

# The Development and Diffusion; of Teletypewriters for Hearing-Impaired People

---

In 1963, Robert Weitbrecht, a physicist with a profound hearing loss, hiked up Mount Lassen in California. As Weitbrecht exclaimed about the beauty of his surroundings to his hiking companion, his voice was overheard by another hiker on the trail, Ed McKeown, whose wife is deaf. The speech of deaf individuals varies, but it usually has a distinctive quality that is easily recognized by a person with a deaf family member. McKeown introduced himself and the two exchanged names. Weitbrecht mentioned that he had technical interests and education and that he was a radio ham and operated a radio teletypewriter (TTY).

Some months later, Weitbrecht received a letter from James Marsters. Marsters, a deaf orthodontist from Pasadena, had heard about Weitbrecht via the McKeowns and the social network of deaf persons in northern California. Marsters, who had developed a whole set of strategies to run his office efficiently, was deeply frustrated at being unable to use the telephone. Marsters was using his expertise in electronics to explore ways that deaf individuals might communicate with each other by radio or telephone, and his friends in the Bay Area network had suggested to him that Weitbrecht might be a good coinventor.

After more correspondence, Marsters purchased a Western Union 32ASR TTY. He continued to encourage Weitbrecht, and in November 1963, Weitbrecht invented an acoustic coupler modem\* that permitted him to communicate with Marsters over the voice-grade telephone lines by typing from his TTY to a similar unit in Marsters' home. The two men used the telephone because a radio system would have required a Federal Communications Commission license, which Marsters lacked. Also, both men reasoned that if a communications system were to be useful to

\*Couplers existed before Weitbrecht invented his model. His patent hinged on eliminating echo on the line.

the entire deaf population, it would have to be based on the telephone. Although relatively few deaf people could make direct use of the telephone, many of them owned telephones so that their children, other relatives, or neighbors, could make calls for them in times of emergency. A commercial TTY network already existed, but its costs were prohibitive for private individuals.

As the TTY communications went back and forth between Weitbrecht's home in Redwood City and Marsters' in Pasadena, tests and modifications were made to overcome telephone line echo problems. Finally, an echo-suppressing tone burst was achieved. This meant that the modem reliably converted TTY signals into tones that could be carried by the voice band of the telephone line. All this time, in the tradition of home-workshop inventors, Marsters and Weitbrecht were donating their time and the money for parts. Neither private industry, the Federal Government, nor academia was interested in deaf people's need for telephone communications.

On June 23, 1964, the new equipment was demonstrated in Salt Lake City, Utah, at the biennial convention of the Alexander Graham Bell Association for the Deaf, an international organization of parents, teachers, and deaf adults who advocate use of lipreading, speech, and residual hearing. Latham Breunig, a deaf statistician present at the convention, wrote (5):

It was . . . an exciting and thrilling experience. There, between two rooms in the Hotel Utah, these deaf people were, for the first time, able to make unassisted telephone calls over the regular voice grade telephone network by means of a teletypewriter in each room. This feat was made possible by the development of an appropriate coupler or modem, interfaced between the TTY and the telephone.

Marsters encouraged Weitbrecht to apply for a patent. The R. H. Weitbrecht Co. was founded in 1965. Marsters enlisted the additional capital and business expertise of a third deaf man, Andrew Saks. In 1967, Weitbrecht, Marsters, and Saks formed the Applied Communications Corp., which replaced the Weitbrecht Co.

Until 1967, the TTY communications system grew slowly. The acoustic coupler, known as the Phonetype®, had to be debugged under various conditions. The first working TTY units were installed in Los Angeles, New York City, Indianapolis, and San Francisco, followed soon after by installations in St. Louis and Washington, D.C. Used TTYs were not readily available, and newly manufactured ones were too expensive for individuals and families to buy. Surplus TTYs could not be released by the American Telephone & Telegraph Co. (AT&T) until it settled a Carterfone lawsuit, which it did not do until 1967.

To make a TTY call, a person making a call places an ordinary telephone handset on the acoustic coupler modem and dials the telephone. When the call is answered, the caller types the message, stopping to type "GA" ("go ahead") when a response is expected. The acoustic coupler modem transforms the electrical signals into two sounds of different frequencies, which are then transmitted over the telephone line. At the other end of the line, the signal is received by another modem.

In the 1960's, the surplus TTYs looked as if they belonged in a turn-of-the-century Western Union office: they were made of sheet metal and stood about 4 ft high; they were noisy and shaky in use; and they took up a lot of space. But they worked. As the surplus machines became available, scattered people created a network of deaf people who could communicate with each other, and that network grew.

In 1967, surplus TTYs were made available to deaf persons through an agreement between AT&T and the Alexander Graham Bell Association for the Deaf. By the end of 1968, there were 174 TTY stations for deaf people operating around the country; by 1970, there were 870.

Because the Alexander Graham Bell Association for the Deaf was not set up to be an equip-

ment vendor, Marsters recommended that it set up a separate organization involving the National Association of the Deaf and any other organizations for the deaf, to pick up, distribute, and service the surplus TTY equipment. In 1968, the non-profit corporation called Teletypewriters for the Deaf, Inc. (TDI), was created by Latham and Nancy Breunig of the Alexander Graham Bell Association, along with Jess Smith of the National Association of the Deaf. TDI appointed deaf persons all over the country to be its authorized agents, picking up surplus machines from AT&T outlets, reconditioning them, and placing them in the homes of deaf people. The system grew to approximately 12,000 TTYs by 1975. Keeping accurate records to fulfill its agreement with AT&T, TDI was able to publish a list of stations, which continues to serve as a telephone directory for the deaf community and for those businesses that make a special effort to serve deaf individuals.

In 1973, the agreement between AT&T and the Alexander Graham Bell Association for providing TTYs to deaf people was replaced by a similar agreement between AT&T and TDI. Western Union also released a substantial number of machines at that time. Maintaining itself through membership dues and contributions, TDI was also able to establish, through a grant from the Lilly Endowment, a revolving fund to make loans to local groups for equipment acquisition, enabling the surplus equipment to be distributed throughout the country as needed.

The philosophy underlying all these activities was "by and for the deaf." Although a few non-deaf groups with an interest in service (e.g., Telephone Pioneers, an organization of retired Bell System employees) volunteered in some locations to help with reconditioning TTY units, information about availability of equipment and advantages of different models was disseminated completely within the deaf community, through booths at conventions of deaf organizations and small advertisements in journals about deafness.

New models of acoustic couplers, developed in New Jersey and Texas in 1969, were competitive in price with the original Phonetype® that had been patented by Applied Communications Corp.<sup>1</sup> All these couplers interfaced a telephone

---

<sup>1</sup>Robert H. Weitbrecht. U.S. Reissue Patent Re 27,595, Mar. 6, 1973 (based on Robert H. Weitbrecht original U.S. Patent 3,507,997 filed Aug. 22, 1966, and issued Apr. 21, 1970).

and a TTY that typed out hard copy on a roll of paper. Some deaf persons and their families bought modern terminals that were quieter and less bulky than the surplus models. Still, these new terminals were not portable, and they were too expensive for most deaf people.

In 1972-73, telecommunications terminals were introduced that utilized soft copy, or transitory readout, on a television screen or on a marquee display with a light-emitting diode showing above the keyboard. New brands at that time included TVPhone® by Phonics Corp., MCM by Micon Industries, and Magsat by Magsat Corp. \* These devices offered certain advantages over the standard TTY models: they were much smaller and lighter, portable, and quiet. TDD (telecommunications device for the deaf) was the new term coined to include the old and the new models. Portable TDDs are small enough to store in a drawer or carry in a briefcase. Many deaf users still prefer a paper printout, but portable machines offer flexibility for family and business communication. Several portable devices are now available with built-in or optional miniature printers.

Even though a variety of TDDs were available on the market by the early 1970's, the devices all had to be able to interface with one another. In 1973, TDI issued recommended standards for coupler manufacturers in an attempt to ensure compatibility among the various types of equipment.

TDI agents organized to develop training programs, operating standards, service manuals, and user handbooks. The TDI biennial convention, begun in 1974, became an important technical and social exchange for the deaf individuals who served as agents. By 1975, the number of TDD stations nationwide had grown to about 12,000.

In 1977, the implementation of sections 503 and 504 of the Rehabilitation Act of 1973 began to affect the public perception of the telecommunications needs of deaf people. Paralleling the increased civil rights activity of all disabled individuals, representatives of the deaf community met with Federal and State legislators and staff from AT&T to review the needs of handicapped persons. A number of legislators installed TDDs in

their offices; every time this occurred, the installation was well publicized in the newsletters of deaf organizations. TDDs were placed in police and emergency facilities, vocational rehabilitation offices, telephone companies, and in some public transportation systems. The theme "by and for the deaf" fit in well with the recognition of the need of handicapped individuals for independent living.

In 1977, surplus TTYs became scarce again, and the cost of new equipment, including the coupler, rose. The TTYs generally used the 5-level Baudot code Weitbrecht had employed in his original device. The 8-level code, called the American Standard Code for Information Interchange (ASCII), had been in existence for some years in computer systems, and Weitbrecht knew of this code when he developed the Weitbrecht device in 1964. In 1964, computers were new, and personal computers had not been envisioned as a common household item. Weitbrecht and Marsters were looking for a simple-to-operate, low-cost device for ordinary communication between two deaf people, or between a deaf and a hearing person, over a telephone line. In 1981, Weitbrecht recalled his thinking about the Baudot code in 1964 (45):

There were thousands of Baudot TTYs available . . . a great surplus waiting to be used. There was also compatible equipment: Kleinschmidt, Creed, Olivetti, and others, all compatible with Baudot code. [It was] an opportunity to get equipment and train the deaf without great expense. TTY machines had been surplusd for many years to radio amateurs, I knew there were surplus machines ready to be put to use.

Thus, Weitbrecht built the device using the Baudot code. As other couplers appeared on the market, the Weitbrecht/Baudot 5-level code device was accepted in practice as the standard to preserve compatibility among all such couplers and modems; however, users of Baudot-code TDDs could not converse with ASCII-based computers.

By 1977, the cost of computers had come down, and the development of the microcomputer began to make some technically minded members of the deaf community wonder if the push for compatibility of all equipment in the TDI system was not a mixed blessing. Approximately 27,000 stations existed at that time; the system was flourishing.

\* Phonics, Micon, and Magsat were no longer in business by 1982.

But some concerned people realized that as the system expanded, it would become increasingly obsolete with the advance of technology.

Estimates varied widely, but by 1981, there were between 50,000 and 100,000 stations. At least 10 small companies had been involved in the manufacture of TDDs. Many of these small companies were started by a deaf person or included a deaf person in their management. To some extent, all these companies infringed on Weitbrecht's patent rights and paid him no royalties. Weitbrecht never contested the patent infringement. Applied Communications Corp. and Weitbrecht chose not to use their funds and energies to pursue a lawsuit.

It has been said that approximately 20 years elapse before a technological device for disabled individuals develops from an idea into a widely available aid.<sup>2</sup> Seventeen years after the first TTY call, from Redwood City to Pasadena, Calif., TDDs are being distributed free by the telephone company, through a surcharge on all telephone bills, to deaf residents of California. The initial distribution site, Fremont, Calif., is not far from Weitbrecht's home workshop. This history of this development in California will be discussed in the subsequent chapter.

---

<sup>2</sup>Robert Mare, Department of Biomedical Engineering, Massachusetts Institute of Technology, in a speech at the Helen Keller Centennial, Boston, June 1980.