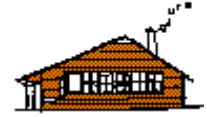


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Studio Installation & Design

Creating the Craft of Tape Recording

by John T. Mullin

When a GI sent a German tape machine back home to America, he only glimpsed what it would mean to his -- and recording's -- future.

In 1944-LIKE THOUSANDS Of other GI's just before D Day, I was in England. Because of my background in electronics, I was assigned to the Signal Corps, troubleshooting a problem the Army was having with radio receivers that were picking up severe interference from the radar installations that blanketed Britain.

I became so intrigued with what I was doing that I would work until two or three in the morning. I wanted music while I worked. The BBC broadcasts filled the bill until midnight, when they left the air. Then, fishing around the dial in search of further entertainment, I soon discovered that the German stations apparently were on the air twenty-four hours a day. They broadcast symphony concerts in the middle of the night, music that was very well played, and obviously by very large orchestras.

I had some experience with broadcast music and knew what "canned" music sounded like. The American networks wouldn't permit the use of recordings in the early 1940s, because they claimed the quality was inferior,. You could always spot the surface noise and the relatively short playing time of commercial 78-rpm discs. Even transcriptions had some needle scratch and a limited frequency response. There was none of this in the music coming from Germany. The frequency response was comparable to that of a live broadcast, and a selection might continue for a quarter of an hour or more without interruption.

In Germany at that stage, of course, Hitler could have anything he wanted. If he wanted a full symphony orchestra to play all night long, he could get it. Still, it didn't seem very likely that even a madman would insist on live concerts night after night. There had to be another answer, and I was curious to know what it was.

As the Allied armies moved on Berlin, my unit was reassigned to Paris and lodged in a building that had been a maharajah's palace. It was quite something. Each of us had a big room of his own, with lots of space to store equipment in. We were given the job of rooting out technological developments-particularly those with military applications-that the Germans had made in electronics during the war. That meant taking trips into Germany from time to time.

On those trips, I kept finding battery-operated portable magnetic recorders: about a foot long and eight inches wide with tiny reels. All of them used DC bias, which meant fairly poor signal-to-noise ratio, limited frequency response, and distortion in the high frequencies. But that didn't matter, because they were intended for dictation in the field; bare intelligibility was the prime criterion. We found so many of these recorders that we started dumping them in the maharajah's courtyard. When I left Paris there was quite a pile of electronic hardware out there, rusting in the rain.

In July 1945 a Lt. Spickelmeyer and I were sent to Germany to look into reports that the Germans had been experimenting with high-frequency energy as a means to jam aeroplane engines in flight. Our mission was to investigate a tower atop a mountain north of Frankfurt. There, in an enormous basement room, were two gigantic diesel engines and generators, apparently designed to pump out high-frequency energy to resonate the ignition systems of enemy planes. Nothing ever came of it. While we were poking around I met a British army officer who was there on the same mission. The subject of music and recording came up, and he asked if I had heard the machine they had at Radio Frankfurt. When he told me it was a Magnetophon, the term that Germans used for all tape machines, I assumed it was similar to the recorders we had been junking in Paris. He raved about the musical quality of this recorder and urged me to listen to it, but I thought he simply didn't have a very good ear.

On the way back to my unit, we came to the proverbial fork in the road. I could turn right and drive straight back to Paris or turn left to Frankfurt. I chose to turn left. It was the greatest decision of my life.

The radio station actually was in Bad Nauheim, a health 'resort forty-five miles north of Frankfurt. The station had been moved into a castle there to escape the bombing of Frankfurt, and it was then being operated by the Armed Forces Radio Service. In response to my request for a demonstration of their Magnetophon the sergeant spoke in German to an assistant, who clicked his heels and ran off for a roll of tape. When he put the tape on the machine, I really flipped; I couldn't tell from the sound whether it was live or playback. There simply was no background noise.

The Magnetophon had been used at Radio Frankfurt and at other radio stations in occupied Germany by the time I stumbled onto it, but there was no official word that such a thing existed. The people who were using it to prepare radio programs apparently were unaware of its significance. For me, it was the answer to my question about where all of that beautiful night-music had come from.

Lt. Spickelmeyer and I went to work photographing all the manuals and schematics. I saw to it that the Signal Corps got two Magnetophons. When we came upon more, I kept two for myself. During my last few months in the Army, I took these machines apart and sent them home to San Francisco in pieces. Regulations specified that a war souvenir had to fit inside a mailbag in Paris or it couldn't be sent. I made little wooden boxes for the motors, shipping each one separately. In all, it came to thirty-five separate items.

Any one of those boxes could have been lost or damaged, but all of them arrived safely. Reassembly, early in 1946, must have taken me three or four months, including the assembly of the electronics, which I wired anew with American parts.



Once I got the units together,, I started showing them to audio professionals. The chairman of what was then the Institute of Radio Engineers (now the Institute of Electrical and Electronics Engineers) heard about them and asked me to give a demonstration at the May 1946 IRE meeting in San Francisco. With Bill Palmer, my business partner in those days, I had recorded some music at NBC and at station KFRC in San Francisco. The station had a pipe organ, which was particularly effective for showing off the Magnetophons.

In the audience for the first San Francisco demonstration was Harold Lindsay, who, a few months later, was retained by Ampex. That company had been making aircraft motors during the war but was now looking for a new product preferably in professional sound. The tape recorder seemed to be a natural.

In June 1947, before Ampex really got involved, I was invited to give another demonstration-this time for Bing Crosby. He had been with NBC until 1944, doing the *Kraft Music Hall* live.

He's a very casual person, and he resented the regimentation imposed by live broadcasts. Some weeks he wasn't in the mood and hated doing a broadcast. At other times he was ready to do two or three at a crack. He didn't like having to keep an eye on the clock and being directed to speed things up or draw them out.

The obvious solution was to record the shows. But NBC had told Crosby flatly that it wouldn't air a recorded show on the network: It never had, and it wasn't about to start. So Crosby took a year off, and when he returned it was with Philco on the new ABC network. ABC and Philco had agreed to let him record. But because the process involved recording and re-recording on transcription discs, quality did suffer-at times to the point where the sponsor threatened to cancel the show because, during that first year at ABC, the audience rating was falling off. Philco blamed the poor audio. Crosby's voice didn't always sound very good after two or three transfers.

During the 1946-47 season ABC's engineers recorded each show in its entirety on 16-inch transcription discs at 33 rpm. If everything went perfectly, there was no problem-they simply would air it as transcribed-but that seldom happened.

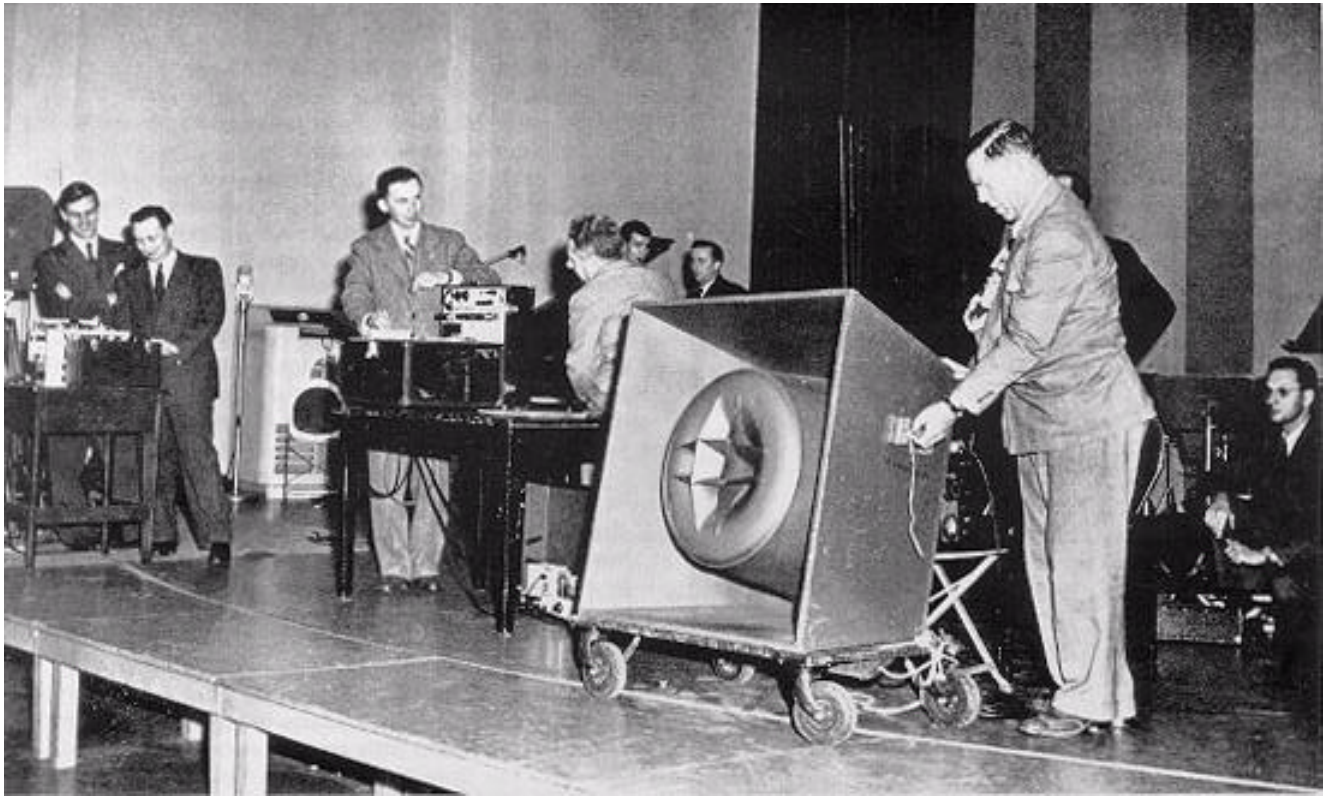
Almost invariably, there was editing to be done. That meant copying some discs onto new ones, making adjustments as they went, maybe substituting a song that had gone better in rehearsal for the final take. Since they recorded everything in rehearsal as well as what took place before the audience, there were plenty of bits and pieces to work with.

Sometimes it was necessary to make what were called predubs. Say they wanted to use three cuts from three different discs, all within a matter of a few seconds. That didn't allow enough time to get each one cued up during re-recording. So they would make little pre-transfers, or predubs, making copies until all the cuts were added. The final record, therefore, might be two or three generations removed from the original.

Bill Palmer and I had been using tape for soundtrack work (he already had a going business in the film industry before we joined forces), where magnetic recordings were far better in quality and more easily edited than the optical tracks that were standard for films at that time. We were introduced to Murdo McKenzie, the technical producer of the Crosby show, through our Hollywood contacts. And after our demonstration we were invited back to record the first show of the 1947-48 season. Crosby's people didn't say, "You have the job." They only wanted to see how tape would compete with the disc system they had been using. When I taped that first broadcast, they asked me to stay right there after the show and edit the tape, to see if I could make a program out of it. I did, and they seemed to like what they heard.

Once the Crosby people bought the idea, they had to find a place for me to work ' The American Broadcasting Company had been the Blue Network of NBC until, a short time before this, the government ordered NBC to sell it. NBC and ABC were still in the same building at Sunset and Vine in Hollywood. Crosby broadcast from what had been one of the major NBC studios.

Prior to the break up, there had been what they called a standby studio, scarcely larger than a hotel room, with two little control rooms at one end. One was the Blue control room, the other was for the NBC Red Network. There was nothing in this studio but a piano, a table, and two microphones. If one of the networks lost its feed from the East, as they did once in a while, somebody could dash into the standby studio to play the piano. An engineer would run into the control room for whichever network was out, and it was on the air again with local programming.



John. T. Mullin, center at magnetophon, gives the first demonstration of professional-quality tape recording in America for the San Francisco chapter of the Institute of Radio Engineers on May 16, 1946. Mullin's partner, William Palmer, is second from left. The unusual doughnut-shaped nine-celled folded-horn speaker in a four-foot-square enclosure, dubbed "the tub," was made by Western Electric.

Once the networks split and ABC had adopted the principle of using recordings on the air, there was no need for the standby studio. So that's where they set me up. I installed my machines, moved in a sofa and a couple of chairs, and it became a little living room. It was a delightful place to work.

Crosby's taping schedule was determined by two factors: when he was available, and when Bill Morrow, the writer, could come up with the material. Sometimes we went right up to the wire. At other times we would be two months in advance. We might do three shows in a row-one a day particularly if we were in San Francisco, where Crosby liked to work because of the audiences.



Mullin, with Bing Crosby, listens to a Tape Edited Show being played back via the Magnetophon.

Murdo McKenzie was a very meticulous man. It was his responsibility to make sure that a studio was available, that the musicians would be there, and that Morrow would have the script. After the show was recorded, it was Murdo's responsibility to satisfy Bill that his script had been handled properly. And if there was anything at all that indicated where I had made a cut, I would have to rework it until it was inaudible—either that or abandon it. Sometimes it would take me a whole week to put a show together after Bing had performed it. I had two recorders and fifty rolls of tape to work with—just what I had sent home from Paris. With those fifty rolls I was able to do twenty-six Crosby shows—splicing, erasing, and recording over the splices.

There were no textbooks on tape editing in 1947, so I had to develop my own techniques. There was no such thing as actual splicing tape, as we have it now. I began with a cement very similar to that used in film editing. The problem with it was that you could hear the splice—a sort of thump—if there wasn't complete silence where it occurred. I then switched to ordinary Scotch mending tape, along with a pair of scissors and a can of talcum powder. Mending tape was fine for the first day or so, but before long the adhesive would begin to bleed, sticking one turn of tape to the next. Then the tape would break, and we would have a real mess. Before I used a roll, I always went through it and rubbed powder on the back of every one of those splices. That would get me by for a while, but soon they would be sticky again.

When the show was finally assembled on tape, it had to be transferred to disc because nobody including me had confidence that this newfangled thing could be relied on to feed the full network. When someone asked me what would happen if the tape were to break, I didn't have an answer. Since each roll ran for twenty-two minutes (at 30 ips), a half-hour show took two rolls and required the use of both machines. I would have no backup if the machine that was on the air failed.

We continued to record all of the material from the afternoon rehearsals. Crosby didn't always know his songs very well, and he might start one and blow it. John Scott Trotter, the music director, would play the tune on the piano. When Bing got it, we would record two or three takes.

In the evening, Crosby did the whole show before an audience. If he muffed a song then, the audience loved it—thought it was very funny—but we would have to take out the show version and put in one of the rehearsal takes. Sometimes, if Crosby was having fun with a song and not really working at it, we had to make it up out of two or three parts. This ad-lib way of working is commonplace in recording studios today, but it was all new to us.

The BASF tape I was using had the iron particles imbedded in the plastic instead of coated onto it, and since the tapes were not of a consistent thickness the sound quality and volume would change from one roll to another. The thicker the tape, the louder the low frequencies. So, having put together a show with various rolls, it was necessary for me to take them apart again afterward and sort the pieces by thickness. I didn't dare throw away an inch of that German tape, because I didn't know where I could get any more.

The salvaging of the tape is a story in itself. Many a night I stayed in my studio, doing just that. In those days, the building was supposed to be closed after hours. The guard would try to throw me out, but unless I stood my ground there would be no tape for the next day's recording session.

In order to get some sleep, I made use of the Buzz Bomb Effect. In England during the war, if a buzz bomb came our way, we woke up. But if it created a Doppler effect, that meant that the bomb was going over to one side, and we stayed asleep. That kind of sensitivity will develop after a while. So I would put a low frequency tone onto the tape, with the machine set to monitor this tone, and lie down on the couch for a little sleep. When the level of the 'tone changed, I'd wake up, stop the machine, take the tape apart, sort out the new piece onto the correct roll, and go back to sleep.



The first two Ampex Machines (modelled on the Magnetophon) finally appeared in April 1948 and were followed immediately by twelve more for ABC. The ABC order had, in fact, made possible the final financing of the first two-Ampex Model 200, serial numbers 1 and 2, which were presented to me. They went into service on the twenty-seventh Crosby show of 1947-48. Still, ABC insisted on broadcasting from discs until its technical people were sure of their backup capacity and of the reliability of tape. But we retired my Magnetophons, which were getting pretty tired by that time.

As we became more familiar with tape, and as blank tape became available from 3M and others, we found that we could do all sorts of things that weren't possible on disc. One time Bob Burns, the hillbilly comic, was on the show, and he threw in a few of his folksy farm stories, which of course were not in Bill Morrow's script. Today they wouldn't seem very off-colour, but things were different on radio then. They got enormous laughs, which just went on and on. We couldn't use the jokes, but Bill asked us to save the laughs. A couple of weeks later he had a show that wasn't very funny, and he insisted that we put in the salvaged laughs. Thus the laugh-track was born. It brought letters, because those big guffaws sounded ridiculous after the corny jokes.



Mullin in 1950 with two "portable" Model 200 Ampex tape recorders (note the handles) and the first Model 300 to leave the factory. With these three machines, Mullin had available a full range of advanced editing techniques.

We considered the ability to splice in laughs a technical achievement. We had to trim carefully so that, where we went into or came out of a laugh, the levels would be the same as those on the laugh we were replacing. It was pretty tricky; we had no way of fading in or out.

About two years later, Chesterfields had replaced Philco as sponsor of Crosby's show. One night Bing had a cold. While doing a commercial with announcer Ken Carpenter, Bing said, "If you like smoking "(cough)"and blew it right there. The audience laughed. As soon as the show was over, the ad-agency men were in my control room. In the end, we had to re-record the commercial.

Then there was the time that Crosby was ad-libbing with Bob Hope. Hope loved to take the script that Morrow had written and throw it out into the audience, saying, "Let's go on from here without a script." Crosby didn't like that very much, but they would make a good show of it. On this particular occasion, Hope said, "It's a lucky thing for you that II Before the show was over the people from Chesterfields were in demanding, "What can you do about it?" I didn't know what they were talking about. "That reference to Lucky Strike," they explained. We had to replay the tape, find the off ending word, and assure the sponsors that it could be removed.

Much of what we did-things like making up a song out of several takes, "inventing" canned laughter, tight editing to take out offending material has become commonplace. But I had to learn for myself. It was part of a process of discovery sometimes serendipitous that began at that fork in the road outside Frankfurt. Sometimes I wonder what would have happened had I turned toward Paris. Perhaps, for the tape recorder, the story would have had much the same outcome; for me it would have been quite different.



Ampex Consul Model 200 S/No 1



Capitol Studios c/w Ampex



The first Monterey Jazz Festival held in 1958



Ampex Recording Booth at Monterey Jazz Festival

The first Monterey Jazz Festival was held on Sunday October 5 1958. Among the guests, was Billie Holiday. Ampex set up their own Recording Booth with mainly 3 Track AG351 Valve Machines and a Stereo AG600. This recording was found much later in 1985, Ampex Engineers set to work to convert the recording to CD media, which was later in 1986 released by Black Hawk Records Inc. 525 Brannan St, San Francisco, CA 94107.

The History of Ampex's Technological Achievements

1944

Ampex Electric and Manufacturing Company is formed by Alexander M. Poniatoff, November 1, 1944, in San Carlos, California.

The word Ampex is an anachronym using Mr. Poniatoff's initials and "ex" from the word excellence.

1948 First Tape Delayed Radio Broadcast

American Broadcasting Company uses an Ampex Model 200 audio recorder for the first ever tape delay broadcast of "The Bing Crosby Show."

1950

Ampex introduced the first ever "dedicated" instrumentation recorder, Model 500, built for the U.S. Navy.

1954

Ampex introduced the first multi-track audio recorder derived from multi-track data recording technology.

Ampex introduced the first magnetic theater sound system, made for Todd/AO CinemaScope.

1956 First Tape Delayed Television Broadcast

The Ampex VRX- 1000 (later renamed the Mark IV) video tape recorder is introduced on March 14, 1956, at the National Association of Radio and Television Broadcasters in Chicago.

This is the first practical video tape recorder and is hailed as a major technological breakthrough.

CBS goes on air with the first videotape delayed broadcast, Douglas Edwards and The News, on November 30, 1956, from Los Angeles, California, using the Ampex Mark IV.

1957 Emmy (#1) for VTR Development

Charles Ginsburg, lead engineer of the Ampex VTR development team, accepted Ampex's **first** Emmy for technical achievement.

1959

Orr Radio Industries, Opelika, Alabama, merged into Ampex to form the Ampex Magnetic Tape Division.

The famous Nixon-Khrushchev "Kitchen Debate" took place at the Moscow Trade Fair and was captured on an Ampex video tape recorder.

1960 Oscar for Theater Sound System

The Academy of Motion Picture Arts and Sciences presented Ampex with an Oscar for technical achievement.

Telemeter Magnetics, Inc. (TMI), a pioneer in core memory technology merged with Ampex, forming the Computer Products Company, later known as the Computer Products Division.

1961

Ampex introduced the first commercial helical scan videotape recorder. This became the basis for all videocassette equipment and is utilized in all home VTRs today.

Ampex Computer Products introduced the LQ, the first commercially available large capacity ferrite core memory with a rapid cycle time of 1.5 microseconds.

1963

Ampex introduced EDITEC, electronic video editing, allowing broadcast television editors frame-by-frame recording control, simplifying tape editing and making animation effects possible.

Ampex developed Terabit memory, utilising videotape technology for large capacity storage of digital information.

Ampex introduced a new computer peripheral digital tape transport, the TM-7. Its design used 80 percent fewer parts than previous tape drives and completely eliminated pinch rollers, brake cylinders and follower arms which handled tape roughly and caused frequent mechanical failures.

1964

Ampex introduced the VR-2000 high band videotape recorder capable of color fidelity required for good quality color broadcasting.

1967 Emmy (#2) for VR-2000 Colour VTR

ABC used Ampex HS-100 disc recorder for playback of slow-motion downhill skiing on World Series of Skiing from Vail, Colorado. Thus began the use of instant replay in sporting events.

The Ampex Computer Products Company introduced the RG memory. It was a medium capacity memory with an access time of 350 nanoseconds (less than half of one millionth of a second) and expendable from medium to very large capacity (up to 5,000,000 bits) by adding memory modules.

1970

Ampex introduced the ACR-25, an automatic library video cassette recorder, which allowed for the programming and playing of short duration spots for television stations.

Ampex introduced TBM (TeraBit Memory), a 2-inch transverse tape-based online digital storage system for high-performance computing applications.

1972 The first TBM delivered reached a never-before-achieved 3 trillion bit capacity.

1974

Ampex introduced the AVR-2, the first modular quadrupled recorder/reproducer for professional broadcasters. It required one-half to one-third the operating space required by other quad machines.

1976

Ampex introduced the VPR-1, helical scan, Type C, 1-inch, videotape recorder. Its predecessor, the VPR-2, became the industry standard for video recording.

1977

Ampex introduced Electronic Still Store (ESS@), which allowed producers to store digital video images for later editing and broadcast.

Ampex introduced the HBR-3000, high-bit rate, high-density magnetic recorder for logging and storage of electromagnetic data.

1978 Emmys (#3&4)

For Automatic Scan Tracking (AST™) & co-development of Type C Format - Introduction of the parallel transfer disk drive for simultaneous access to multiple data tracks.

The Ampex Video Art (AVA) system is used by artist Leroy Neiman during Super Bowl XH. AVA, a video paint system, allowed the graphic artist, using an electronic pen, to illustrate in a new medium, video.

1981 Emmy (#5)

For development of the Electronic Still Store. Ampex introduced ADO" (Ampex Digital Optics) which created special effects allowing rotation and perspective of video images.

1983 Emmy (#6) for development of ADO

Ampex introduce DCRS, digital cassette recorder system, offering compact cassette storage offering the equivalency of 16 computer tape reels on 1 cassette.

1984 Emmy (#7) for co-development of the VPR-5, the first helical scan portable vtr

1986 Emmys (#s 8 & 9) for the VPR-3 Video Tape Recorder and Zeus™ Advanced Video Processor.

1989 Emmy (#101) for co-development of D-2 video recording technology

1990 Emmy (#11) for the ACR-225 (large library robotic videocassette machine)

1992

Ampex introduced DC7C, Digital Component Technology, based on a 19mm helical scan video tape drive. DCT is a complete digital component system including a switcher, editor, digital effects and tape cartridges.

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