Remanufactured Ampex Recorder/Reproducer

Ampex has remanufactured a limited number of the Ampex FR-1400 Recorder/Reproducer systems. Price of the system is under \$10,000, depending on the configuration (slightly higher for FM-type electronics). The FR-1400 sold new for an average of \$45,000 each. Each carries the standard new-product guarantee of 90 days. The systems record and reproduce direct from 400 Hz to 1.5 MHz, in the FM mode from dc to 720 kHz. Four speeds are provided; 7- or 14-channel operation is offered. Contact your nearest Ampex Instrumentation field engineer or Ampex Corporation, 401 Broadway, Redwood City, California 94063. Phone: (415) 367-2011.

Notes

An inexpensive photosensor using a light-activated SCR

DAVID S. MALCOLM, HUNTER COLLEGE OF THE CITY UNIVERSITY OF NEW YORK, New York, New York 10021

The interruption of a light beam is frequently used to define a response in behavioral research. The typical photosensor employs a photocell which responds to changes in light intensity with a change in resistance. Additional circuitry is required to obtain an on-off output for

Fig. 1. Photosensor circuit and LASC base diagram. All resistance values are in ohms and are $\frac{1}{2}$ W: $R_1 = 4.7\text{M}$; $R_2 = 100\text{K}$ potentiometer, linear taper; $R_3 = 100\text{K}$. The LASC is a GE L8F. D1 is RCA 1N537, or equivalent. K1 is an Allied Control T154 relay. LL is a lamp-lens assembly, such as Sawyers 371-504, 375-105. The base diagram of the LASC is viewed from the bottom: K = cathode, G = gate, A = anode.

Fig. 2. Circuit for 2-A power supply. T1 = Stancor P8357; primary 117 V ac, secondary 25.2 V ac, 2 A. BR1 = International Rectifier 18DB2A, 2-A bridge rectifier.

program control. A new device, the light-activated semiconductor-controlled rectifier (LASC), responds to changes in light intensity with an on-off switching action allowing direct control of certain devices such as relays. The LASC is similar in appearance to a transistor but has a clear window in the top of the case. After switching to the on or conducting state, a LASC will not turn off until current flow through it reaches zero. For this reason, the LASC circuit is powered by a supply giving full-wave rectified, unfiltered dc.

Figure 1 shows the circuit for the LASC photosensor. The turn-on threshold is controlled by the biasing voltage on the gate which is adjusted by R2. K1 may be any 24-V dc relay requiring 1 A or less. The power supply shown in Fig. 2 is adequate for several photosensors. The maximum number is determined by the sum of the current requirements of the K1 in each circuit, for this supply a maximum of 2 A. If this is inadequate, several power supplies or one with a larger amperage rating may be constructed.

As the peak sensitivity of the LASC is in the infrared region, filters may be used on the light source to reduce the visible component of the light with little loss of sensitivity.

The LASC photosensor is inexpensive, approximately \$8, excluding the relay. The 2-A power supply also costs about \$8.

A photoelectrically automated shuttlebox¹

DALE M. ATRENS² and KEITH WALDRON, UNIVERSITY OF BRITISH COLUMBIA, Vancouver, B.C., Canada

The shuttlebox, or stabilimeter cage, has long been used in studies of behavior maintained by aversive stimulation and in the measurement of spontaneous activity. Recent data suggest that this device may

Fig. 1. Apparatus schematic; parts from Allied Catalog.

also provide information on the motivational properties of rewarding electrical stimulation of the brain that may not be obtainable in a conventional leverpress situation (Atrens, in press).

One of the disadvantages of this device is that it is rather difficult to automate. The tilting-floor arrangement that is typically used is often difficult to balance and is prone to counting spurious responses if the S jumps or straddles the balance point. This moving-floor arrangement also introduces a substantial and irreducible amount of response-produced stimulation and complicates electrifying the grid.

These difficulties have been reduced in some commercially available units and could be virtually eliminated by using stress gauges to detect the presence of the animal. Unfortunately, both of these solutions are very expensive and have yet to be incorporated in a single unit.

The apparatus schematized in Fig. 1 circumvents the problems inherent in tilting-floor shuttleboxes by the use of a simple photoelectric circuit that can be constructed from readily available components at a total cost of under \$10 (less relay). While essentially the same result can be achieved with commercially available photoelectric devices, the circuit described here represents an optimum solution in several respects. It is very inexpensive, compact, reliable, sensitive, and can operate under virtually any ambient light conditions.

Basically, the photocell and the 47K resistor form a voltage dividing circuit which becomes unbalanced when the photobeam is interrupted. This causes the 1.0-microfarad capacitor to discharge a positive voltage into the gate of the silicon-controlled rectifier, which actuates a relay. The two circuits interact in such a way that once one is activated it cannot be reactivated until the other photobeam is

interrupted. It is necessary to depress the pushbutton switch momentarily each time the power supply is turned on. If this is not done, both photocells stay actuated and the circuit is, therefore, nonfunctional.

The photocells themselves should be enclosed in a 0.25-in.-diam, 0.50- to 1.00-in.-deep tunnel and mounted 1.5 in. above the grid floor. These precautions render the circuit insensitive to ambient light changes and minimize circuit activation by the rat's tail.

The components indicated in Fig. 1 are not critical, and a great deal of substitution is possible. The photocell should be a low-resistance type (approximately 1,000 ohms at 100 fc) with a light-dark resistance ratio of 1,000:1 or better.

A number of these devices have been used in our laboratory and have proven to be reliable and fully compatible with conventional electromechanical programming equipment.

REFERENCE

ATRENS, D. M. Reinforcing and emotional consequences of electrical self-stimulation of the subcortical limbic-forebrain. *Physiology & Behavior*, in press.

NOTES

1. Supported by grants from the National Research Council of Canada to Dale M. Atrens.
2. Present address: Department of Psychology, American University of Beirut, Beirut, Lebanon.

Apparatus for determining cage tilt thresholds in small animals

JON E. ROECKELEIN,¹ ARIZONA STATE UNIVERSITY, Tempe, Arizona 85281, and STEPHEN M. HICKMAN,² MESA COLLEGE, Mesa, Arizona 85201.

Studies concerning the feedback effects of animals' own movements upon their visual and auditory discrimination and generalization capabilities (e.g., Halpern & Lyon, 1966; Thomas & Lyons, 1968) have employed a tilt cage which is under the control of the E. Apparently, no studies have yet described the situation where the animal has *active* control over the lateral angular movement of the test cage. This note describes an apparatus, a tilting cage, which we are using to study lateral cage-tilt thresholds in rats. With slight modifications of the manipulanda, feeder, and intelligence panels in the test cage, the device is appropriate for studying thresholds and sensory-tonic interactions in other small animals, e.g., the pigeon. The type of data which may be collected with the apparatus (Fig. 1) is a series of tracking curves of the animals' behavior as it alternates responses between the left lever

and the right lever, causing counterclockwise and clockwise tilts, respectively, of the test cage on its axis.

A third lever may be added between the

left and right levers to serve as the critical or criterion response manipulandum when the animal "judges" the cage to be at the horizontal level position. Intermittent

Fig. 1. Photograph of cage tilt apparatus and experimental cubicles. Symbols denote the following: (A) cumulative recorder, LVE Model 1516, with felt-tip pen recording stylus; (B) small animal test cage with dipper, LVE Model 1417 and Model 1351, mounted on pipe axis; (C) adjustable close-down motor (override limit) switch; (D) sample set of threshold curves for two rats during early training (two top curves) and late training (two bottom curves); (E) cage axis stabilizer; (F) solid-state multischedule programmer, BRS Model 2901; (G) modified motor control box; and (H) reversible motor, Cornell-Dubilier Model AR-22R, fitted with cage axis.

Fig. 2. Schematic diagram of circuit for modified motor control box and reversible motor: C_1 —4 MFD, 450-V electrolytic capacitor. C_2 —140 MFD, 50-V electrolytic capacitor. CRL (CRL_1 , CRL_2); CRR (CRR_1 , CRR_2)—Control relay left lever; control relay right lever; 17B key telephone unit (KTU) switching relays, Bell, 518-112-412; contact interlocks at CRL_2 and CRR_2 . D—1N4383 diode. F—2-A fuse. LP—GE47 lamp. LS_1 , LS_2 —SPST limit pressure switches normally open, left and right levers, test cage. LS_3 , LS_4 —SPST override limit pressure switches, axis-mounted contacts. S_1 —SPST on-off switch. S_2 —SPDT on-off-on switch, manual rotation control. T_1 —110-V/30-V transformer.