

## **BULLETIN-BOARD QUIZOMETERS**

*by W. Flint Smith and Harry M. Smith*

### *Introduction*

Feedback devices in psychology and education have a long history of use in helping the learner gain information about the correctness or incorrectness of his response to a stimulus. These devices have ranged from the purely mechanical self-instructional, test-scoring mechanism invented by Pressey (1926) to the modern electronic computerbased systems like those at the State University of New York (Adams, Morrison, and Reddy, 1968), the University of Illinois (Bitzer, 1966), and Florida Atlantic University (Estarellas, 1970) which have appeared since 1960. Pressey's multiple-choice testing apparatus presented the learner with a question and various alternative responses; by depressing a key corresponding to the correct answer, the student automatically advanced the next question and registered his score. This self-instructional mechanism and others like it were among those which, in combination with a growing interest in behavioral psychology, led to the development of programming instruction and the proliferation of teaching machines in the late 1950's and early 1960's (Galenter, 1959; Lumsdaine, 1963). The sophisticated computer interfaces of this decade are a further outgrowth of media, electronics, and the principles of learning brought to bear on the instructional process. Now via computer-assisted instruction, each student is able to work at his own pace with materials that can provide special information and help when problems arise. Moreover, his progress can be monitored and evaluated step-by-step, and appropriate remedial instruction can be incorporated into the interaction process through the unique branching and storage capabilities of the computer's memory banks.

There is a great difference between Pressey's initial "drum tutor" and today's sophisticated high-speed computers. In the intervening years many, many types of feedback devices have been tried and tested. They have included punch boards, self-scoring chemo-cards, programmed textbooks, intricate simulators like those used in the training of pilots and astronauts, the so-called automatic testing-mechanisms designed to give a lecturer an immediate estimation of how well an audience has understood specific concepts included in his presentation, and even the record-playback language-laboratory. One principle remains the same throughout; no matter how simple or how complex the hardware, each has been designed to give the learner some knowledge of his efforts, immediately and in an efficient manner.

Innovations in technology applied to education have tended to increase in complexity and in cost as succeeding apparatus have been constructed; yet they need not be expensive nor must they be complicated. This paper describes two simple, low-cost, battery-operated, feedback devices developed by the Department of Modern Languages at Purdue University over the past two years. Called "bulletin-board quizometers" due to their ubiquitous appearance in the corridors and laboratories of the language building, these unique self-testing apparatus have come to form an instrumental part of the beginning instruction in several languages. In combination with daily or weekly bulletin-board quizzes, they allow the student to test his knowledge and understanding of discrete informational and drill materials, and to know automatically and immediately if he is right or wrong. Placed in the hallways outside classrooms and language laboratories where students often congregate while awaiting the change of classes, these unobtrusive devices stimulate interest. They arouse curiosity; they invite inquiry; they challenge the students to attempt the exercises posted nearby. Finally, located within a language-laboratory booth for use in conjunction with listening-comprehension material and/or a series of slides, the quizometers provide the learner with a facile and effective means to verify his understanding of a taped exercise or his recognition of visuals.

### *The Quizometers*

The quizometers are somewhat smaller in size than a portable cassette tape recorder although they are decidedly less complex in design and circuitry, and are extremely inexpensive. Both are composed of five major parts: (1) a container (a rectangular Bakelite box), (2) a faceplate or cover, (3) a means for programming the device, (4) a power source, (5) a feedback light.

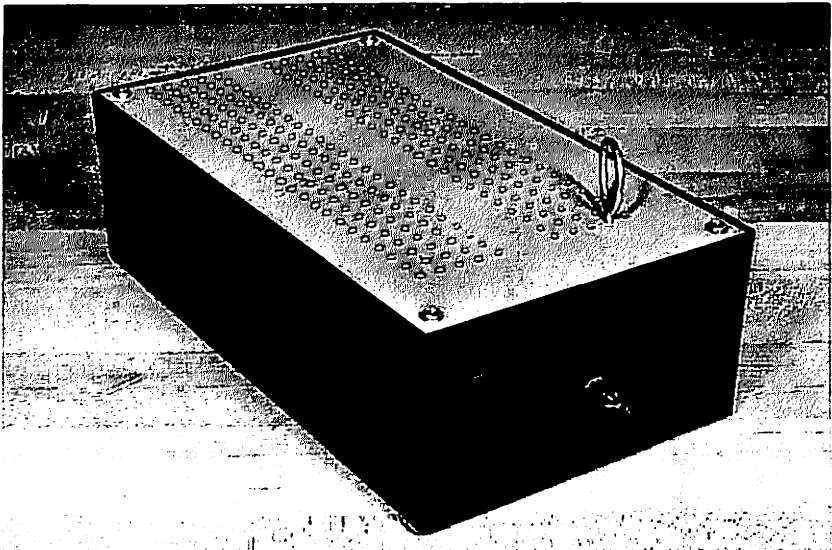
*Model I.* The student using the Model I quizometer (figure 1) sees on the faceplate the heads of fifty brass screws arranged geometrically into ten rows five each. These screws serve as the positive terminals of a low-voltage electrical circuit which allows the quizometer to function. He also observes a probe on the end of a short wire which protrudes from the side of the box, the probe being the negative pole emanating from the same circuit as the aforementioned screws. The student will also notice a light which is illuminated when the probe wire is touched to an answer terminal that has been programmed as a correct response, that is, when the circuit is completed. The quizometer thus admits a ten-item quiz in multiple-choice format with up to five alternative responses (by using only two terminals, the device can be employed to handle a true-false exercise). The student making use of the quizometer reads the stem of a question and its alternative responses then selects his answer by touching the probe to a terminal. For a correct response, he gets a green light. No light, try again.

## Quizometers

Programming the Model I quizometer is accomplished quickly and easily. The faceplate is removed and the terminals which have been selected as the correct-answer alternatives are connected to the power supply as follows: within the device there are ten "programming wires," one for each question and its set of five alternative responses A, B, C, D, and E. One end of each "program wire" is attached to the power source, the other terminates in an "alligator clip." To program the device, the program wire is clipped to the appropriate correct answer terminal on the underside of the faceplate, and the unit is reassembled. (By linking together in series two or more terminals in the same set, more than one alternative can be programmed as a correct response, thus increasing the degree of difficulty of given items.)

The feedback light of the Model I quizometer is a standard, two-cell flashlight-bulb covered by a lens cap; its power source consists of two 1½ volt cells which fit snugly within the Bakelite box. The normal "bulletin-board life" of the batteries is about two months. A block diagram for the circuitry of the Model I device is given in Appendix A. The total cost of the components, including batteries, wire, clips, bulb, lens, screws and container is less than two dollars; the entire unit can be assembled in two or three hours.

*Model II.* The Model II quizometer (figure 2) was devised to increase the number of items that could be tested by one apparatus while at the same time simplifying the means by which the device is



MODEL I QUIZOMETER

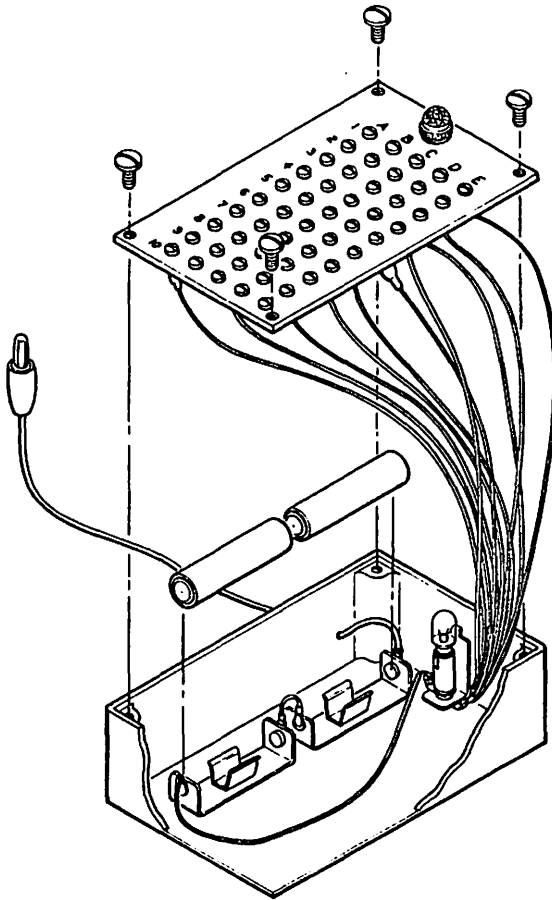
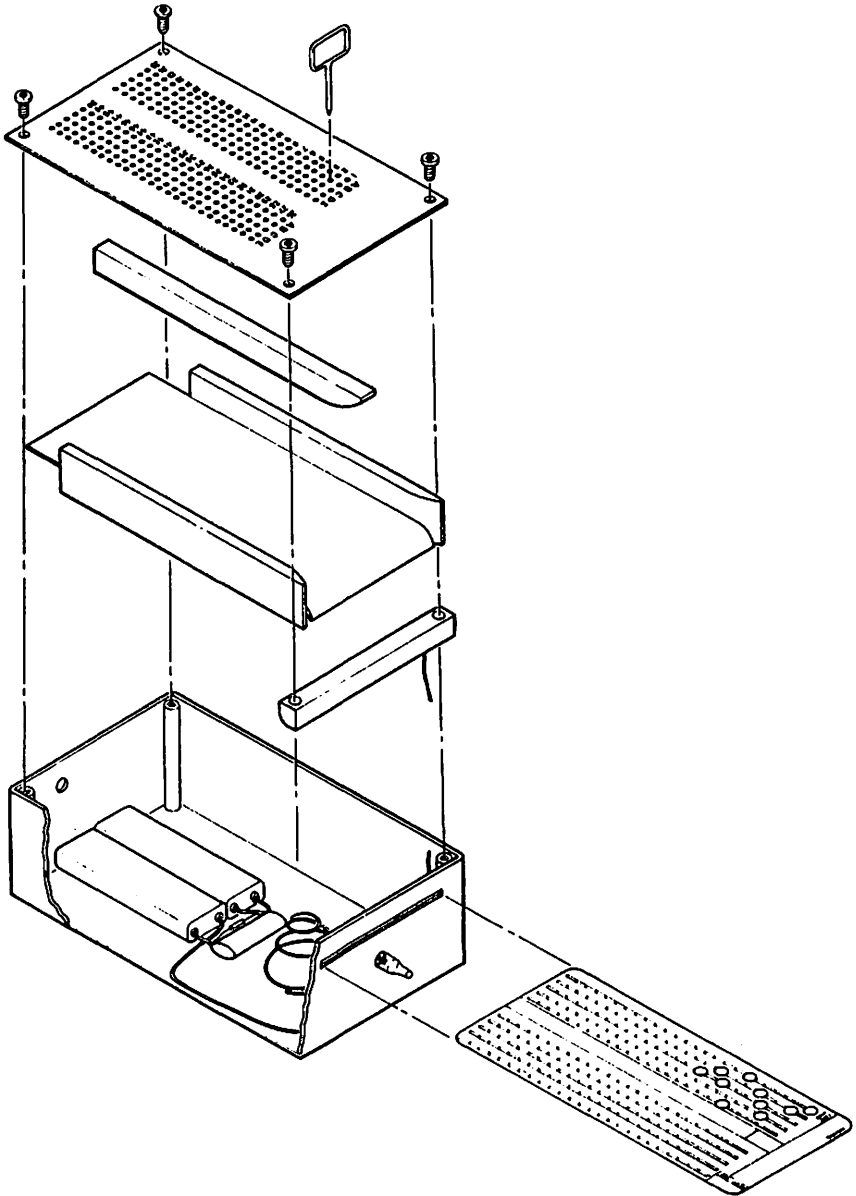


FIGURE 1

**Quizometers**

**MODEL II QUIZOMETER**



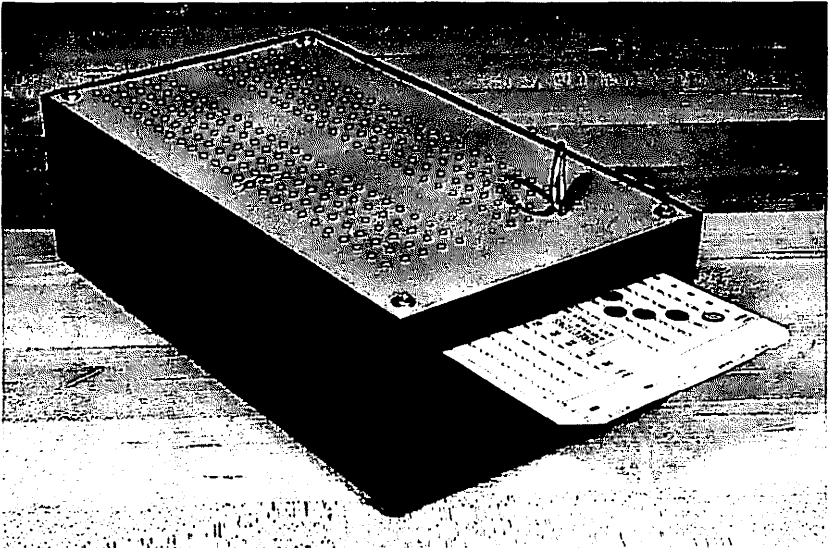
**FIGURE 2**

## Quizometers

programmed for a correct answer. Both ends were achieved in its design: the number of separate items that can be quizzed at one time is increased fivefold; it can be programmed by means of a single punched card. The item numbers of the Model II quizometer are grouped in two columns or twenty-five apiece (1-25, 26-50), an arrangement which permits a quiz or drill exercise in true-false or multiple-choice format of up to fifty items and in the latter case, with up to five alternative responses.

The basic parts of the quizometer remain essentially the same. There is a Bakelite box (somewhat larger but thinner than the original device), a faceplate, a probe, a feedback light, internal circuitry, and a power supply. The faceplate is fashioned from aluminum and serves as the negative pole of a low-voltage circuit. The answer terminals previously indicated by screw heads in the Model I device have been replaced by holes. A common-contact plate takes the place of the alligator clips and programming wires; it is wired as the positive terminal of the aforementioned circuit. Finally, the probe is fashioned from a nail slightly smaller in diameter than the holes in the faceplate. The student inserts the nail into the holes to attempt an answer to a stimulus.<sup>1</sup>

<sup>1</sup>The probe can be attached to the quizometer in the same manner as the Model I unit if the device is to be located in the corridors or learning centers. In the classroom, however, the teacher may wish to retain the probe apart, allowing the learner to "check it out" as a reward for completion of normal daily tasks.



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The faceplate and common-contact plates are constructed as a separate "bridge" which may be removed independently from the unit. Parallel non-conductive spacers allow the plates to be cemented together while, at the same time, insulating them from one-another. These same insulators also serve to guide the punched card into its correct position within the unit. A stand-off, cemented to the reverse side of the faceplate, similarly helps to hold the card in place. (In this fashion, and in combination with the small diameter of the holes in the faceplate itself, the punched-card is placed so as to obviate visual inspection of the correct response.) The internal circuitry of the device makes contact with the bridge as follows: the negative pole of the circuit is wired to a bar running the width of the unit at its uppermost edge; the faceplate portion of the bridge rests upon the bar and, as such, becomes an extension of the circuit. The corresponding contact portion of the bridge touches the positive pole of the circuit by means of a flashlight-type spring mounted within the Bakelite box. The spring is compressed against the contact plate when the unit is assembled; the tension provided by the spring assures that the plate is in constant contact with the positive portion of the circuit. Thus, when the probe bridges the two plates in an appropriate fashion, that is, when the student causes the probe to touch the faceplate and backplate simultaneously, the circuit is completed and the feedback light is illuminated.

The Model II quizometer is programmed by means of a standard, mark-sense answer card of the type widely used in objective testing.<sup>2</sup> One simply determines whether alternative A, B, C, D, or E is to correspond to the correct answer, marks it with a pencil, and then punches out the penciled response on the card. The program card is then inserted in the quizometer through a slot in the top of the Bakelite box. The holes in the punched card allow the probe to touch with the common-contact plate only when the correct alternative is chosen. The remainder of the card effectively marks the portion of the plate behind incorrect alternative answers so that the probe, inserted erroneously, cannot complete the circuit. The student is forced to try again until he succeeds in illuminating the light. Two or more correct answers to a single item are provided simply by punching out more than one correct answer within a given set of alternatives. To program the quizometer for other quiz or drill materials, one simply exchanges punched cards (a pencil or pen inserted in a hole in the bottom of the unit allows the card to be pushed up so that it can be retrieved), a

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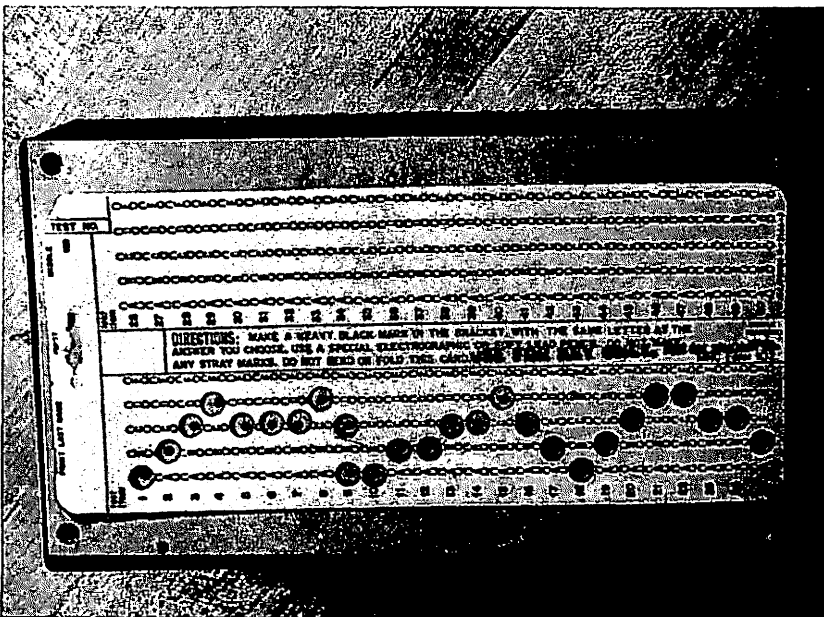
<sup>2</sup>A sample card may be obtained from the Measurement and Research Center, Engineering and Administration Building, Purdue University, Lafayette, Indiana 47907. Request MRC form 102.

procedure which obviates opening the unit each time new quizzes are posted or additional materials are used. In addition, duplicate copies are easily punched when the original card is prepared and can be quickly replaced in the event of errors or theft. Finally, the "key cards" may be kept for future use.

The cost of the Model II quizometer is actually somewhat *less* than that for Model I, since the overall design uses fewer components. Substituting holes for screws on the faceplate and a common contact-plate for the programming wires and alligator clips reduces the overall expense for parts. A small, long-life neon lamp is used for a feedback light in place of the flashlight bulb and lens arrangement. Two 45-volt batteries linked in series power the unit, under normal conditions they can be expected to last for about two years. The device requires extra time for assembly, however, given the greater precision needed in its construction.

*The Quizometer as a Mediator of Media*

The Model II quizometer has two additional applications which increase its usefulness as a teaching device. Wired to a solenoid or relay-operated tape recorder, or to a slide projector, the quizometer can be utilized to start a taped program or to advance succeeding visuals. In both instances the machines are mediated by a punched





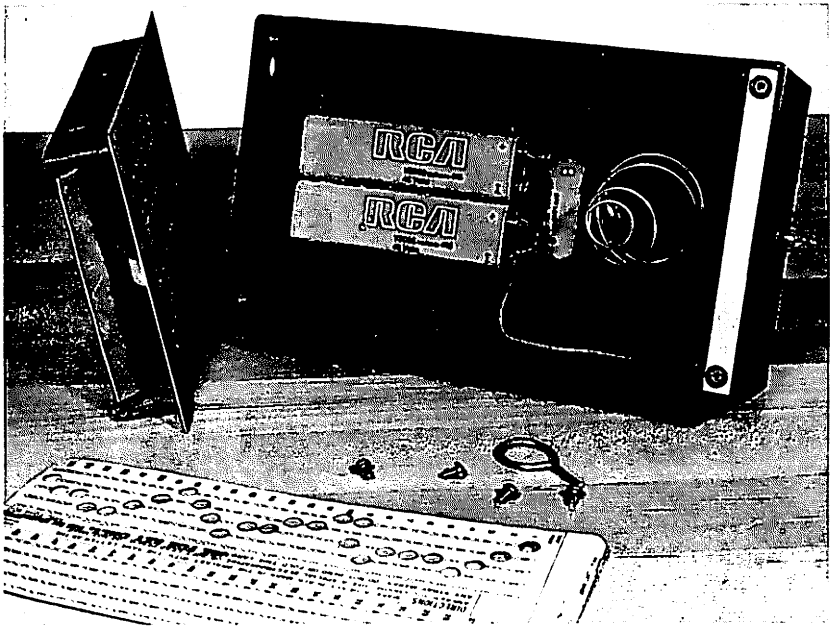
## Quizometers

program card and the feedback device. For example, the learner might be directed to identify a series of paintings by artist, epoch, or style, the respective alternatives for each listed A, B, C, D, and E. The quizometer can be wired to the projector so that when the student correctly identifies the title or some aspect of the visual, the completion of the circuit (probe to plates) will advance the machine to the next slide. All incorrect responses go unrewarded. The student cannot cause the next transparency to be presented until he selects the appropriate response. No matter if he achieves it by trial and error, for the student ultimately learns from his mistakes.

The use of the quizometer as a tape-advance mechanism is equally interesting. Various tape-recorders<sup>3</sup> are equipped with appropriate circuitry and filters which will automatically stop the tape upon sensing tones of a specific frequency (generally 350 HZ).<sup>4</sup> Engaging the "play" button will cause the tape to resume and proceed until the next "stop

<sup>3</sup>For example, the LVT (Ling, Tennco, Vought) Professional Series, Model 2600 Cassette Tape System, LTV Education Systems, Mountainview, California 94040.

<sup>4</sup>The use of auditory codes to help the learner find his place on a tape has been reported elsewhere by Krones, Sawyer, and Grosjean (*Language Learning* 14,i(1964):51-54) and more recently by Smith (*NALLD Journal* 7, i (1972): 31-38.)



code" is sensed by the machine, whereupon "play" must again be activated before the tape will continue. The Model II quizometer can be wired directly to the play electronics of a relay-operated recorder such that when the probe and plates come in contact, the play function of the machine is engaged automatically. Used in conjunction with a listening comprehension tape coded with 350 HZ tones at critical points throughout and a tone-sensitive recorder, the quizometer in effect mediates the taped exercise; that is, a student can be given an auditory problem, including written and/or voiced alternative response, which stops automatically after each item is presented. If the student chooses the appropriate alternative, that is, if he inserts the probe into the corresponding correct-answer hole and completes the circuit (probe to plates), the taped program will advance to the next question or stimulus.

Finally, using the automatic stop-and-advance principle with a tape recorder and slide projector simultaneously, an audio-visual exercise can be mediated by the quizometer — items 1-25 being programmed for tape advance and items 26-50 for slides, respectively — each set wired to its corresponding presentation device. Block diagrams reflecting the circuitry for simple and complex applications of the Model II quizometer are given in Appendix B.

### *Conclusion*

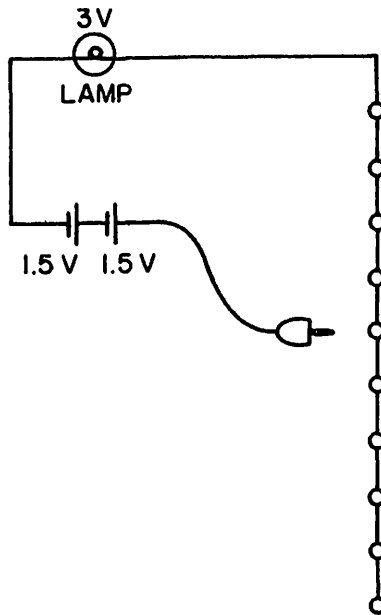
The quizometer or feedback devices described above have an obvious application in individualized and tutorial instruction in all disciplines. Because of their inherent flexibility they are especially valuable where students in one or more classes are progressing at differential rates through a given curriculum. Quizzes, drills, and audio-tutorial materials reflecting subject-matter from various lessons can be provided at several stations in the classroom, in the language laboratory or in the learning center. Students can be directed to work with them independently, in pairs, or under peer or teacher supervision. The grouping of several feedback devices in a single location permits the teacher to post quizzes or exercise materials which reflect past as well as present subject-matter; The Model II quizometer is especially useful as a feedback device for lengthy pre- or practice-tests, as well as audiovisual presentations. Finally, due to their low cost and relative ease of construction, many teachers may be able to make their own. Additional applications await only the creativity and ingenuity of the classroom teacher.

## Quizometers

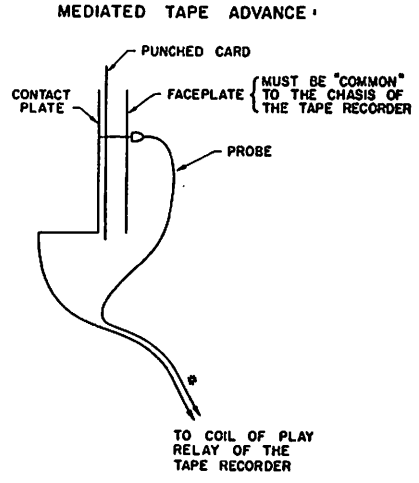
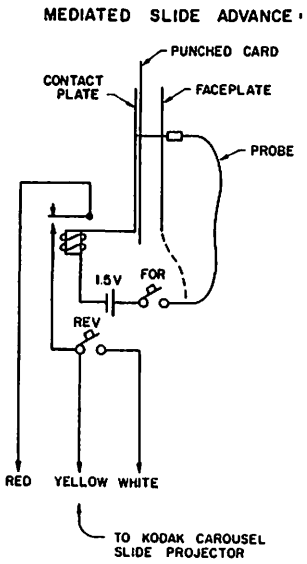
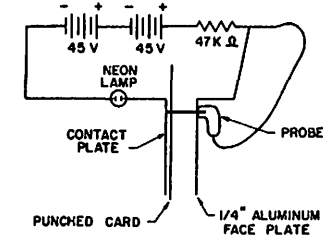
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### APPENDIX A BLOCK DIAGRAM : MODEL I QUIZOMETER



APPENDIX B  
BLOCK DIAGRAM : MODEL II QUIZOMETER



\* IT MAY BE NECESSARY TO ADD A RELAY TO THE WIRES EMANATING FROM THE PLAY ELECTRONICS OF THE TAPE RECORDER TO OBTAIN HIGH VOLTAGE FROM REACHING THE QUIZOMETER.