

A TAPE RECORDER FOR INSTRUCTIONAL AND OTHER BEHAVIORAL RESEARCH¹

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Many times, a tape recorder would be helpful which could easily be incorporated into the electromechanical apparatus common in modern behavioral investigations. The Uher "Universal" (West German), currently available for about \$300, can be so incorporated and has several unusual features of research value.

The Uher "Universal" is small and light (h.w.d. in in., 5.5 by 12 by 10; weight 17 lb). All of its functions (Forward, Rewind, Fast Forward, Record) are solenoid controlled and available by contact closure across appropriate output points. Forward operation is secured by sustained contact closure across the pinsockets at the twelve-o'clock and one-o'clock positions of the Microphone jack, whereas Rewind is available by sustained contact closure across the eleven-o'clock and one-o'clock pinsockets of this jack. (The one-o'clock pinsocket is chassis ground.) Fast Forward operation is available by sustained contact closure between the one-o'clock pinsocket of the "Δ" jack and chassis ground. Record operation is secured, independent of the selection of tape motion, by sustained contact closure between the center pinsocket of the Microphone jack and chassis ground. Connection with the Microphone jack may be made by a plug cut from the Universal's dictation microphone (or from the USK 600 Microphone Extension accessory). Pins of the right size extracted from Cannon cable connectors, inserted singly into the pinsockets, also will serve the purpose. In particular, a Cannon pin may be used to connect with Fast Forward pinsocket.

Rewind operation followed by Forward operation may be obtained by *momentary*

contact closures between the appropriate "automatic replay" leads and chassis ground. These leads are normally connected to metal foil sensing posts at the left and right ends of the tape guide slot to provide automatic rewind and replay of tapes which have silver foil leaders. Any tape may be prepared for automatic replay use by placing on it short (0.25- to 0.5-in.) tabs of the metal foil adhesive strip which is distributed by several companies.²

Both the tab sensing posts and the automatic replay feature can be turned to good account beyond their normal use. In experimental work, it is convenient to replace the single-contact sensing post at the left end of the tape guide slot with a double-contact post of the type found at the right of the tape guide slot, and to insulate the bottom contact of each post from chassis ground with a thin plastic washer. (The upright rod near the left sensing post is positioned during manufacture so that contact between it and the left sensing post can occur only near the end of a reel.) Leads from the four contacts of these sensing posts, the upright rod, the two automatic replay contacts, and chassis ground may be brought out in an eight-conductor cable if a small hole is cut in the lower left center of the machine's front panel. When this is done, automatic replay signals can be given to the machine from sources other than foil tabs on the tape; and foil tabs on the tape can be made to provide patterns of signals for other purposes than putting the machine into automatic replay.

With a USK 600 Microphone Extension cord cut in two and both halves wired to pin jack or snap connector panels (audio connections being brought to phono jacks), and the eight leads mentioned above brought out as

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²Two sources of metal foil adhesive strip are: E. L. Products Company, Department A, Box 771, Haverton, Pennsylvania; Wollensak Optical Company, 320 East 21st Street, Chicago 16, Illinois (part number, A187-10).

described, the tape recorder is completely and very flexibly controllable by relay circuits.

The following features are also of interest:

(a) *Unusual speeds combination.* The Universal features speeds of $1\frac{5}{16}$, $1\frac{7}{8}$, and $3\frac{3}{4}$ in./sec. (Because it lacks a $7\frac{1}{2}$ -in./sec speed and has a monophonic half-track head, the Universal is unsuitable for use with prerecorded music tapes; but this consideration is inconsequential for research.) Frequency response is 40 to 4000, 8000, and 16,000 cycles on the three respective speeds (± 5 db, manufacturer's figures). Thus, the $3\frac{3}{4}$ -in./sec speed provides for quality work, whereas the slower speeds allow an unusual amount of material to be recorded on the 5-in. reels accepted by the machine. Using "extended play" tape, more than 3 hr of material can be placed on one track of a 5-in. reel at $1\frac{5}{16}$ in./sec. Continuous uninterrupted play with a cycle of up to an 1 hr and 10 min is possible by the use of a continuous loop cartridge.³

(b) *Voice operation.* Use of the "Akustomat" accessory allows the machine to be set to start and record whenever there is an audio input signal at the Microphone (or Radio-Phono) jack. The input sensitivity is adjustable over a wide range by means of the Recording Level control. The time from the end of a given signal until the machine stops is adjustable on the Akustomat from about $\frac{1}{3}$ to about $5\frac{1}{2}$ sec.

(c) *Signal-operated contact closure.* The intended purpose of this feature is to allow a remote-control slide projector to be synchronized with recorded material to provide fully automatic audio-visual presentation. Using the Akustomat, low-frequency (20-cycle) signals are placed on the tape during the recording of the audio message; during playback the Akustomat senses each signal and closes a pair of contacts for its duration. The system is easy to use and works well on any of the machine's three speeds. However, there is the disadvantage that the Akustomat tends to respond to radio signals generated by the sparks which occur in some

apparatuses, and to close the contacts at unwanted times.

(d) *Dictation accessories.* Either by means of the voice operation mentioned above, which clips the first syllable or so of each utterance, or the remote-control dictation microphone provided with the Uher, the experimenter can collect data on the reactions of a subject who is engaged in some task requiring most of his attention. Standard dictation accessories speed transcription of the protocols.

The Universal has input jacks which allow recording from microphone, radio, and phonograph. The Record Level indicator is a sensitive and easily read "luminous band" type, which operates like the familiar "magic eye." An Automatic Recording Level control can be used when signals of a wide range of intensities must be intelligibly recorded and without manual adjustment of the Record Level control. The Loudspeaker jack allows the output of the machine to be conducted to a remote location. (The machine's internal speaker is cut when a plug is inserted into this jack.) Also included are a tone control, a "pause" button, and a position-finding index counter.

The Uher provides outputs at three different impedances. Perhaps the most satisfactory method of connecting headphones is to tap the preamplifier output (high-impedance) appearing at the Loudspeaker jack and to use crystal headphones such as the Clevite "Brush" BA-205 headphones.⁴ A signal appears at the preamplifier output when the machine is in Record, too, so "audioactive microphone" and "self-monitoring" capabilities are available for use in language work.

The Universal may be set to operate from a variety of voltages, and the change of a pulley modifies it for 50-cycle operation. The machine consumes about 50 watts of power, has a signal-to-noise ratio of about 45 db, a wow-and-flutter maximum of $\pm 0.3\%$, and its amplifier puts out 3 watts (all manufacturer's figures).⁵ It is distributed in the United States by Martel Electronics Sales, Inc., 7400 Melrose Avenue, Los Angeles 46, California.

³Continuous loop cartridges for use on reel-to-reel tape recorders are available from the Cousino Electronics Corporation, 2107 Ashland Avenue, Toledo 1, Ohio (Circular AV-1 N22560).

⁴Manufactured by the Clevite Electronic Components Division, Clevite Corporation, 3405 Perkins Avenue, Cleveland 14, Ohio.

⁵For pictures and an informal discussion of the Uher, see *Tape Recording Magazine*, April 1960, p. 32.