restart, and a real-time clock. Software includes a mathematical library, relocatable loader, and restricted assembler.

North American Phillips Corp.
Dept. 007
100 E. 42nd St.
New York, N.Y. 10017

Ultra-Sensitive Brightness Meter

The Ultra-Sensitive SPECTRA Brightness Spot Meter is advertised as a thousand times more sensitive than the standard model. This is accomplished through the use of a photomultiplier type of phototube and an associated power supply to furnish the required voltages. Since the output of the photomultiplier tube varies approximately as the seventh power of the supply voltage, it is necessary that this power supply be well regulated.

The 1½-deg Ultra-Sensitive model measures brightnesses of 0.0001 fL to 100 fL. The ½-deg Ultra-Sensitive model measures brightnesses from 0.001 fL to 1,000 fL. The Ultra-Sensitive model finds application wherever low illumination levels and/or low reflectance surfaces are encountered when measuring brightness. The Ultra-Sensitive SPECTRA Brightness Spot Meters are priced at \$1,095. A power supply for all models is \$660.

Photo Research
300 N. Hollywood Way
Burbank, Calif. 91502

Event Counter

The Series 49500 microminiature nonresettable four-digit totalizing event counter weighs less than 1 oz and measures 37/64 in. sq x 1¼ in. deep. The counter registers up to

9,999 events, then automatically recycles, starting a new series of counts at 0000. Count rate is 1,200 cpm, and the unit is available for 50, 60, or 400 Hz and dc operation at various voltages.

A. W. Haydon Co.
232 N. Elm St.
Waterbury, Conn. 06720

New NOVA Minicomputers

Three new models of the NOVA minicomputers, fully compatible with existing NOVAs, were recently introduced by Data General. The three computers are: NOVA 1210, a 5½-in.-high machine that costs \$4,350 with 4k 16-bit words of core memory and \$5,750 with 8k words; NOVA 1220, which offers low-cost expansion abilities and costs \$5,250 with 4k and \$6,650 with 8k; NOVA 820, which provides 800-nsec instruction execution for \$6,450 and 4k of core memory and \$7,850 with 8k. Prices of all include programmer's console, power supply, control processor, Teletype interface, high-speed direct memory access data channel, built-in I/O cable connector, and automatic interrupt source identification. Boards plug into a single back panel.

The NOVA 1210 and 1200 have a cycle time of 1,200 nsec and execute arithmetic and logical instructions in 1,350 nsec. The 1210 has four slots for the standard Data General 15-in.-sq circuit boards, one of which is taken up by the control processor. Using Data General's new 8k core memory module, the NOVA 1210 can hold 24k words of core memory internally. The 1220, with a total of 10 slots, can accommodate the maximum 32k words of core memory internally and still have 5 slots free for I/O device interfaces.

The NOVA 820 can execute instructions in one 800-nsec cycle and can hold 32k words of core internally and give a user five subassembly slots for interfaces.

A 1,024-word core memory that can be used in NOVA line computers has been recently introduced also. The 1k unit occupies one of the standard 15-in.-sq circuit boards and has a 1,200-nsec cycle time at \$1,900 or a 800-nsec model at \$2,200.

Data General
Southboro, Mass. 01772

Punched Tape Programmers

Singer has introduced direct-reading punched tape programmers which sell for as low as \$10 per channel and can control up to 82 circuits all at one time. The method of reading and controlling load circuits relies on a

simple arrangement of brushes which complete a load circuit through a punched hole in the tape. Brushes are arranged so that they provide "make or break" switch closure when two or more holes are read in a channel. So, switch closure can be sustained indefinitely through consecutive holes, dispensing with memory or lock-up relays.

The punched tape of any length is a closed loop driven by one of three techniques: synchronous motor, stepping with fast advance, or variable speed. Programs are changed by changing tapes. Four models are being marketed: 12, 22, 42, and 82 channels priced from \$400 to \$795.

Singer
Industrial Timer Division
U.S. Highway 287
Parsippany, N.J. 07054

Transparent Rabbit Restrainers

Plas Labs advertise improved features on their rabbit restrainers. The features include: a stainless steel pin to provide "fine" adjustment for the neck stock; plastic aids in retaining body warmth; a curved back/butt plate; adjustable vertical head bars which are removable; total visibility of the animal; a nonslip surface; and, ease of cleaning.

Plas Labs
917 E. Chilson St.
Lansing, Mich. 48906

Briefs

Free Shock Handbook

A new 32-page "Aversive Electric Shock" handbook is available free to interested individuals from Lehigh Valley Electronics, Inc., Box 125, Fogelsville, Pa. 18051. The handbook describes some of the basic principles of electric shock with associated shocker hook-up diagrams.

Lafayette Regional Offices

Lafayette Instrument Company of Lafayette, Ind., has opened two new regional offices. The West Coast office is at 861 N. Cypress, No. 24, La Habra, Calif. 90631 (Mr. Jeff Peirce); the new East Coast office is at 2116 Allen St., Allentown, Pa. 18104 (Mr. Ralph Moyer).

Teaching Aids

With the current emphasis on environmental pollution, behavioral scientists may be interested in the teaching modules offered by Modern Learning Aids. The most appropriate for psychologists is the Noise Pollution Module selling at \$24. The purpose of the unit is to examine the medical,

legal, and social effects of noise pollution on the community. The module includes: a general statement of the problem of noise pollution; psychoacoustics and anatomy of the ear, including the nature of sound; noise pollution measurement, medical, legal, and social aspects. The module includes a tape cassette of filtered speech to allow students to experience a hearing loss, suggestions for independent research, and quiz questions and answers.

Modern Learning Aids
Division of Ward's Natural Science
P.O. Box 302
Rochester, N.Y. 14603

Rechargeable Cardiac Pacemaker

GE nickel cadmium batteries in a rechargeable cardiac pacemaker (developed at Johns Hopkins University) is claimed to operate in a human body for up to 20 years without repair or removal. Generally, heart pacers have to be surgically removed about every 2 years because of power depletion. The new unit can be recharged through the skin, taking about 1 h per week. A special vest is worn, in which an ac field passes through the skin and is picked up by the pacemaker where it recharges the battery, all without any sensation to the patient.

Psych Equipment Price Reduction

BRS Foringer recently announced a price reduction in their Electro-Mechanical/900 Series. For example, Shock Generator SG 901, formerly priced at \$70, is now \$57; Timer TI 902, formerly \$130, is now \$90. Complete price listings may be obtained from BRS Foringer, 5451 Holland Drive, Beltsville, Md. 20705.

Psychochemistry

Kodak is marketing Chromat/0/Screen Analysis Kits for obtaining detailed pathological profiles. The kits were developed for screening studies to aid in determining if further, quantitative analysis is desirable. A new concept in thin layer chromatography, each kit is a self-contained unit consisting of sufficient material for performing many tests. The thin-layer chromatographic procedure uses disposable developing chambers, and a solvent mixture in a tube. After development for 30 min, chromatograms for amino acids, sugars, and catecholamines are ready for visualization and interpretation. Kodak Chromat/0/Screen Analysis Kits are also available for the analysis of barbiturates, amphetamines, and alkaloids, in both 60 test and 150 test sizes. Analysis of these drugs requires a

prechromatographic extraction step which can be accomplished with a Chromat/0/Screen Extraction Kit or by the usual method. Write: Dept. 412L, Organic Chemical Markets, Eastman Kodak Company, Rochester, N.Y. 14650.

Biomedical Research Instruments

A recent 8-page bulletin introduced some new Ortec biomedical research instruments. The same company's original modular stimulator system was announced a year ago. The recent brochure describes an expanded line of program controls and stimulators, plus biomedical amplifiers and data reduction/analysis equipment. In data analysis the major new product is a histogram analyzer which performs on-line functions. Bulletin LS-201 can be obtained from: Manager, Life Science Products, Ortec, Inc., U445 Midland Rd., Oak Ridge, Tenn. 37830.

Bioelectrodes

Miniature bare and glass-insulated-type electrodes have been developed by Annex Instruments of Santa Ana, Calif., for bioelectrode recording and research. A series of standard and hybrid silver-silver chloride bioelectrodes feature essentially nonpolarizable wire and pellet electrode types with large interstitial surfaces. The units are specifically intended for use in research projects requiring polarization voltages as low as 2-4 microV (counter EMF) at 0.1 microA in 85% NaCl solution.

Solid-State Timer

Artisan Electronics Corp. of Parsippany, N.J., has developed a two-terminal ac solid-state timer, the "time capsule." The unit converts an ac control device, e.g., a solenoid or relay, to a delayed controlled device by a series connection as if it were a two-terminal resistor. Delay capabilities are 0.1 to 900 sec. Cost of the unit is \$7 to \$12, depending on the quantity.

Miniature Push Solenoid

Autotronics, Inc., of Joplin, Mo., is marketing a miniature push solenoid with a response time of 0.58 msec for 0.015-in. stroke. The Micro-Sprint Model S-240-4 sells for \$3.75.

Solid-State Batteries

Dr. C. Liang, Laboratory for Physical Science, P. R. Mallory & Co., Burlington, Mass., has developed a solid-state lithium battery with an active shelf life of over 10 years. The batteries are leakproof, nongassing, and noncorrosive and can be stored at temperatures as high as 200° F without detectable capacity loss.

Chronic Stereotaxic Preparation

Neuro Probe, Inc. (7400 Arden Rd., Bethesda, Md. 20034), advertises a lightweight headpiece with a stereotaxic coordinate gridplate constituting a stable reference system securely affixed to an animal's skull. The unit uses angular or vertical probe drives and contains a terminal board with 15 leads for quick coupling of permanently implanted electrodes to remote electronic equipment.

Stepping Motors

Stepping motors of various types are marketed by the following firms:

Abrams Instrument Corp.
606 E. Shiawasse St.
Lansing, Mich. 48901

Automation Development Corp.
9905 Jefferson Rd.
Culver City, Calif. 90230

Bergen Laboratories, Inc.
60 Spruce St.
Patterson, N.J. 07501

Bulova Watch Co., Inc.
Instruments Div.
Green Acres Rd. W.
Valley Stream, N.Y. 11582

Cambridge Thermionic Corp.
445 Concord Ave.
Cambridge, Mass. 02138

Cedar Division
Control Data Corp.
5806 W. 36th St.
Minneapolis, Minn. 55416

Clifton Division of Litton Industries
5050 State Rd.
Drexel Hill, Pa. 19026

Computer Devices Corp. of
California
11925 Burke St.
Santa Fe Springs, Calif. 90670

Conrac Corp.
330 Madison Ave.
New York, N.Y. 10017

GAP Instrument Corp.
17 Brooklyn Ave.
Westbury, N.Y. 11590

Harowe Servo Controls, Inc.
Westown Rd. at West Chester Pike
West Chester, Pa. 19380

A. W. Haydon
232 North Elm St.
Waterbury, Conn. 06720

Heinemann Electric Co.
Magnetic Dr.
Trenton, N.J. 08602

ICON Corp.
156 Sixth St.
Cambridge, Mass. 02142

IMC Magnetics Corp.
6058 Walker Ave.
Maywood, Calif. 90270

Kearfott
1150 McBride Ave.
Little Falls, N.J. 07424

Ledex, Inc.
123 Webster St.
Dayton, Ohio 45401

Mesur-Matic Electronics Corp.
Church St.
Warner, N.H. 03278

Novatronics of Canada, Ltd.
P.O. Box 610
Stratford, Ont., Canada

Sigma Instruments, Inc.
Braintree, Mass. 02185

Superior Electric Co.
383 Middle St.
Bristol, Conn. 06010

Weston Transcoil
Trooper Rd.
Worcester, Pa. 19490

Obtaining Blood Serum from Small Animals

In working with small animals, there is often a problem in obtaining repeated samples of plasma or serum. G. Thornhill recently reported on a technique (*Laboratory Animal Digest*, 1971, 7, 70-71) for obtaining blood samples from the tail which has been used successfully on animals weighing from 30 to 500 g. The mortality rate in Ss bled by the method is reported as essentially zero.

After anesthetizing, the tail is wiped with 70% ethanol and then put into water, about 45° C for 30-60 sec. (The author states that water more than 5° warmer inhibits blood flow and that the skin of the tail may slough.) After drying the tail quickly, about 2 mm of the tip is severed completely with a scalpel at about a 30-deg angle. Blood is dripped into a plastic centrifuge tube, 0.4-ml capacity, which is held at a 30-deg angle from the tip to allow the blood to flow down the side. Clotting may be inhibited by coating the tube with an anticoagulant. Gauze sponges control hemorrhages. Thornhill uses a Beckman Instrument Co. "Microfuge" for centrifuging the tubes. The instrument is essentially a microhematocrit centrifuge motor in a modified housing, and plasma is removed with small pipettes. Evidently 10% of an animal's blood volume can be removed every 10 days over a

period of 40 days with no significant hematocrit reading change.

Notes

A device for recording aggressive contact between animals

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A device is described which enables automatic counting of aggressive contacts between two fighting animals undergoing aversive stimulation. The basic circuitry is a contact relay or drinkometer which, when operated by fighting animals, allows the quantification of aggression.

In this report, a simple device is described to record and quantify the amount of aggressive contact between pairs of animals experiencing painful stimulation. The apparatus, following the approach of Azrin, "aids in reducing the complete reliance upon gross visual observation that has characterized previous measures of attack behavior."

The basic unit used to measure the amount of aggression between paired rats in our laboratory is a contact relay (Lehigh Valley Electronics, Model 221-05), also known as a drinkometer. In operation the unit puts out a low undetectable current (4 microA), which if permitted to return to its input terminal operates a relay that can operate counters and/or event recorders.

In the aggression situation, it is possible to pass the current through both rats, so that when physical contact is made between the animals, the contact relay will operate and send

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†Reprints may be obtained from Ronald Baenninger, Department of Psychology, Temple University, Philadelphia, Pennsylvania 19122.

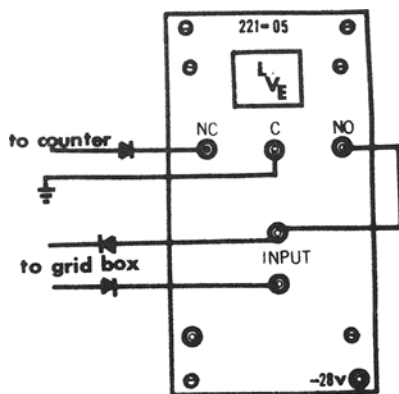


Fig. 1. Wired Lehigh Valley contact relay for measuring aggressive contact.

pulses to counters and recorders. Figure 1 shows the diagram of our contact relay. The input snap studs go to the rats (described further below); when the rats are in contact, the relay operates. The leads from the input terminals are Lehigh Valley diode leads; the capacitance problem and short circuiting due to urine and feces, found with drinkometer circuits, is partially alleviated in this manner. Ground is connected through the pulsing relay at the common contact, with counters and recorders connected through the normally closed contact. We found that when using a counter along with an event recorder, it was necessary to use diodes to eliminate any contamination of the data by backpaths from the counter to the event recorder and vice versa. The usual case for a drinkometer circuit is that the counters are connected through the normally open contact; this can be done and should be, if a different brand of drinkometer is used, but a slight modification has been made. The normally open contact is connected to the contact relay input; it was found that this modification has the advantage of acting like a pulseformer and also speeds the operation of the relay when needed during intense fighting bouts. The question may arise about this particular arrangement in that oscillations in the contact relay might occur if the rats remain in contact; in fact, after many pairs of animals were run through this apparatus, no oscillations were found through visual monitoring of both event recorder data and the rats themselves. This, then, is the basic unit.¹ We describe below its use.

Two rats were placed in an experimental chamber which measured 229 x 203 x 190 mm. Two sides of the box were of Plexiglas, and the remaining two sides were opaque, each containing a 25.4-mm circular hole. The holes were opposite and diagonally across from each other, just above floor level. The grid floor was composed of 3.2-mm steel rods spaced 13 mm apart. The tail of each animal extended through the hole in its side of the box and was secured by a soft rubber clamp attached just outside the box. About 120 mm of the tail was available to stimulate (tail-pinch), while minimally restricting, the S's movements. Three grids on either side of the box were wired together and connected to the input terminals of the contact relay such that the current would pass through the rat's feet into its body. As physical contact was made between the rats at the paws, mouth, and face, the circuit was closed, operating the relay.²

Painful stimulation in the form of a tail-pinch similar to that used by Baenninger and Grossman (1969) was used, resulting in severe fighting. (Electric shock from two independent sources has also been used successfully.) Contacts between the fighting rats were recorded by an Elmeg counter and a Lehigh Valley event recorder. Ten pairs of rats were run in this apparatus, with each set of data being remarkably similar to the data for all other pairs. The results indicate remarkable stability for this form of pain-elicited aggression and marked reliability of this method for quantifying responses.

REFERENCES

- AZRIN, N. H., HUTCHINSON, R., & SALLERY, R. D. Measurement of aggression toward inanimate objects. *Journal of the Experimental Analysis of Behavior*, 1964, 7, 223-228.
BAENNINGER, R., & GROSSMAN, J. C. Some effects of punishment on pain-elicited aggression. *Journal of the Experimental Analysis of Behavior*, 1969, 12, 1017-1022.

NOTES

1. The diode in the counter circuit eliminates contamination of data by backpaths from the counter to the event recorder.
2. If contact were maintained longer than the oscillation period, one might suspect erroneous counts. In both the pilot and the thesis work, the fighting pairs and visual records were monitored simultaneously. No instance of error contributed by oscillations was noted.