

# 1 Introduction to TV Sound Engineering

The significance of sound to the visual medium cannot be overestimated. Film producers learned many years ago the impact that sound and music had in the success of a screen production. No one will ever forget *Jaws* and how a simple two-note audio cue made everyone's hair stand up.

As television equipment and television remote production trucks, also known as *outside broadcast* (OB) vans, got bigger and more sophisticated, television producers and directors began to pay more attention to sound. A motivated group of audio technicians rose to the occasion with clever ideas and great-sounding results. Recently, a *USA Today* columnist bestowed audio accolades on some and blistered others about the sound of the weekend's television coverage. Finally, people are paying attention to the sound!

The importance and complexity of audio production in today's broadcasting environment is particularly evident with the move from analog to digital. It has taken years to settle on standards and the implementation has been inconsistent, but high-definition television with surround sound is here to stay. (See Figure 1.1.)

Producers like Don Ohlmeyer and director Mike Wells pushed the expectations of audio and have inspired superior productions. FOX Network Director of Sports, David Hill has used sound to differentiate FOX Sports from other sports telecasts. It could be argued that FOX has been the most progressive of all the American Broadcasters in implementing new technology and production techniques.

Television has a legacy of being a live medium. Game and quiz shows and variety programs such as *The Ed Sullivan Show* were a main source of programming during the 1950s and 1960s. They were live and by today's standards fairly easy to produce. (Do you think the Beatles got a sound check?) Ed did not use a lavalier microphone and there were no wireless microphones, which made the job of the "boom operator" the key sound position.



**Figure 1.1** ESPN sideline position with three announcer headsets. This audio position requires three announcer headsets, a camera operator on the directors communication channel plus stage manager and audio communications gear.

It did not take long for some television producer to figure out that live events such as news, sports and entertainment can fill a lot of air time! The remote broadcast was born, even though the equipment was large and sometimes difficult to keep operating. The sound engineer wore a tie and a pocket protector and operated a mixing desk with eight rotary faders and some relays and vacuum tubes. The networks had large engineering departments. The BBC even had a complete R&D department, which can be credited with work on the first digital-mixing consoles.

Technology and television have a symbiotic relationship that thrives on new ideas. Sports and location production drove the development of superior and smaller cameras with better resolution. Recording and playback devices now have multichannel playback and record, and some can do both at the same time. Television sound has evolved from viewers being happy just to see a picture, to the sound being the most technically and aesthetically differentiating factor of a program.

Certainly the role of audio has evolved as well. Television audio is an art that is reliant on technology to combine and manipulate sound to generate a soundtrack for a picture. New technology such as surround sound has opened many creative possibilities for live sound mixers that were formerly only available

to post-production film sound. As television sound equipment grows more complex, those in the field must continuously learn in order to survive. If you can master the technology, you can master the art of sound. Dynamic dimensional soundscapes are possible for the creative sound artist.

The senior audio role is to manage the sound responsibilities of the entire production. This includes show sound in all audio formats, managing the audio team, organizing and programming the communications, routing and distributing the audio elements and transmitting and sometimes troubleshooting a problem while on-the-air. The sound mixer/designer role is to create a full rich soundscape in real time. Live! Most multicamera shoots, entertainment, sports or informational programs are live to a viewing audience or live to tape.

There is a tremendous amount of accountability beyond “mixing a good show.” A growing trend is toward having an audio technician travel with the television truck because of the variety of digital consoles, routers and programming involved in getting to air. For complex productions, the set-up has grown tremendously, in addition to all the various mixes, outputs and formats that the audio mixer has to generate, plus mix a good-sounding show. If a piece of equipment has a microphone, speaker or audio circuit, it is the responsibility of the audio department—and it’s a lot of work! If you ask most people in the field why they love it, a standard and probably honest answer is “the challenge of doing it live”! No second take, and no taking it off the airwaves! In television, you are only as good as your last show, and fortunes and misfortune turn fast and sometimes unfairly.



**Figure 1.2** The mixing console is the control center for all audio signals.

Televised sports exploded during the 1980s. Rights fees were cheap and sports were the mainstay of cable programming. This led to rapid growth at ESPN, which prompted the rise of cable TV and the concept of a nationally distributed cable station like the Superstation Channel 17 and WGN Chicago. The Atlanta Braves baseball franchise provided a lot of hours of airtime when Channel 17 and Ted Turner were pioneering cable television programming.

The phenomenal rise in cable television, mergers and acquisitions at the networks, along with an unsettled union labor pool all laid the foundation for a paradigm shift in broadcast production and the labor force. A series of events occurred in rapid succession. In 1986, General Electric (GE) bought NBC through a purchase of RCA. GE reduced spending at NBC and then began to expand into cable television by its acquisition of shares in CNBC, Bravo, Arts and Entertainment channel, and others. At about the same time, ABC was purchased by Capital Cities for 3.5 billion dollars. Capital Cities then moved ABC into cable television by taking control of cable sports network ESPN. CBS was fighting off an expensive hostile takeover and the unions were threatening to strike. All three networks were anxious for a change!

This flurry of activity gave rise to the independent remote truck known as the OB van (outside broadcast van), which actively pursued work from the networks and cable broadcasters hungry for programming. This fleet of freelance television facilities was also happy to provide a talented freelance crew. Through all the mergers and acquisitions, network management changed and so did labor relations. The transition to a freelance labor began.



**Figure 1.3** NEP is a major supplier of television mobile vans. This unit is one of five OB vans used for NASCAR racing.

The freelance labor force got a boost in the 1980s with big demands from the networks and cable channels using a newly emerging industry of independent OB vans. The OBs provided top service, equipment and technicians and the industry grew exponentially. The final major shift in television production and labor relations occurred when Rupert Murdoch fashioned the FOX TV network from a bunch of independent stations around the United States. FOX shook up the stability of the big three when key talent, production and engineering left the “majors” and joined up, with hefty commitments and fresh capital.



**Figure 1.4** ESPN camera operator Jay Morrow fighting off wasp at an outdoor camera platform.

## The Quest for Sound

Over the years many audio mixers, or A1s, have been committed to pushing the envelope in audio production. In the early years, experience was lacking and audio personnel resorted to trial and error. Stories circulated about audio personnel placing a microphone in the golf hole on the green, in the baseball dugout, or in a condom underwater! I learned about the roar microphone from Dennis Finney at ESPN, when I had to climb 100 feet up the inside of the scoreboard at the Atlanta Motor Speedway to place a microphone. It had to be a cardioid microphone placed at the very top of the tower pointing up, so the microphone did not pick up sound reverberating inside the scoreboard. Television sound is a very demanding and sometimes frustrating job and should always be approached with a passion for adventure. The quest for sound begins with a love for sound!

The quest for sound is a journey. Television sound has reached new levels and will grow exponentially as high-definition television and surround sound become the norm. Surround sound offers unparalleled creativity as the move is made from *sound reproduction* to *sound design*. Sound reproduction is what is expected of a sound mix—for example, the sound of the bat crack is expected. Sound design often involves the unexpected and the subtle. For example, spatial placement is one of the new tools of sound design. Sound design is a quest for sound excellence and requires a passion and a drive along with a fine understanding for the art and science of sound (plus a good set of ears).

Television sound design is evolving as an integral part of the entertainment experience. For example, early radio and television coverage of sports had few natural effects and little atmosphere. Since those days, television sound has evolved into a medium that puts the viewer into the athletic experience. Consider the cameras and microphones in race cars, which have changed the viewing experience of motorsports.

## **The Technology**

The evolution of sound coverage and production parallels the improvements in electronics and sound technology, at a somewhat slower pace. The greatest advance in broadcasting was the development of small home speakers. When the consumer could finally hear the difference in sound quality on their television, they wanted more! Recent progress in the implementation of new technology in television sound has been pulled by consumer demands.

The implementation of surround sound has not been smooth. Many issues in monitoring, generating multiple mixes and upmixing two-channel audio sources are still being resolved every day through live television production. Surround was introduced in the early 1970s with an unsuccessful attempt at quad sound, but the problem for broadcasters was the delivery of the audio and video signal. Transmission of the television signal by satellites has a history in remote television, but analog satellite transmission has limited bandwidth and only two channels of audio. This not only hindered the progress of stereo but presented a unique challenge for any type of surround sound.

A major problem for the networks has been the existing infrastructure for moving audio and video around a facility. For every stereo signal path, only two wires were needed for sound, but with surround, six wires are needed for 5.1 sound. Control rooms had to be fitted with speaker monitoring, mixing capabilities and routing flexibility. Additionally, transmitting the audio signal and retransmitting the audio signal by affiliates had to be resolved. Early surround used encoding methods by Dolby and Circle Surround to process a surround-sound mix into a two-channel left-total and right-total enhanced stereo sound mix. The enhanced two-channel audio mix was compatible with any two-channel or stereo sound system, and a decoder was used to decode the two channels into a surround-sound mix similar to what was started with.

Encoded surround sound has presented mix challenges to the A1. Perceived loudness levels of announcers have been a significant issue for sound mixers because of improper speaker placement and calibration in OB vans and other small control rooms. Given all the problems that were being worked out, FOX produced its first season of NASCAR in stereo and worked on the issues associated with ramping up to surround sound in the background.

### ***Racing and Audio—Refining the Process***

*Car racing has a long legacy of television coverage, with the Daytona and Indianapolis 500 garnering a large viewing audience. This large audience has allowed the network to invest heavily in these large-scale productions. In 1985 CBS Mobile Unit 8a and 8b covered the Daytona 500 with 12 cameras and a 32-Channel Ward Beck mixing desk. At the 1985 Daytona 500 Bob Seiderman used one microphone on a camera that was mounted on the wall at car level. This camera and the associated microphone became known as the speedshot and has been the source of great visuals and evolving microphone placement. A couple of years later, an additional microphone was added to capture the exhaust blast as the cars passed the camera. This combination of attack of the motor sound and the trailing roar of the car was an enhancement for the large speedways, because it provided a believable fill sound between camera cuts.*



**Figure 1.5** 1985 Daytona 500 CBS mobile units MU8a and MU8b plus a support trailer that carries cable and additional equipment and has a complete maintenance area.

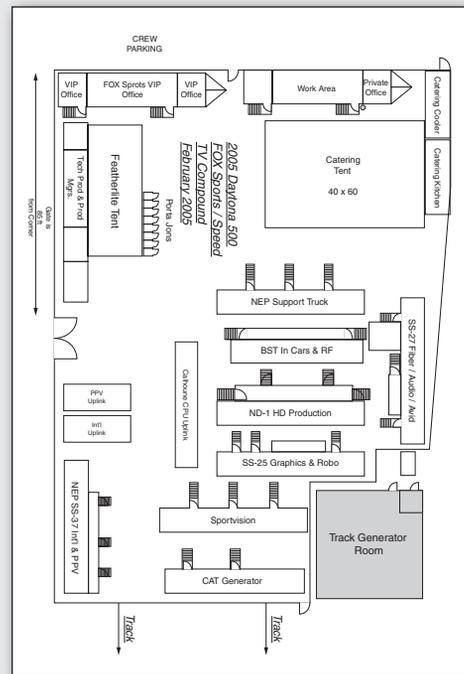


**Figure 1.6** 2005 Daytona 500 with six mobile units plus generator.

**Figure 1.7** The compound diagram is enclosed in the production manual and the production manager will follow the layout of the compound consistently from venue to venue.

*Fifteen years later, FOX A1s Fred Aldous and Denis Ryan refined the sound of NASCAR and took it to another level. The same speedshot camera at Daytona now has three microphones—an omnidirectional approach microphone, a trailing exhaust microphone, plus a stereo AT825 mounted on the fence, away from the track for consistent left-right wider dimension. Surround sound certainly enhances the viewing and listening experience and FOX has led the industry in implementation and innovation of surround.*

*Innovation is the pleasure zone for audio. The speedshot microphone has been an evolving concept, and now with surround sound spatial placement is available. Fred Aldous places some of the trailing sound in the right surround channel, adding yet another dimension to the telecast.*



## The Workplace

Television studios in New York and Los Angeles produce sitcoms, game shows, talk shows and soap operas every day of the week and often in front of an audience. At the same time, location productions originate from all parts of the globe—ones as simple as a newscast and as complex as sports coverage in surround sound. The common denominator is that every single television production requires sound. Even though all types of productions are different in scope, methods are common and require the skills and talents of an audio practitioner when it comes to capturing and reproducing high-quality, engaging soundscapes.

Television sound usually includes a voice track that is captured live with headsets, lavalieres or hand microphones, depending on the type of production. On a soundstage, microphones are used on boom arms and follow the sound source around, while on a news set lavalieres are used because the sound source is usually stationary. All television production requires quality sound and all sound is prepared using microphones, mixing consoles, processing and playback equipment. The difference is in the mobility of the equipment. The single greatest difference between studio (inside productions) and remote television productions (outside productions) is the set-up and tear down.

Depending on the size of the shoot, a few hours to several days are needed to set up a television shoot. The tear down and packing of the equipment is commonly known as *strike*. Remote television production is usually sports or entertainment and generally occurs at a stadium or arena. Video engineering for entertainment has a familiar set-up, and as with any visual production, camera angles and lenses are chosen to deliver a desired look. Video and communications are effectively done in a television truck, but large-scale sound production often requires multiple specialized mixing positions.

## The Equipment

At the heart of any television production is the equipment and the housing for the technicians to operate it. Because of the high expense for broadcast equipment, there are very few fixed multicamera venues beyond the religious sector. That means that remote trucks must be brought in to shoot the production. However, much of the equipment used in studios and trucks is the same. Since the truck audio is more complicated due to its mobile nature, we will use a truck for our equipment discussion.

The television truck, or outside broadcast (OB) production van, comes in many sizes, varieties and specialties depending on the specific requirements of the production. A basic mobile unit is fitted with a video switcher, audio mix desk, intercoms, graphics, recording machines and cameras. For large television productions the television truck expands, almost doubling the size of the trailer. Specialty units are fitted with additional equipment that provides support to the main OB van. Television trucks are not optimized for sound monitoring and a specialized sound OB van will have proper space and speaker placement for sound monitoring.

The size, complexity and scope of television production have grown exponentially along with the related technology. As the scope has grown, so have the demands for more production space and expandable trucks. Extremely large and complex productions require specialized equipment and units that are specifically designed for that purpose. NASCAR coverage utilizes a great deal of “pop-up” telemetry visual inserts that require the specific capabilities of a unit that takes the audio and video after the team produces it and then inserts the graphics and sends the delayed video and audio back.

Depending on the type, length and location of the remote, an OB van may not be required and the equipment may be assembled and organized in what is termed “flight cases” or a “flight pack.” Most broadcast equipment will fit into a 19-inch rack space and is easily assembled into portable cases for protection and shipping. Usually a systems engineer designs the signal flow of the production and specifies the equipment and components. The interconnect cabling has gotten easier with the use of fiber optics, and some existing systems may have wire looms of precut cable for recording devices and communications.

Whether using flight cases or a television truck, engineering set-up and systems checkout are always performed by the audio and video crew under the supervision of the tech manager, engineer in charge, video engineer and senior audio.



**Figure 1.8** Three-camera shoot on aircraft carrier.

Entertainment productions are generally musical variety, award shows, or concerts and tend to be music based. Music and concert productions require a sound truck with proper microphones and processing equipment to achieve an acceptable concert or studio sound that satisfies the artist. Often the rehearsals are recorded, so the artist can listen and tweak the mix for the final performance. Additionally shows like *American Idol* and the Grammys are in front of a live audience and the sound of the live PA and television are sometimes at odds. A monitor mix for the talent is critical to all television productions, especially a music production. The levels of quality and certainly the levels of expectation go with the Hollywood budgets.

The television truck becomes a temporary garrison of technicians and engineers and the area of operations around the truck is known as a television compound. The television compound will generally house

one or more TV trucks, satellite uplink, office trailer(s), catering and portaloilets. There are similarities in all television or film productions particularly when it comes to logistics. The compound becomes a small city that performs a specific purpose and requires power, catering, telephones and security.

Safety is a serious consideration because of the large amounts of power, equipment and cabling that weaves a web around the television compound and often public spaces. Rigging of television gear often requires access to areas of extreme danger, such as high places and near hazardous machines. Television productions are often at venues with high noise levels and operators sometimes have to listen to communication at unsafe volume levels. Fiber-optics cable is used extensively to interconnect broadcast equipment and laser safety is a major consideration. (Never look directly into a fiber-optics cable to see if it is working!) RF emissions can be a problem around microwave and satellite equipment, which is prevalent around broadcasts. In addition, sports often continue during adverse weather and antenna stands and scaffolding for cameras can become a lightning-strike hazard.

## **The Host Broadcaster**

The international and national popularity of multiday entertainment and sports events has created demand for an uninterrupted television and audio signal of the entire event. The *international broadcaster* or *host broadcaster* produces core coverage of the event generating video and natural audio for all the “rights holders.” The Olympics, Worldcup Football, and the Academy Awards are examples of events that utilize a host broadcaster. The rights-holding broadcasters overlay their own announcers and production elements and retransmit the final production in their home market.

The host broadcaster’s role insures complete and unbiased coverage of the event, sport, athletes and entertainers and provides the core coverage so the rights holders do not have to duplicate resources. The host broadcaster minimizes the impact of seating loss by eliminating the need for multiple cameras at key positions. The host broadcaster also functions as an intermediary between the rights holders’ requests from the event or venue.

The continuous coverage allows broadcasters to take commercial breaks at different times and a pay-per-view event can therefore be telecast without interruption. The host broadcaster coverage is recorded for archive and no action is missed.

## **Audio Positions**

A wide variety of job opportunities exists for audio technicians on soundstages, at broadcast facilities and from remote locations all over the world. The amount of sports and entertainment that is broadcast and recorded is staggering. One particular US network has three different production teams just for the regular football season. Hundreds of local and national television studios do some kind of original programming. Depending on the regularity of the production, the facility may have a full-time staff to cover the demands or use freelancers, or both.

The news and talk shows are produced and broadcast essentially live, although some of this programming is recorded and delayed according to time zones. While many of these programs tend to originate from the national networks, affiliate and independent stations in every major city across the world produce their own local news and interest shows.

Following are descriptions of the main audio positions in television sound production.

### ***Audio Mixer***

The audio mixer (A1) needs a diverse set of skills that includes creative/artistic, technical and managerial. Creative skills are used in producing the end product, “the mix.” Sound mixing requires the ability to judge the balance and quality of audio signals and requires the motor skills and talent to create a pleasing, effective soundscape. There is nothing technical about mixing—it is the artistic and creative aspect of sound. However, television audio also requires a technical mind capable of logical and methodical thought in order to set up, operate and maintain the large quantity of technical equipment. Technical skills are necessary.

Organizational skills are also essential to success for the senior audio, audio supervisor and AIC (audio in charge) on an OB van. Organizing and mapping the signal flow is critical to the success of a good mix. The audio mixer is responsible for managing the work load of the audio assistants.

Mixing skills are learned and practiced every time you sit behind a mixing desk. College basketball has been the proving ground for many top sound mixers and provides a good opportunity to practice the critical listening skills essential to constructing a good-sounding mix. Balancing the announcers with the dynamics of the crowd is a challenge with any production. Learning how to selectively listen to the producer and director is probably the most difficult aspect of television to teach, learn and train. “Ear-training” is learning how to listen critically and balance a sound mix, while selectively listening to the director and producer. The one day set-up and telecast common for college basketball is also good training for managing time and personnel. Additionally, basketball provides good practice on the set-up because the OB van is close to the venue, simplifying cable runs and connections in severe weather.

### ***Sub-Mixer***

Large television productions will have one or more sub-mix positions. Award shows like the Grammys, Emmys, or Academy Awards will have a senior audio mixer managing and balancing the entire production, several music mixers, an audience mixer and maybe an RF microphone sub-mix. Some events have so many record and playback sources they may require an additional sub-mix position. NASCAR uses three mix positions and has a unique position that monitors the racing radios off air and feeds relevant conversations between the drivers and crews to the mix. This is an unusual position because it requires the mixer to act as the producer and decide what is relevant and fish for interesting conversations. This can be a gratifying role because it can make a big difference in the sound of a show without having to carry the responsibility of the senior audio.

### ***Music Mixer***

The music mixer is a unique position because a knowledge of instruments, music and microphones is required. Microphone placement and equalization are often critical to the sonic characteristics of a music mix. Music production can require the reproduction of a mix that was created in a recording studio. Large music-award productions usually utilize a sound OB that is properly equipped for the live reproduction of music.

## **Effects Mixer**

The effects mixer is used in golf, motorsports, professional football and many large sporting events. Golf is a unique effects mix because the effects are mixed to air as well as sub-mixed and recorded for playback. A hole in golf will typically have between three and five microphones associated with it. These microphones are balanced and recorded off air for playback. Additionally, racing and golf are a very fast mix that requires intense concentration for a long period of time. There have been a number of studies about noise fatigue and, even though I am not a medical practitioner, I have experienced the drain of an afternoon in the truck!



**Figure 1.9** Effect mix position at NASCAR.

## **Post-Production Sound**

Post-production sound is common in film and edited video productions. Post production for a television sound track includes music, sound effects, additional voices or narration and fixing and previously recorded dialog or natural sound tracks.

## **Studio Control Room**

Productions like national news and weather usually use a “host set” where announcers present the stories between playback of video and sound. The sound mixer is responsible for the “live” sound

from the announcers and mixing playback audio from record machines or video servers. Often music is played from nonsynchronous sources for feature stories or for going to commercial break. A challenge for this operator is the addition of reporters or announcers from a variety of locations. To prevent the announcers on location from hearing a delay of themselves, the host control room audio creates a mix of the program minus the location announcer and feeds that mix back to that particular location announcer. A separate audio mix-minus is created for each location announcer. For example, there could be two location announcers and a studio host. Location announcer number one will hear the host and announcer number two only. Location announcer number two will hear the host and location announcer number one only, and of course the host will hear everybody.

### ***The Audio Assistant***

The audio assistants for sitcoms and game shows are the boom operator(s), playback effects specialist, and sometimes a dialog recordist. The audio assistant for a music production sets the microphones for the instruments, while the audio assistant for a sports production is responsible for helping set up microphones, run cables, and possibly operate a microphone during an event.



**Figure 1.10** *Saturday Night Live* production audio control room.

## ***Playback/Foley***

Since the days of radio, the sound-effects specialist has been critical to the believability of a production. Before recording devices, the effects were created live by a “foley artist” using objects to recreate the sounds that matched the image on the screen. These objects could include things like coconuts for horse hooves. NBC’s *Saturday Night Live* used NAB carts in the 1970s, samplers in the 1980s, and now the entire effects library is played off a hard-drive playback. NAB carts are a continuous loop tape format that was used for music and sound effect playback. They used a tone to fast forward the tape loop from any place on the tape. If you had a four minute piece of music, it could take up to a minute to fast forward to the beginning of the piece. During a late night edit session in the OB van, this was often a source of frustration! Samplers are recording devices that are usually triggered by a keyboard. They can record a variety of sample sounds and the keyboard can instantly playback any sound. Samplers came from the music and recording industry and essentially were the first instantaneous playback device.

## ***Sound Recordist***

In some productions the sound may be recorded on a separate record device and a recordist will set and monitor sound levels, listen to insure quality, check sync plus log and slate each take.

## ***RF Audio***

The ever-increasing use of wireless microphones has created a niche position in the audio domain. Wireless microphones require constant attention because of problems with outside interference. Professional football productions will use a wireless audio technician on the field. There will usually be seven wireless microphones, one for each effects microphone, two for any on-camera talent, and one for the referee. The RF technician will also be responsible for the talent’s wireless earpiece and any wireless communication circuits.

## ***Communications***

Intercoms have turned into a specialty of their own. The majority of remote broadcasts use the intercom that is built into the television truck, but for large entertainment shows or events with multiple locations, additional intercom equipment and system specialists are desirable.

## ***Boom Operator***

Hollywood has a tradition of using shotgun microphones on film and television sets, because the shotgun has a tight pickup pattern to minimize background ambiance. Most drama or situation comedy productions involve a lot of movement and require the specialized audio services of a boom operator. Operators need a combination of good motor skills and concentration.

The operator moves a mechanical arm and controls the movement and orientation of the shotgun microphone used to capture the dialog on a set. The boom arm is balanced on a pivot point that has 360 degrees of horizontal rotation and full vertical movement above and below the arm’s plane. The boom pole collapses inside itself on a bed of rollers, giving the boom arm unlimited sweep of a set, only bound by the length of the arm and any lighting issues with shadows.

Small booms can be handheld by a boom operator for smaller productions. In Figure 1.11b, a boom operator is shown using a field mixer.

ENG/EFP (electronic news gathering and electronic field production) sometimes utilize field mixers. Portable cameras have gotten smaller, making it more difficult to monitor and adjust the audio controls. When there is multiple on-camera talent, a portable mixer is useful to control and monitor audio levels. Most quality field mixers will have a way to meter the audio and calibrate the mixer to the camera input levels. (See Figure 1.11a.)



**Figure 1.11 a)** A boom operator is shown working with a field mixer. **b)** ENG/EFP shoot field audio technician Chad Robertson.

### ***Audio EIC (Engineer in Charge)***

Productions that are complex and have a nonregular crew increasingly have an audio engineer with the television truck. This has become necessary particularly with the use of digital mixing consoles that the audio mixer may not be familiar with. The audio EIC is responsible for setting up the mixing console, programming the communications, assisting with the patching and supervising the interconnect of any other television engineering and production vehicles or sites.

## **The Sound Designer**

The sound designer is the most senior audio role and is responsible for the planning and preparation of all the sound elements and audio concerns that will go into a production. During the preproduction period, a sound designer will meet with the show producer and director to insure that the production and engineering requirements are understood and that the proper equipment will be specified and budgeted for. The sound designer will deliver a wired and wireless microphone plan, evaluate the television facilities and recommend solutions to the production team.

All of the major broadcasters have senior level audio consultants that provide significant input for major events including crew, equipment, communications and the general sound design and philosophy. In many instances, key sound designers such as Fred Aldous at FOX, Ron Scalise at ESPN and Bob Dixon with NBC are shaping the sound of entire networks through their efforts. These people and many more talented audio technicians are basically writing the book, because every method and technology has changed and evolved in as few as four or five years.

## **Breaking into the Business**

Television sound has advanced far beyond what any single textbook or advanced television course can offer. There are plenty of books on microphones, but there is a definite lack of application information on microphone usage and placement for television. A few universities offer media degrees, but the problem is that the technology is advancing so fast that the universities cannot keep pace. To give the students hands-on experience, many universities have partnered with networks and broadcast facilities to offer internships.

When I began working in television, I was told that you first learn the workings of the outside of the truck, like the announce booth, microphone set-up and cabling. This is a practical and proven approach to learning television sound and how it is hooked up and brought back to the inside of the truck. However, learning the trade is not just learning how to plug things in, but also why! The knowledge of how microphones work should be gained from books and articles. The placement of microphones and what has worked best will be learned from other audio people you work with. Learn first, and then take any opportunity you get to prove your worth.

Entry-level audio positions exist as “audio utilities” for network television productions of college and professional sports. Utilities assist the audio technicians with cabling and equipment installation and during the event the audio utility will point a microphone at the desired sound source. Microphone pointers are common in American football. There is a lot of detail and work to be done in preparation for a broadcast, and this is a great opportunity to meet audio people and learn.

The audio assistant is the normal path to the mixing position in sports. The audio assistant learns the signal flow, equipment operation and production workflow by assisting the A1 and working with fellow audio assists. The audio assistant experience is invaluable to the A1 because it teaches troubleshooting skills and installation practices. I interviewed Dennis Ryan, who mixes NASCAR, and he said his experience as a field audio assistant taught him the sound of the tracks, how each track was different and how to approach miking a track. Some audio assistants have made a career of the announce booth and are valued by their A1s and the producers for keeping an orderly work area.

Television attracts experienced sound mixers from recording studios and PA companies. However, the only similarity between television and other sound mixing is the skill of balancing faders on a mixing desk. Music mixers usually successfully master television audio and find that their music experience contributes to their listening skills.

The Host Broadcast Training program originated with Manolo Romero and is maintained by Jim Owens for the Olympic host broadcaster in the host city. The host broadcaster organizes and conducts training programs, including a hands-on remote broadcast with television truck with the universities in the host city of an Olympics production.

Every professional should work on mentoring those who want to learn around them. Audio people are known for taking others under their wing and helping them advance their knowledge and career. Bob Seiderman was one of those that made a difference because of his exceptional talents and insight.

You have to stick it out! During the network's transition to a freelance labor force, the staff network technicians were often very unfriendly and made it clear that the freelancers were not welcome. The freelancers had to prove themselves, not only to their television peers and cohorts but also to management and production. Getting established can be a long and difficult journey. My advice is to take any job that will get you on the crew and take the opportunity to learn and practice. It will help if you are within travelling distance to a college town or a city with professional sports. Entry-level positions may not pay very much and are usually "local hire" or "daily hire," meaning the broadcasters are not expecting to pay for travel or provide accommodations for these positions.

Technology has advanced and most electronic equipment has changed from analog to digital. Fiber optics and advanced camera electronics now bring high-quality microphone signals with better technical specifications and fidelity to the digital mixing desk. Technical skills will help open doors because audio requires the application of technical intelligence and procedures. Basic electrical knowledge is essential for installation and maintenance of audio equipment such as microphones, power supplies, amplifiers and fiber-optics interfaces. Audio requires a significant amount of cable and connector maintenance, which mean soldering and metering are also useful skills. Finally, audio requires a lot of interconnecting cables, which are installed and derigged for each show. This means that a very basic skill for an audio technician is how to properly "over and under" coil cable!

Television is about problem solving. The more useful and knowledgeable you are, the more opportunities will make themselves available. Be ready and have your act together. Do not be the problem!