



Figure 5.30 Early '90s truck compound (Source: Doug Barry – Denali)



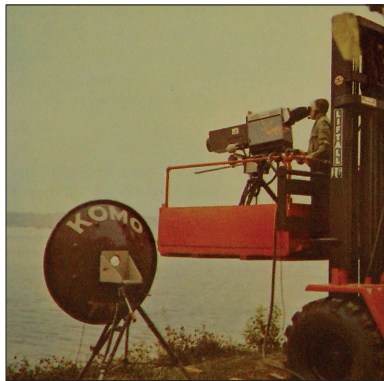


Figure 6.1 Before microphone manufacturers offered highly directional mics, they were "homemade." Putting a regular microphone at the focus of a parabolic shaped reflector makes the simplest directional mic. It was discovered that snow saucers, and even wooden salad bowls, made good reflectors. Here a microwave reflector with a mic capture the sounds of a boat race a mile or so off.

The Evolution of Audio

Lots of cameras and lots of microphones need to be blended into one stream, the television program, conveying to the viewer the producer's and director's vision of the event. Video mixers are referred to as switchers in the United States and are operated by technical directors. The British refer to the video switcher as a vision switcher. Large audio mixers are referred to as consoles in the United States or desks in the UK. Let's look at the world of the A1, A2 and the audio mixer.

It Used to be a Poor Stepchild

There's an old adage in television: Video without audio is a mistake, but audio without video is radio. Early on, the industry often treated the sound portion of television as if it really was important only to radio. The audio effort was often only what was necessary to support the pictures. While some productions gave audio the required effort, it was usually in the area of sound effects, and not in fidelity. And why should they have put more effort into it? Most early television receivers had a single small speaker. The sounds coming out of that little speaker weren't going to enhance the presentation. Audio was generally commented on only when it was absent. The major advances in television for the first 30 years were mainly on the video side, as black-and-white video moved out of the way for color, and image quality slowly improved. Although microphones evolved, audio processing equipment didn't keep pace with the advances in video technology. The average television station and remote truck had small mixers in their studio control rooms or compartments.

Although remote productions were where audio first began to blossom into a nearly equal party to the video, early on the audio wasn't treated much better on the road than in the studio. The audio effort at many sporting events into the '70s was so small that the audio mixer was often not even located in the truck. Often it was up in the announce booth, as only three or four audio sources were required, and a couple of those were usually the announcers.

Then the production folks wanted to find more ways to immerse the viewer in the event. One of the first ways audio was used to do that was

by amplifying the sounds occurring in the event. In sports this meant the sounds of the bat hitting the ball, the slap of pads and helmets in contact, the squeak of tennis shoes on the court, the ref's whistle and the players' grunts.

My Life in Television Audio

By Bob Dixon

It's a hot and muggy Tuesday night in 1993 at the ballpark in Atlanta, but in the living room of a viewer in a small town on the St. Lawrence River in the Canadian province of Quebec, it is actually quite comfortable. The sounds of the crowd in the stadium fill the living room and most of the light in that room comes from the close-up of Montreal's newest relief pitcher, who is staring intently at each sign from the catcher.

The announcer calls the first pitch a fast ball, and it sounds obvious from the way the ball explodes into the catcher's mitt that this new guy has a very powerful arm. The umpire calls "strike one!"

Meanwhile, inside the production truck parked adjacent to the gates of Fulton County Stadium, a quiet panic is developing. It is the last of the ninth inning, with Montreal leading 5 to 4. Atlanta has a man on second base and another on third; there are two outs. Camera 2 is following the runner on third, and is being recorded on the red machine; camera four has another runner on second.

The director tells each camera exactly who to cover if they should score; who to stay tight on for reaction shots; and then tries to remember if there are

enough cameras left to cover all the things that can happen with this batter.

The producer calls camera assignments to videotape, reminds the director to make sure each manager is covered and cues the announcers to look at the graphic on their monitors. With all of this stuff coming out of the intercom speaker, I'm sitting at the audio console trying to concentrate on the balance between announcers, crowd, home plate and the music playing on the PA system.

The second pitch is swung at and hit, but it doesn't sound like the contact was solid. The ball slowly rolls toward third, and the infield

looks like one of those fire drills teenagers used to practice at red lights. The runners bolt as if they've been shot from cannons; the pitcher makes a mad dash and scoops up the ball. In an instant he makes the decision to go for the out at first base. He fires the ball and the first baseman stretches. You can hear the ball pop into his glove; the runner touches the bag and the umpire yells "safe!"

Two different angles get played back at real speed. Channel 2 of the machines is tracked, replaying only the sounds of the effects microphones. Each time it shows the runner's foot has yet to touch the base. The viewer in Canada is yelling nasty French words at the television. Atlanta got lucky, and we, the TV crew, are feeling pretty good about what we captured for our audience.

Not so long ago, that was about the best an audio mixer could hope for when working on a baseball game. Now things have gotten a bit more complex, but let's spin the dial on the "Way Back" machine before we get into that. Let's go back to 1970 for a bit. Actually we'll be going back farther than that equipment-wise, because in 1970 I worked for a public television station, and back then our equipment was state of the art — for 1960 maybe.

In those days microphones went to mixing consoles, just like they do now. But the microphones were bigger, a lot bigger, and the mixing consoles were smaller.

Mixing consoles then had a big rotary volume control for each input. The inputs generally went something like this:

1. Host microphone
2. Guest #1 microphone
3. Guest #2 microphone
4. Guest #3 microphone
5. 1/2-inch audio tape playback
6. Audio cart machine
7. Videotape machine #1 playback
8. Videotape machine #2 playback
9. Turntable

That was it. Everything was mono. All the inputs got mixed together

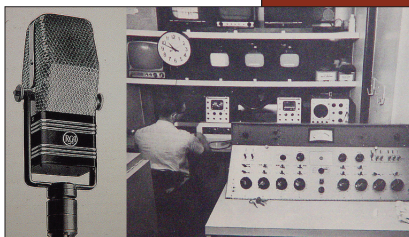


Figure 6.2 On the left is a state-of-the-art microphone at the time television became widely available. It weighed 8.5 lbs. and was 12 inches long. On the right is a state-of-the-art audio console for the early 1960s. It could handle eight inputs and level control was via the rotary pots. The left four pots controlled low-level audio sources such as microphones, while the right four controlled the level of high-level audio sources such as turntables, or audio or videotape players.

and sent out the main output. Often the audio mixers had two main outputs. We didn't really need the second one for air, so we would use it for different jobs. Sometimes I'd use it for a "cue speaker" for the director. That way our host could talk to the director when we were playing back a tape piece. Other times I'd send all my microphones to output #2, and then bring that back into another input, and send that to output #1. That way I could raise or close all the microphones with one control. Like when we went to tape. It's hard to close four big rotary controls and open a fifth, all at the same time with only two hands.

But we did a lot with a little. During the summer we did a weekly jazz show. Every Monday night we'd have a local group from Hartford, CT, playing on a city furnished stage. People would be spread out all over the lawn in the back of a regional vocational tech school that resembled a natural amphitheater. It was actually very nice. Around sunset, limos would start driving in and the "Name" group of the week would arrive. Being fairly close to New York City, we had some pretty hot talent that were close enough, and nice enough to make this drive. They included people like Clark Terry, The Thad Jones/Mel Lewis Big Band, Thelonius Monk, Herbie Hancock and lots of others.

Planning for these shows started the previous fall and winter. We had a wonderful producer/director who would write to all of these groups. He would include a piece of paper that would have a little drawing of the stage, and he would ask the leader of the group to draw in where people would be, and where they would like the microphones. We got some great drawings back.

My second output channel got some real use then. No, we didn't isolate anything — no multitrack tape machines, and no stereo. My second channel fed a couple of MacIntosh tube amplifiers that were connected to two Altec Lansing Voice of the Theater loudspeakers that were on top of scaffolding we brought with us. The loudspeakers were owned by one of our video engineers. That was the PA system.

The setup consisted of one mic for each instrument, except the

drums. They got one mic over the top of the drum kit and one for the kick drum. Fortunately our chief engineer came from WGBH in Boston, where audio is still considered important. We had some very nice microphones to work with. As the groups grew in size, I would run out of inputs on my mixing console in the truck. I would then bring in the reserves. We had a portable four-input GE mixer and a six-input portable Ampex mixer. I grouped instruments by type into each mixer, and then brought the outputs of these into the main mixer. It was great having one control for all of the horns and another control for all of the background vocals. They were like "submasters." As for any equalization, as they say in New York, "fuggedaboutit". No bass control. No treble. If you don't like the way it sounds, move the mic or try a different one.

Fast forward to the early 1980s. I was a relatively young audio freelancer then, and I often worked on a weekly boxing show from an ice arena in Tatowa, NJ. ESPN hadn't been on the air very long. They had their own trucks back then, with some pretty nice audio mixers in them.

Gone were the days of rotary faders. This baby had 31 straight faders that moved up and down. The audio mixer could put one finger on each fader and easily control several at a time. And, even better, those 31 inputs went to any or all of eight audio groups, or "submasters." Wow. All the announcer microphones could go to one sub, all the effects microphones could go to another and all the tape machines could go to yet another. If I needed to close all the announcer mics at once, one fader did the trick. Even better, each input had equalization. There were controls for the lows, the middle and the highs. If we needed to brighten the sound of something, just a tiny movement of the top EQ knob might do it. All those submasters continued on to either, or both, of the final two outputs.

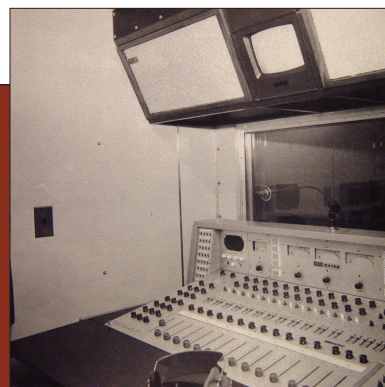


Figure 6.3 By the mid-70s, audio mixers were beginning to look like they do today, with a combination of faders and rotary knobs.



Figure 6.4 By the '80s audio mixers closely resembled many of today's consoles, as this mixer on a network truck attests. (Source: A.F. Associates)

No, we weren't in stereo then either, but our videotape machines had two audio tracks. We would record our program sound on track one, and just our sound effects on the second track. That second track could be used later by the network for making highlight tapes or adding new voice-overs. Sometimes we would play back that second track during the program to let the viewers hear the way something happened earlier in the show.

The boxing show wasn't packed with commercials like shows are now, and often we would stay in between rounds. We'd sit on a wide shot and the announcers would tell people stories, or we'd look at a trainer working on the cuts on one of the fighters, and I'd be think-

ing "Boy, it would be cool to be able to listen in on that." I remembered using fishing poles when doing documentaries at public television, and I talked to the ESPN producer after one of our shows about trying something new. The next week I got a microphone floor stand from the truck and unscrewed the heavy base from the bottom. This left us with a long, pretty heavy chrome pole. On top of this I had mounted a big shock mount and a "shotgun" microphone made by Electro Voice. Not only was this rig heavy, but much of the weight was at one end.

There was a guy named Smokey who was in charge of the crew setting up all the chairs in the arena, and he agreed to bring his 16-year-old daughter into work for us that night. She was a very pretty, very petite young lady who listened intently while I explained that what I wanted her to do was hold up this heavy mic in between these sweating, swearing, big bloody men so that we could hear what they were saying to each other. I gave her an intercom box with a big set of headphones so she could hear me guiding her in one ear, and what she was pointing at in the other. It was great. The producer loved it. He said, "Bob, send her over to the other corner." I'm thinking, "other corner?" I don't know if you've ever been to a live boxing match, but you can't just walk in between all these people and judges with heavy equipment dragging wires behind you.

By the next week we had a setup in each corner. At about two minutes into each round I would ask the producer which corner to use. The producer would decide, I'd tell Chris and she would run from one corner to the next, taking off and putting on the hardware. All for \$25 a match.

Within a month this had become so popular we doubled our crew. It seems Smokey had another daughter, so we had both corners populated full-time.

Now it is 2002 and, as I've alluded to earlier, things are a bit more complex. Let's take a look at boxing for comparison. Videotape machines have had four separate audio channels for a long time now. At the Olympics in Salt Lake City, NBC used Sony's new IMX videotape machines, and they came with eight audio channels. Many shows (but not all) are done in stereo now, and some are done in four-channel surround sound. (When we change over completely to digital broadcasting we will have the ability to do 5.1 channels of audio for the viewer's home theater system.) Let's take a look at how boxing has changed since the '80s.

My reference point for boxing is HBO. Here is what they do on a typical fight for World Championship Boxing:

- 5 head-worn microphones for the announcers sitting at the announce booth
- 5 hand microphones for when the announcers go "on-camera" in that area
- 2 hand mics, one in each fighter's corner, for Larry Merchant in case there is something controversial going on and Larry feels he should go talk to the trainer about it
- 1 to 2 headsets for interpreters in the fighter's corners
- 4 hand mics in a high "on-camera" position for the open and close
- 2 hand mics in each fighter's dressing room (sometimes two rooms, sometimes four)
- 2 crowd mics
- 2 mics over the center of the ring
- 2 mics for the neutral corners
- 2 mics for the "fishpoles" in the fighters' corners
- 1 mic on each of three handheld cameras
- 1 wireless mic on the referee
- 1 wireless mic on each of two trainers
- 1 mic on the bell
- 2 feeds of the PA system
- 2 tracks on each of nine playback machines
- 4 tracks from music playback machines
- 2 tracks from a CD player

That's 54 tracks if we only do two dressing rooms and there are no downlinked satellite interviews with fighters for a fight coming up in the near future.

As you can imagine, our audio consoles have grown as well. When I get really lucky, I get to mix on a Calrec Q2 audio console, which has 60 faders...on the bottom row. There are another 60 just above those. Each fader can accommodate a mono input. Or, depending on how it is ordered, a stereo input (two channels). That means there is a potential for 120 stereo inputs. Who would ever need that many inputs? Well, at the Salt Lake City Olympics we at NBC had such a console in each of two audio control rooms. We felt bad because we couldn't quite fit all of the inputs the audio person would potentially have to deal with. So we fed several inputs with the output of a "router." This allowed the audio mixer to choose what device he wanted to feed into an input by just pushing one of 48 buttons.

The Calrec Q2 has eight stereo groups, or submasters, and four stereo main outputs. It has 10 "auxiliary" outputs (two of which are stereo-capable). It has 32 multitrack outputs. Do we use all of this? Well, if we are doing skiing, or track and field, or golf, or figure



skating, or any of several other sports, we use an awful lot of it.

Remember all those tracks that are now on videotape machines? We "ISO" things there. Maybe one machine is recording one fighter's corner with the fishpole on one channel, the RF mic on another and full program on the other two. Another machine is doing the same with the other corner.



Figure 6.5 Modern mixers give the A1 very wide latitude as to how they will organize the various sources, and what type of processing will be applied to each source.

Figure 6.6 Early "shotgun" mic. Clever mechanical placement of baffles and pickup elements made for a mic that was highly directional.



Figure 6.7 Audio consoles historically doubled as the audio mixer also, as the audio actually passed through the operator's console. Today's mixers, especially digital ones, have extremely high-powered Digital signal processing occurring. As a result, many mixers today are organized like video switchers, with one operations console, which controls the frame that does the processing and mixing of audio, per input from the audio console. (Source: Marty Etbeck)

Figure 6.8 Today's boards are so flexible that most likely no two AIs would organize and mix a show the same way. Some boards have multiple sets of faders, and allow faders to control different sources with the push of a button. Most high-end "boards" let you assign often-used sources to close faders, and the "set once and forget" sources, often part of a sub-mix, to faders not as conveniently located.



With some insight from someone who has been there and done that, we had a look at how audio went from necessary evil to an integral part of the show, and how good audio is produced by a person who is half artist, half engineer. Next we will look at some of the engineering and mechanics that go into the audio mix. ■

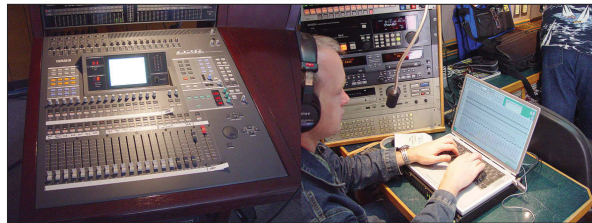


Figure 6.9 Many audio consoles blatantly display their computer underpinnings. The board on the left has motorized faders, and "soft" buttons, and rotary pots. This allows a particular setup to be saved and recalled. The right photo shows a "virtual" console. The laptop controls the mixer, and the GUI on the laptop is the control console.