

HOW SMALL OR HOW LARGE: THE SENSIBLE USE OF TOUCH-TONE RETRIEVAL SYSTEMS IN EDUCATION

Acoustron Corporation

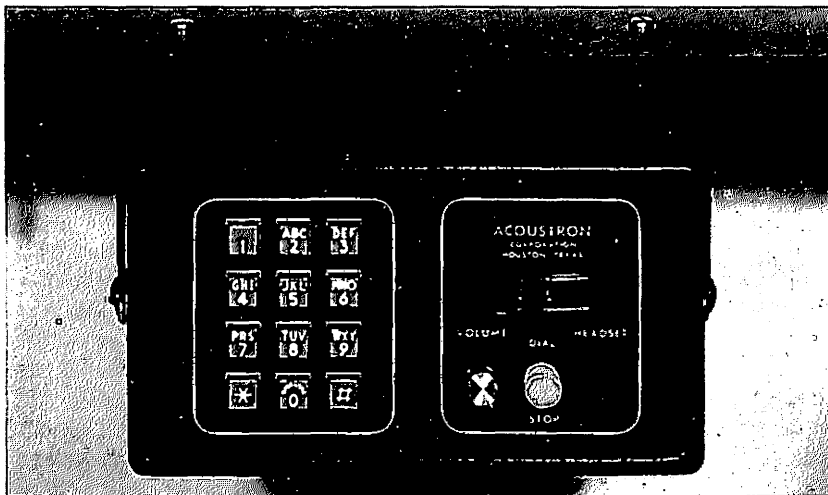
When Alexander Graham Bell used his first electric telephone to ask his assistant, Thomas A. Watson, to come into the other room, he marked the beginning of a communications era. That was in the year 1876. Within 15 years the limitations of manual switching in connecting one telephone to another had become so restricting that the first automatic telephone exchange was being built in La Porte, Indiana. It was operated by means of a pushbutton located at the customer's instrument, but the use of the pushbutton soon gave way to the familiar telephone dial for selecting the telephone of the called party.

In the early 1960's the pushbutton was reborn. Today it is available on telephones almost anywhere in the United States. Its appearance in our homes and offices of the future is as certain as the appearance of the telephone itself.

The Touch-Tone pushbutton unit gets its name from the fact that the familiar buzzer-like tone is replaced by one of a more musical quality. Also, in addition to the use of a more pleasing tone, the pushbuttons of the unit allow numbers to be selected by means of touch rather than dialing. When the buttons are pushed, a different combination of tones is produced. The physical characteristics of these tones operate the switching equipment to provide the desired connection.

Thus, with touch and tones, the customer can select (notice the verb 'to select' replaces the verb 'to dial') the number he wants.

Even the Bell System which is currently the world's largest manufacturer and user of Touch-Tone equipment points out the fact that it is not limited to simple replacement of the telephone dial. Unlike a dial which works on the rather primitive principle of turning the circuit on and off (like the kitchen light), the Touch-Tone unit generates tonal combinations that can be detected and used to operate not only telephone exchanges, but also computer processing units or your own private switching equipment.



It is in combination with private switching equipment and occasionally some computer equipment that the Touch-Tone finds its greatest application in education. Especially in the learning laboratory the Touch-Tone offers an efficient, economical and modern solution to the problems associated with providing student access to audio material. This is true for the foreign-language laboratory as well as similar efforts in the fields of literature, music, science, etc. Attempts are also being made to economically disseminate visual material using this equipment, but they have thus far been frustrated by the state of the videotaping art.

For an example of the Touch-Tone's use let us look at the application to that part of teaching a foreign language that occurs in the language laboratory. The popularity of the language laboratory has resulted in its being installed in virtually all colleges and most high schools throughout the country. Many of these are already approaching the point where new equipment is being considered to replace the original installation which is wearing out or in need of expansion. It must, sadly, be observed that many laboratories have not received such profitable usage, but the "forgotten" language laboratory will not be considered here. Only those installations which might profit by the use of a Touch-Tone retrieval system will be of interest.

Any foreign-language course that teaches some measure of the oral skills, speaking and listening, will of necessity have a large amount of material that lends itself well to being recorded on tape. Naturally, if classes were small enough and all teachers were native speakers, this would be superfluous, but reality is such that it has proved practical to let tape and tape recorders do much of the repetitive drillwork associated with language learning.

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The handling of this material is quite simple provided students remain a homogeneous group and all need the same tape at the same time. This, too, is not a real case. Students will always represent an entire spectrum of achievement, ability and motivation. To make sure they are all able to have access to tapes they need, anytime they need them throughout the course, a rather free policy of making the taped material available must be adopted.

One way of doing this would be to pass out a complete set of tapes to each student in the class. Thus, for 60 students there would be a need for perhaps ten or twenty dual-channel language laboratory recorders and 60 sets of material. The taped material would include any supplementary recordings the teacher made any time during the course and would probably amount to about 50-60 hours of tape for a one year course. The problems associated with this method of disseminating audio recordings include the cost of duplication for a large number of language courses, the cumbersome handling of tape circulation and equipment use as well as the terrors of freely distributing several thousand reels of tape for students to mishandle, lose or rerecord with hard rock and folk songs.

An alternate to this is to provide some electro-mechanical device that will provide students with access to the right spot within a large number of always available tapes. This is where Touch-Tone selection is advantageous. It offers a student-operated selection device that allows the students to decide what he wants to hear. This selection can, of course, be under the remedial guidance of the teacher. Its most important advantage though is that it frees the student from the lockstep frustrations of linear programming. *i.e.* he is able, at any time, to either decide that he has mastered the principles of a certain drill exercise or is just unable to master them at this time and to reselect some more appropriate exercise. With proper thought on the part of the course's authors this new practice will prove to be remedial and not just a way to escape from working.

Just as in the case of the Touch-Tone on a telephone, a language laboratory with Touch-Tone selection equipment utilizes certain combinations of tones to connect the student with the desired program. The tones are created within a transistor inside the pushbutton housing. You can hear them as you push the buttons.

The chief advantage of the tones over manual switches or even the most sophisticated dial equipment is that there need be no moving parts outside of the student pushbutton unit. Nothing is subject to friction, abrasion or damage from dirt carried in the air. It is in the dial exchange that the greatest maintenance problems have existed until now, but the state-of-the-art use of solid-state logic circuits and switching devices circumvents the problems associated with the continual wear on mechanical contacts.

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In using a Touch-Tone retrieval system the student locates the three digit number of the exerciser he wants to hear on a director list. He then selects it by pushing three buttons on his Touch-Tone unit. The switching is performed electronically without the use of moving parts and with the speed of light.

Many teachers object to the most elementary language laboratory equipment as an unneeded expense, and there are also many who point to the use of the Touch-Tone retrieval of taped material as an unnecessary expense for foreign-language teaching. Their objections usually fall into two categories. First, they say that the electronic switching equipment is such a large investment that it proves to be an uneconomical one, and even when funds might be available for it, the cost of program sources to hold the recorded material makes the system too expensive. Second, they object to the fact that in the interests of economy a student who selects a program after another student has done so will not hear it from the beginning but from some point in the middle.

To refute the first objection one need only perform a rough cost analysis of what it costs to teach today's students. This is seldom done and reveals some surprising facts. According to information published by the National Education Association and the United States Office of Education, instructional costs per student per hour ranged from an average of 90c in colleges down to an average of 30c in secondary schools in 1963-64. Extrapolation would put these figures at \$1.20 per student per hour for colleges and 50c per student per hour for secondary schools during the academic year 1969-70.

A 50 position laboratory used in conjunction with sixty program sources and connected to them by means of a Touch-Tone retrieval system compared to a conventional language laboratory presents a cost structure over a twelve year period that looks like this:

	Touch-Tone Retrieval Laboratory	Conventional Laboratory
Original Equipment	\$60,000	\$30,000*
Overhead Costs	56,000	48,000
Maintenance	30,000	15,000
Supplies	42,000	48,000*
Staff	144,000	192,000*
12-Year Total	<u>\$332,000</u>	<u>\$333,000</u>

(* These figures are slightly higher than might be expected because of the inclusion of personnel and high speed duplicating equipment needed to provide a large quantity of individual tapes.)

For a school year of 180 days of six teaching hours this provides for the instruction of 648,000 students over the twelve year period.

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The cost per student per hour for either type of laboratory is 51¢. It is far less than the average college hourly instruction rate and remarkably close to the high school rate. It could be greatly reduced by the use of the equipment for more than six hours a day and for more than 180 days a year.

It is noteworthy that the initial investment in Touch-Tone equipment which seemed to make the system so much more expensive, was amortized equally with the costs of manually recording and circulating a large number of individual tapes. In addition the Touch-Tone retrieval system offers far greater potential for other uses. It is operable anywhere a wire can be run on a college campus or within a school district, and it is thoroughly compatible with current developments in Computer-Assisted Instruction and commercial telephone technology.

With such inherent expandability the Touch-Tone retrieval system is obviously unlimited as to how large it can grow. From the rough calculations above it would appear that such a system should be no smaller than 50 student positions to make itself economical, but this figure can be reduced to around 35 positions by suitable engineering of the hardware. This is based on a use survey of the system and the curriculum to be conducted before purchasing. Ways can often be found that will reduce the costs without eliminating the advantages of a fully automatic and thoroughly dependable Touch-Tone retrieval system.

The second objection cited above was that in attempting to reduce the initial costs of such systems the students are not provided with exclusive access to an individual program. This is true, but it is similar to the fallacious argument that classrooms should be replaced by individual tutors because the students are denied exclusive access to (*i.e.* the complete attention of) the teacher. There are just some things that cost too much money, and for most the use of a teacher-student ratio of 1:1 is just as far out of the question as is exclusive access to a taped program in a retrieval system given the current state-of-the-art.

Any college or school which has already developed their learning laboratory techniques and methodology in foreign-languages, literature, music or science to the extent that they are contemplating adding to or replacing part of their existing equipment should give some thought to surveying the possibilities of using a Touch-Tone information retrieval system to offer more efficient access to material at the same costs that are involved in their present system. This holds true no matter how large nor how small the school might be.

For further information on the flexibility of Touch-Tone systems and how to conduct a thorough survey of curricular requirements, you are invited to contact the Acoustron Corporation, 2418 Bartlett, Houston, Texas 77006.