WINTER 2010 VOLUME 2 ISSUE 1 UNITER 2010 VOLUME 2 ISSUE 1 UNITER 2010 VOLUME 2 ISSUE 1 UNITER 2010 VOLUME 2 ISSUE 1



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ARTERLY



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Cover: Set of NASA Mission Control, from the motion picture Marooned, 1968

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From the Editors



With the new year we enter another awards season, celebrating the accomplishments of all who toil in the entertainment industry. We congratulate the nominees for Best Achievement in Sound Mixing for the Cinema Audio Society and the Academy of Motion Picture Arts & Sciences.

Every motion picture, every television episode, news report and sports program is the product of the contributions and the collaboration of boom operators, sound utility, video engineers, playback operators and sound mixers of Local 695.

As the editors of the 695 Quarterly, we are proud to tell your stories and encourage you to contact us with your ideas.

This issue marks a milestone for the 695 Quarterly, also a collaborative endeavor. We hope we have earned your respect, and we invite you to contribute to the process as we move forward into our second year.

Fraternally. Richard Lightstone, Eric Pierce and David Waelder

From the Business Representative

responsibility to ensure such work is done safely.

Motion Picture-Television

With the ongoing evolution of the

production audio and video electronic

recording chain providing for longer

uninterrupted photography or televising

of a scripted scene, does not diminish

either the employer nor employee's

Industry Safe Working

Environment

It is worth reviewing the following Producer-IATSE Safety Agreement.

"It is agreed by the parties that too great an emphasis cannot be placed on the need to provide a safe working environment. In that context, it shall be incumbent on each employer (herein referred to as the Producer) to furnish employment and a place of employment which are safe and healthful for the employees therein; to furnish and use safety devices and safeguards, and adopt and use practices, means, methods, operations and processes which are reasonably adequate to render such employment and place of employment safe and healthful; to do every other thing reasonably necessary to protect the life; safety and health of employees. Correspondingly, no employer shall require or permit any employee to go or be in any employment or place of employment which is not safe and healthful. In addition, every employer and every employee shall comply with occupational safety and health standards and all rules, regulations and orders pursuant to applicable laws which are applicable to his/her own actions and conduct; no person (employer and employee) shall remove, displace, damage, destroy or carry off any safety device, safeguard, notice or warning, furnished for the use in any employment or place of employment; no person shall interfere with the use of any method or process adopted for the protection of any employee, including his/herself, in such employment or place of employment.

"Rigid observance of safety regulations must be adhered to and willful failure of any employee to follow safety rules and regulations can lead to disciplinary action including discharge; however, no employee shall be discharged or otherwise disciplined for refusing to work on a job that exposes the individual to a clear and present danger to life or limb. No set of safety regulations, however, can comprehensively cover all possible unsafe practices of working. The Producer and the Union therefore undertake to promote in every way possible the realization of the responsibility of the individual employee with regard to preventing accidents to himself or his fellow employees."

(ref. Producer-IATSE Basic Agreement-Article XXXI, Safety, pgs. 80-81)

Should you have any questions, call my office at 818 985-9204 or email [OConfidentialinfo@695.com

QUARTERLY

I.A.T.S.E. Local 695 **Production Sound Technicians, Television Engineers**, Video Assist Technicians and Studio Projectionists Certified & Chartered September 15, 1930 A California Nonprofit Labor Corporation Incorporated July 31, 1951, State of California Affiliated with the A.F.L.-C.I.O., California State Federation of Labor, and L.A. Central Labor Council

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From the President

As I began working on the piece for this issue, the phone rang. It was my father, Sam Ulano, calling from New York to say hi and shoot the breeze. Sam will be 90 this year and is extremely active as a jazz musician, teacher and writer in the percussion world. He and his twin brother are the two youngest of eight kids; five of which are still kicking around. In fact, his oldest sister, Ida, is celebrating her 102nd birthday this week and still goes to the gym daily with her daughter, who is in her mid-80s.

Dad asked what I was up to and I told him I was working on a piece about staying inthe-know as a sound and video professional through our version of "cross training." He mentioned that it sounded similar to a theme he had written in one of his recent books, Keep Swinging! Approach Your Senior Years Without Skipping a Beat. After the call, I dug out a copy and realized how relevant the subject was for us, in our working world. With thanks to my old man, here is an excerpt from his chapter "Are You Flexible?"

6 Over the past years of my musical life as a professional drummer, I have learned that I am able to be flexible. Knowing this about myself has allowed me to Go With the Flow, so to speak.

Being rigid can be a hang-up because there are times we must be able to bend. I've watched many friends in my field be inflexible. If they were in the Broadway scene, that was all they could do. Those who were in the Dixieland field played that style and could not play in the Latin, bebop styles, or many of the other styles that were developing.

I am a big believer that we must be able to bend and play in as many styles as possible. I've learned to teach, write, lecture and perform in a great many musical situations. This meant that I could be working most of the time. That is a good way to be, I think. It allowed me to travel in many musical circles...

It's good to be a specialist in your field, but you must have other irons in the fire. I remember Henny Youngman, the great comedian, who said his mother wanted him to learn a trade so at least she would know what kind of work he was out of...

Train yourself to be flexible. Be able to change directions and do more than just one thing. I write books and I market them, I teach drummers and try to give them the wider picture about being a drummer. I tell all my students to teach and play in order to be the best they can be in their profession. Not only do my students learn to play their instrument, but they learn to move in many directions.

Think about this: If you are a band player and that's all you can do and the bands you work with have a dry spell, you've got no work. What do you do for income? But if you teach and have 20 or so students and your band is out of work, you still can have what we call "cash flow," so that you at least can keep going. Then, when work with bands comes in, you are still able to keep your head above water.

YOUR BASKET.

Thanks, Dad. Transposing this philosophy to our professional world seems to make a lot of sense these days.

Warm regards and a successful 2010 to all our members.

Fraternally, Mark Ulano President I.A.T.S.E. Local 695



BE FLEXIBLE. BE ABLE TO BEND. HAVE MORE THAN ONE EGG IN **99**

NEWS & ANNOUNCEMENTS

Production Tracking Database

Don't forget to submit your job information now and each time you take a job. The Local 695 Production Tracking Database allows us to develop a more accurate picture of the workplace and provides us a valuable tool to protect our contracts. Submit your job information on **www.695.com** or call the Local at 818 985-9204.

Discounts for Production Reports and Online Resume Service

The publisher of the entertainment industry monthly periodical Below the *Line* is offering discounts to Local 695 members who sign up for their online Production Reports database. Local 695 members can get a subscription to both the Production Reports www.find filmwork.com and Online Resume Service www.btl411.com for \$50 per year, or just the Resume Service for \$40 per year.

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lections	Features		Latest Headlines	
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2010 Membership Directory

The deadline for updating your information in the upcoming 2010 Local 695 Membership Directory will be **Sunday**, March 7. If you've already entered your directory information and it's still current, you do not need to do anything. That information will continue to be printed until you change it. If you haven't yet entered any information, only your name and classification will appear.

To enter or update your information, go to www.695.com and click on "Membership Directory"-"review/add/edit." You can also call the Local at 818 985-9204 to request a mail or fax-in form.

Please note: If you were expelled and then reinstated during the past year, previously entered directory info may have been removed. Please log on to www.695.com to verify that your data is still there.



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- ALL CHANNEL ASSIGNMENTS CAN BE PRE OR POST
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 - B MIX BUSSES FOR VERSATILITY
 - * SLATE MICROPHONE
 - * REMOTE ROLL
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 - B BALANCED OUTPUTS ON FULL-SIZE XLRS

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EDUCATION & TRAINING

by LAURENCE B. ABRAMS



"You snooze, you lose"

To borrow a phrase, three of the most important ways we can prepare ourselves for the demands of production are... Training, Training and Training. This is particularly obvious now, with the hyper-rapid development pace that is impacting the equipment we use. For both sound and video, tape-based analog recorders have been replaced by a quickly evolving assort-

ment of far more capable, and more complex, computer-driven solutions ... which calls for training. Now that our 2010 Skills Training proposal has been submitted to Contract Services, we're optimistic about offering a greatly expanded selection of training programs during the coming year. That training proposal needs a few more weeks to complete its way through the review process but for now, don't waste time ... please take advantage of these free options:

- Fisher Microphone Boom: One on One Intensive... www.695.com/mbr/edu-fbt.php
- Streaming Video of 695 Events...
 www.695.com/html/edu-stream.html
- More Than 700 Online Software Tutorials... www.695.com/mbr/edu-vtc.html

T.A. Edison by Mark Ulano

So here we are again at February 11 and an important acknowledgment should be made to an institution in the form of the man, Thomas A. Edison. Whether by causing the invention, or inventing a thing himself, Edison was the actual father and creator of the technological river that propels all of our careers. Not the least of these is analog sound recording, which grew from his tin foil phonograph of 1877.



Born February 11, 1847, he is a complex, prob-

lematic and essential figure in the genesis of contemporary technological mass media.

As Robert Conot states in the introduction of A Streak of Luck, his definitive 1979 biography of Edison, "Edison was history's most prolific inventor—1,093 patents were issued in his name—and one of the nation's most honored men. At one time, he was the best-known American in the world. Yet his life and career seemed peculiarly elusive."

Previous generations have better recognized his dominating presence at the birth of these technologies. In respect and gratitude, I propose we reignite that flame of remembrance.

Happy birthday Mr. Edison, wherever you are, and thank you.



Private Software Training Sessions

If you plan to buy an Apple computer anytime soon, you might be interested in a fairly amazing training option offered by Apple. With a \$99 membership in Apple's "One to One" program, you can schedule face-to-face, one-hour personal training sessions with an Apple Training specialist at any of the local Apple Retail Stores. This includes instruction in Final Cut Pro, Apple Logic or any other Apple software. You can use their computer or you can bring your own. Pending availability of the trainer, you can sign up for as many of these one-hour sessions as you want over the course of a full year ... and membership can be renewed for up to three years in a row. Local 695 members who have enrolled and requested Final Cut Pro instruction have found the personalized sessions to be extremely valuable. One to One membership also includes workshops, per-



sonal hardware setup, and three-hour online "personal project sessions." But you can only enroll in this program at the time that you buy a new computer, and only if it is being purchased from an Apple store or through Apple phone sales or Apple online.

- For a complete description of the One to One program, see... http://www.apple .com/retail/onetoone
- For a list of Apple retail store locations, see...

http://www.apple .com/retail/storelist

Additional Training



Additional education and training resources and information can be found at www.695.com /mbr/edu.html

Reminder About Email The most efficient and timely

The most efficient and timely way to keep you informed about upcoming training events and resources is by email.

• If you're already registered at 695.com...

Be sure to log in at **www.695**. **com** to verify that your email address is current and that your Opt-In status is set to "Yes."

• If you're not already registered at 695.com... It only takes a minute to register at www.695.com



OCAL SALUTES THE 201 NEES

Congratulations go out to all the nominees and their Production Sound teams for the 46th Annual CAS Awards, announced on January 21. The CAS Awards banquet will be held o n Saturday, February 27, at the Millennium **Biltmore Hotel.**



Local 695 would also like to congratulate the award-winning Sound **Mixers and the Production Sound** team for the "Best Sound" Award. named at the 2010 Film Critics Awards on January 15, at the Hollywood Palladium.



Avatar **Eventieth** Century Fox, Lightstorm Entertainment Christopher Boves.

Jim Tanenbaum, CAS, William B. Kaplan, CAS, Art Rochester, CAS, Davis Lee, Jesse Kaplan, Thomas Giordano, Ken Beauchene, Mark Williams, **Daniel A. Greenwald**

*Names in red are Local 695 members

MOTION PICTURES











Transformers: Jeff Humphreys, **Chris Cooper**

Avatar

Tony Johnson, CAS, Christopher Boyes, Gary Summers, Andy Nelson, Jim Tanenbaum, CAS, William B. Kaplan, CAS, Art Rochester, CAS, David Lee, Jesse Kaplan, Thomas Giordano, Ken Beauchene, Mark Williams Sam Spicer, Stacey Parish, Kyle Griffiths

District 9

Ken Saville, Michael Hedges, CAS, Gilbert Lake, Richard Mohlari, Bob Hazell, Benoit Hardonniere, Richard Sprawson

The Hurt Locker

Ray Beckett, Paul N.J. Ottosson, Simon Bysshe, Craig Stauffer, Juniper Watters

Star Trek

Peter J. Devlin, CAS, Paul Massey, CAS, Andy Nelson, Anna Behlmer, Michael Piotrowski, **David Raymond**, Scott Solan, Phillip W. Palmer, CAS, Patrick Martens, **Chris Quilty**

Revenge of the Fallen Geoffrey Patterson, CAS, Greg P. Russell, CAS, Gary Summers, **Ben Wienert,**

TELEVISION MOVIES & MINI-SERIES



House MD "Broken" Von Varga, Richard Weingart, CAS, Gerry Lentz, CAS, Ken Strain, **Juan Cisneros**

ENDGAME

Endgame Chris Ashworth. Mark Paterson. amie Roden



Grey Gardens lon Stermac

Into the Storm

Martin Trevis, CAS, Brendan Nicholson





Taking Chance J O'Mara, Rick Ash, ason Benjamin, **Dustin Chiocchi**

TELEVISION SERIES











"10 PM to 11 PM" William F. Gocke, CAS, Michael G. Olman, CAS, Kenneth Kobett, CAS, **Todd Overton**, **Corey Woods**

Battlestar Gallactica "Daybreak, Part 2"

Desperate Housewives "Boom Crunch"

Agamemnon Andrianos, **CAS,** Michael G. Olman, CAS, Kenneth Kobett, CAS, **Douglas Shamburger,** Alex Names, Chuck Buch, CAS, **Ross Deane, John Evans**

Glee "Wheels" Phillip W. Palmer, CAS, Joseph H. Earle Jr., CAS Doug Andham, Patrick Martens, **Devendra Cleary**, **Harsha First**

Mad Men "Guy Walks Into an Advertising Agency" Peter Bentley, Ken Teaney, CAS, Todd Orr, Chris Sposa. **David Holmes**

AWARD OMINEES

TELEVISION: NON-FICTION, VARIETY OR MUSIC SERIES OR SPECIALS



Deadliest Catch "Stay Focused or Die" Bob Bronow, CAS



The National Parks "The Scripture of Nature," Episode 1 Dominick Tavella, CAS, Lou Verrico

NOVA "Extreme Ice" David Ruddick. Jeff Orlowski. Chris Strollo, CAS, Paul





The Metropolitan **Opera Opening** Night Gala Starring Renee Fleming Jorge Silva, Ken Hahn, CAS, Jay Saks

Woodstock: Now and Then Ionathan Chiles. Ryan Carroll, en Hahn, CAS

DVD ORIGINAL PROGRAMMING











Keith A. Rogers, CAS "Bob's Big Break"

Galactica's The Plan Rick Bal, CAS, Greg Hewett, Michael G. Olman, CAS, Kenneth Kobett, CAS

Battlestar

Caprica Rick Bal, CAS, Michael G. Olman. CAS. Kenneth Kobett, CAS

Family Guy: Something, Patrick Clark.

Into the Blue: The Reef Joel Catalan. Terry O'Bright, CAS,

Monsters vs. Aliens

The British Academy Awards will be held on Sunday. February 21, at the Royal Opera House in London, England. Congratulations to all the nominees and Production Sound teams for the "Best Sound" nominated films.



Fony Johnson, CAS. Christopher Boyes, Gary Jim Tanenbaum, CAS, William B. Kaplan, CAS, Art Rochester, CAS, David Lee, Jesse Kaplan, Thomas Giordano. Ken Beauchene. Mark Williams, Sam Spicer Stacey Parish, Kyle Griffiths, Corrin Ellinaford

District 9

Avatar

Ken Saville, Michael Hedges, CAS, Gilbert Lake, Benoit Hardonniere, Chris Hiles, Joe Fraser, Richard Sprawson

The Hurt Locker

Ray Beckett. Paul N.J. Ottoson, Simon Bysshe, Craig Stauffer. Juniper Watters

Star Trek Peter J. Devlin. CAS. Paul Massey, CAS, Andy Nelson, Anna Behlmer, Michael Piotrowski, **David Raymond**, Scott Solan, Phillip W. Palmer, CAS. Patrick Martens, **Chris Quilty**

Something, Something Dark Side James Fitzpatrick, CAS

Gary D. Rogers, CAS, Daniel J. Hiland, CAS



The nominations for the 82nd Academy Awards were announced on Tuesday, February 2, and the awards ceremony will be held on Sunday, March 7. In the category of "Sound Mixing," the nominated Sound Mixers and the Production Sound teams are:











Avatar

ny Johnson, CAS, Christopher Boyes, Gary Jim Tanenbaum, CAS, William B. Kaplan, CAS, Art Rochester, CAS, David Lee, Jesse Kaplan, Thomas Giordano, Ken Beauchene, Stacey Parish, Kyle Griffiths

The Hurt Locker

Craig Stauffer, Juniper

Inglourious Basterds Mark Ulano, CAS, Michael Minkler, CAS, Tony Lamberti, Tom Hartig, Benjamin

Star Trek

Peter J. Devlin, CAS, Paul Anna Behlmer, Michael Piotrowski, David Raymond, Scott Solan, Phillip W. Palmer, CAS, Patrick **Martens, Chris Quilty**

Transformers: *Revenge of the Fallen* **Geoffrey Patterson, CAS,** Summers, Ben Wienert, Jeff **Humphreys, Chris Cooper**



On January 7, at the Technology & Engineering Emmy Awards presentation at the Mandalay Bay Hotel in Las Vegas, Local 695 members Courtney M. Goodin and Laurence B. Abrams were presented with an Emmy for "Pioneering Development in Electronic Prompting" for their development of the Compu=Prompt com-

puter teleprompting system in 1982.

The Technology and Engineering Awards began in 1948 to "honor development and innovation in broadcast technology and recognize companies, organizations and individuals for breakthroughs in technology that have a significant effect on television engineering." They're presented by the National Academy of Television Arts & Sciences (NATAS), and are now part of the International Consumer Electronics Show.

In the early days of television, prompting was done either with handwritten cards or mechanical scrolls of paper mounted near the camera. In the 1950s, the process of projecting a mechanically scrolled page onto a partially silvered mirror in front of the camera lens was patented by *I Love Lucy* producer Jess Oppenheimer.

But that changed in 1982, when Courtney and Laurence, working as the sound mixer and boom operator on a high-profile national television spot, observed the shortcomings of the noisy mechanical prompter and saw an opportunity to replace it with a personal computer. Utilizing an Atari 800 with a mere 48k of RAM, Courtney wrote the code to handle the operator controlled continuously variable bi-directional smooth scrolling that is essential to any teleprompter. From there, he and Laurence developed a collection Courtney M. Goodin and Laurence B. Abrams honored with a Tech & Engineering Emmy

of features that were not possible in paper-based prompting, such as invisible electronic bookmarks for instant random access.

search and replace, an onscreen stopwatch, in-line editing with color-coded text for different speakers and centered text to help the actor maintain a better eye-line to the camera. And for the first time, copy could be sent and received by a modem and instantly uploaded to the prompter.

Commercial use of the

Compu=Prompt system expanded quickly and set the standard for virtually all computerized electronic teleprompters, including those in use today. Compu=Prompt was among the very first on-set applications for the personal computer and represents one of many technological innovations that have been made by members of Local 695. Congratulations to Courtney and Laurence!

ompu=Promp

onsole 1984

Cat 5: nere Anything Can't 1

You're probably familiar with an Ethernet cable: that wire attaching your computer to a network and/or cable/DSL modem. If you look closely, it looks like a large modular telephone connector, consisting of eight wires in four twisted-pairs, terminated with a plastic 8P8C modular connector (often incorrectly called RJ-45, a voice-grade telecom jack for non-twisted pair). These wires are defined as Category 5/5e/6 cables and probably have more uses than most people ever imagined.

We owe much of this flexibility to the ingenious engineers in the telecommunications industry. Like a typical balanced XLR audio cable, each pair of two wires carries equal, opposite signals and the destination detects the difference between the two. Noise introduced into the wires by electric or magnetic fields tend to couple to both wires equally. The noise produces a common-mode signal, which is then canceled at the receiver when the difference in signal is taken. Early telephone engineers discovered that twisting the pairs cancels magnetic coupling, eliminating noise. As each



by Ben Betts

half twist of the wire nearest to the noise-source is exchanged, the noise will appear evenly in both wires, allowing it to be canceled by common-mode rejection. The twist rate (also called pitch) makes up part of the specification for a given type of cable. When the neighboring pairs in a cable have equal twist rates, engineers have found that it decreases the effectiveness, partially undoing the benefits of differential mode and increasing cross-talk. For this reason, the twist rates differ slightly among the four pairs in a Cat 5e/6 cable. The most common networking cable in use today is Cat 5e, an enhanced version of Cat 5, which adds specifications for far-end cross-talk, including the different pitches between pairs. It was formally defined in 2001 as the TIA/EIA-568-B standard. Cat 6 cable is often a heavier gauge wire (22-23 vs. 24 AWG) with thicker insulation. Due to the balanced nature of these twisted pair cables, there is generally no need for additional shielding (coining the description "Unshielded Twisted Pair" or UTP), but for high performance in particularly RF-noisy environments, Cat 5 is also available with a shield, which should be attached to ground. All of the Cat 5/5e/6 cables have a practical distance limitation of just more than 300 feet without using repeaters. Since the standards are basically the same for our specific purposes, I'll refer to them just as "Cat 5" for the rest of this article.

Those who have worked with me know that I'm a huge fan of controlling networked computers via "Remote Desktop." I often feel like "Mr. Wizard, behind the curtain" while controlling all the computers on the local set, the next stage over or just about anywhere in the world. Obviously, Cat 5 cable is great for connecting computers together on a network, but many sound/video engineers have discovered the multitude of other ingenious applications. By using a "balun," a wide variety of signals can be transmitted using this inexpensive, easy-to-terminate cabling and connectors instead of traditional audio/video cables.

A balun is a small impedance transformer that converts a signal from balanced to unbalanced and vice versa, while making the necessary impedance adjustments for transmission between different wiring systems (such as 75 ohm for video) over a cable that has a different impedance (Cat 5 has 100 ohm impedance). Baluns have long been used for radio and television broadcasts. A few years ago, one could be found on just about every off-air television's "rabbit ears" antenna. It was the small box that converted the two wires of the 300-ohm antenna lead to the 75-ohm single round coaxial cable input on the television. A passive balun generally consists of just a certain amount of wire wrapped in a specified pattern around a ferrite core. If the transformer inside the balun is wound 3:1, it allows a 150 ohm balanced load to be transmitted over a 50 ohm cable; if it is wound 4:1, the balun allows a 200 ohms balanced load to be transmitted over a 50 ohm cable, etc. You need a balun at each end, one to transform the original impedance to the impedance of the cable and the other to transform it back to the original impedance. If there's an impedance mismatch, the signal will be reflected from the receiver back to the transmitter causing delays in the signal transmission; the delays often have a ghosting or ringing effect on picture or sound.

There are numerous commercially available Cat 5 Baluns, allowing the transmission of just about every type of audio and video signal, including HDMI, DVI, VGA, SDI, Component, S-Video, Composite and RF. There are even USB and RS-232/422 Serial signal Cat 5 Baluns. For shorter distances (less than 80 feet), you can often use passive baluns, which are cheap and convenient, not requiring any power to operate. The passive models are generally only for signals that could traditionally be carried on one to five coaxial cables. Due to their nature, they are generally more flexible, being bi-directional and able to mix audio and video signals on the same line, etc. For



higher performance signal transmission over longer distances, active baluns should be used. Active baluns do require power at one or both ends of the Cat 5 cable, but they provide amplification and skew compensation. As mentioned earlier, with Category 5e/6, each of the twisted pairs has a different pitch rate, making the actual wire length different between color signals. This can yield skew because the individual color signals arrive at the receiver at slightly different times. The effect is more pronounced as the cable length increases and is usually seen as thin bright edges along the right side of darker objects. Obviously, this isn't an issue when using single conductor signals, such as composite or SDI video, which only requires one of the four pairs in a Cat 5 cable.

So how does Cat 5 Cable make my life easier? The most obvious advantages are cost savings and convenience. A 1,000-foot box of Cat 5e is less than \$100 and can be found at just about

"Cat 5 can't make you more popular, grow more hair or win the lottery, but it can make your life on set easier."

any electronics or hardware store. For custom installations, it's also much easier to run and install than just about any other type of cable. Literally, you just grab the lead coming out of a "pullbox," pull until you have enough cable and then cut to length. Terminating the ends is cheaper than using BNC connectors on coax and requires about the same skill level. For terminations concentrated in one area, I usually use punch-down panels with prelabeled multiple jacks, rather than individual connectors. You can also use existing premise wiring to carry your audio/video signals. While shooting in an abandoned hospital, we were able to drive our 24-frame VGA set dressing monitors in remote locations without stringing cables all through the ceilings. All we needed were a pile of Cat 5 VGA-baluns, a cable tester and access to their cable closet.

There are a few things to be aware of when choosing what Cat 5 wiring method to use. Generally, solid copper cable is used for long "permanent" runs and stranded copper for patch cables. If you use



crimp-on 8P8C connectors, make sure they are specifically designed for either solid or stranded wire, whichever you are using. We've learned from experience that a number of RJ-45 connectors sold for telecommunications use will work fine on stranded cable, but will be intermittent on solid cable, even though cable continuity testers say they are good. There are also two standards for pin numbering T-568A or T-568B (originally one scheme was for voice and the other data), the only difference being the orange and green pairs are reversed, so make sure both ends of each cable are wired the same.

In practice, I generally use solid Cat 5e cable, with punchdown panels in our video room and female "keystone" jacks out on the set. The keystone-style jacks are designed to snap into plates and are much easier to terminate than crimp-on connectors. They also use the same Telecom 110type punch-down tool as the punch-down panels. Pre-made Cat 5 patch cables are dirt cheap and readily available in common lengths

patch cables are dirt cheap and readily available in common lengths and colors, so we use those for interconnect cables. If one gets run over by the dolly grip, it's a lot easier to replace or repair on the spot than a VGA or coaxial cable.

As far as specific Cat 5 balun models go, we've had better experiences with the active models for video playback purposes; however, they are more expensive than the passive ones and generally not interchangeable between manufacturers. There are also Cat 5 distribution amplifiers and matrix routers, specifically designed to route and switch audio, video or computer signals after they have been converted to Cat 5 balanced connectors. These should not be confused with computer

networking hubs, routers or switches, which share the same type of connectors and cabling, but use a completely different type of signal.

Using Cat 5 cable for your interconnections not only makes for a

much more compact setup, but it's significantly easier to patch a single 8P8C than five BNCs, VGA or DVI connectors. It's not often that one single inexpensive type of cable can replace so many more cumbersome and expensive ones. Cat 5 can't make you more popular, grow more hair or win the lottery, but it certainly can make your life on set easier!

Ben has always had a passion for integrating audio, video and computer technology. He holds a bachelor of science in telecommunications management, is active in I.A.T.S.E. Local 695, a licensed C10 Electrical Contractor and THX-Certified Engineer. Among his work experience, he built one of the first microcomputer CGI-rendering farms for Amblin Imaging, logged more than 12 years as the supervising engineer on Paramount's various Star Trek TV series and feature films, recently acted as video technical director for Studio 60 on the Sunset Strip, and currently is the key video engineer on NBC's Chuck at Warner Bros.

INVENTIONS & INNOVATIONS

Hal & Alan Landaker and 24-Frame Video Record and Playback

by Richard Lightstone and David Waelder

As the popularity of television increased in North America from the 1950s onward, filmmakers began to photograph television monitors as part of the storytelling process. Although their careers started in sound, Hal and Alan Landaker would invent a process that facilitated this storytelling. Hal's motion picture work began in 1954 when he was hired by Columbia Pictures as an engineer to maintain the production sound equipment for the studio.

By 1967, he was the engineer in charge of all the production sound equipment, and was the Assistant Head of the Sound Department. On the old "Gower Gulch" lot, John Sturges was about to start filming the space-exploration feature *Marooned*. This film had an enormous set resembling NASA's Mission Control with well over 30 television monitors and one large screen display.

Due to the difference in frame rates (film at 24fps and video at 30fps), an annoying black line would appear on the television screens. Changing the camera shutter to 144 degrees was the only technique available to cinematographers at the time. By shortening the exposure time, the camera would see only one of the two interlaced video fields, but there was still a small splice line. The technology to lock the AC synchronous motors used by the Mitchell BNC cameras of the day to the video display rate didn't exist so the elements would drift apart and the scan line would invariably crawl up or down the screen. With the multiple monitors planned

for *Marooned*, this would be an unacceptable distraction and the producers asked Hal if he could fix it.

Hal's audacious solution was to run the video at 24 frames per second so the film camera shutter would be open when the full video image was displayed on screen. This may seem an obvious solution to the layman but to the engineer it is a considerable challenge. Implementation required modifying the four video cameras necessary to provide images to the monitors and adjusting them to track to a non-standard rate, locking the camera motor and video display together to hold the elements in sync and also being able to adjust phase to move the shutter bar out of the picture. Hal worked out all the elements and *Marooned* was able to hold multiple monitors and a large process screen in perfect sync. Twenty-four frame video was born!

In 1971, Columbia Pictures and Warner Bros. Pictures came together to form the Burbank Studios. Hal was promoted to Head of the Production Sound Department and brought his older son, Alan, as chief engineer. Their years of partnership on projects began.

William Friedkin was shooting *The Exorcist* in '72 and needed seamless video for some scenes. Because the 24-frame video was still such a new technique, and few others had yet been trained to use it, both Hal and Alan flew to New York to help shoot the video playback scenes.

In 1978, Hal was asked to do the video on *The China Syndrome*. Back then the system was only used with black-and-white monitors. After reviewing the production requirements, Hal said, "Yes" and then turned to Alan to ask, "Can we really do this?" Alan responded, "I think I can make a system that will do the job in color."

The China Syndrome presented another special challenge. In the drama, a near calamity occurs in a nuclear power plant while a news crew is investigating reports of safety issues. For the realistic portrayal





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	Hal (center) with his two Acade

EL.

of developing news events, the producers wanted to be able to shoot monitor feeds simultaneously with the action. This necessitated supplying 24-frame video both from cameras and from playback equipment. Hal assigned the engineering task to his son. For Alan, it meant many nights of taking work home to figure out how to accomplish the task. In the end, he modified tape machines to run synchronously with the film camera and altered a video standard converter to make on-the-fly conversion of the 30 fps camera feeds to 24 fps video.

Their work on *The China Syndrome* confirmed their position as the preeminent video playback source. They subsequently worked on *Star Trek I* through *Star Trek III, The Swarm, Scarface, The Star Chamber, The Burbs, Dragnet, The Deep* and many other pictures over more than two decades. The *Star Trek I* through *Star Trek III, The Swarm, Scarface, The Star Star Chamber, The Burbs, Dragnet, The Deep* and many other pictures over more than two decades. The *Star Trek III and Star Trek III through Star*



Mission Control



Hal (center) with his two Academy Award–winning sons, Alan and re-recording mixer Greg

Throughout the time they were developing video playback, to his retirement at the end of the '80s, Hal continued to run the production sound department at TBS. It was his job to make sure every production on the lot had the right sound men available for their show and that the productions had their sound needs met with equipment supplied by the Burbank Studios.

Sometimes routine pictures presented their own challenges. For *Thank God It's Friday*, the producers wanted to record dialogue in the middle of a dance scene. Continuous playback was necessary for the dancers to keep the tempo in the scripted disco scenes. Out of this request rose what we now know as the "Thumper." Because dialogue recording cuts off any audio below 100Hz, Hal reasoned that the low frequency beats of the click track could be kept out of the final recording. He had Alan build a filter system to cut off anything in the click track above 30Hz.

Smart Car(t)



On the drive home in my Smart Car, I was struck by a stunningly obvious idea—the "Smart Cart!"

by Douglas Axtell, CAS

I recently had the opportunity, thanks to John Pritchett CAS (first unit sound mixer), to mix the second unit for *The Green Hornet*.



It was 10 weeks of nights spread out all over Los Angeles doing car chases, stunts, explosions, gunfire, cannon launches, etc. The director of the action unit was Vic Armstrong, a veteran of countless high-energy movies. Occasionally, we would get the first unit director, Michel Gondry, to shoot a quick scene with the principals, Seth Rogan, Jay Chou and others. So we had to be prepared for large-scale moving around as well as smallscale scene work. Additionally, a minimum of "5-7 Panavision cameras" would be used at all times. The production manager, Debra James, told me that she had "Dan Moore on video and 'Noodles' on microwave." She was all excited about Noodles, Jason Hooper. To be fair, she was exited about Dan too.

The first day (we had one day before our nights) was in an enormous sand pit. It was four city blocks wide and 75 feet deep. At 7 a.m., I saw various departments loading their already dusty gear onto four-wheel drive Gators and driving down into the pit. We were offered space on a stake-bed truck with Craft Service but



Driving to set with utility Kim Podzimek. Going up to the shuttered Hawthorne Mall's rooftop-parking garage, i.e. the "Freeway Chase Set."

opted to push the sound carts. Bad idea. It was like dragging a sled at the beach in blowing sand. At the end of the first day, we were exhausted and the gear was trashed. I knew we needed to figure out a better way.

A BETTER WAY

On the drive home in my Smart Car, I was struck by a stunningly obvious idea—the "Smart Cart." That night, the passenger seat came out and my Chindha modified Cantar/ Venue mini cart went in. I added a speaker, Comtek base station, PSC Powermax, a huge 72ahr Tempest lead-acid battery, a couple of suction mount antennas, a production walkie-talkie and voilà a street legal Sound Cart was born. Smaller than a Gator, faster than a golf cart, more comfortable than a passenger van and more functional for sound recording than any mobile setup I'd ever seen on a set. But would it fly? The next night, I pulled up into the base camp to rig the cart. Like a dog hearing a highpitched whistle, the Teamsters' heads cocked slightly when I pulled in. LAPD officers peered over their donuts. Production assistants and ADs smiled. I rolled my window down and a second AD said quietly, "Cool." So began my

weeks of nights on The Green Hornet Action Unit.

We added a securing strap for Randy Johnson's boom caddy, an additional suction mount for a rooftop-mounted dynamic mic. The Comteks and headsets were stored in a compartment in the "trunk;" paperwork, batteries, spare mics, and cables were stored in Ikea bins behind the drivers seat.

I made up some LED 12-volt strip lights to mount onto the visors and attached them to a switch by the handbrake to quickly go from super bright in the cab to stealth mode. Luck had it that my black car perfectly concealed itself in plain sight. We were never in the shot even though we were often in front of the cameras.

STREET LEGAL

Unlike the Gators, we could legally drive on the open road. The Gators needed a police escort and had to wait until their entire convoy was ready before they were permitted to pull out. We had the luxury to drive off anytime when were ready, figure out the shot and find our spot prior to the invasion.

This setup also allowed us to move very quickly and adjust all our gear smartly across the street, down the block, back down an alley or across the studio lot in the rain.



Randy with the Ultimate Arm mic. During many of the chase scenes we mounted various mics on the Ultimate Arm for on board ambience.

ON STAGE

This is a *biggie* for studio lots, security, firemen and teamsters. Every studio lot has some sort of arbitrary rule about putting gasoline-powered cars on stage. Warner Bros. only allows cars with one gallon of gas in the tank. Universal wants you topped off, etc. I probably wouldn't have gone on stage if it wasn't so much fun!

Next step is the all-electric Smart Car 2012. Thanks, John.

Zaxcom 992 EVALUATION by David Waelder



The Zaxcom 992 in use. Several components are combined to a single unit.

As wireless systems improved in performance, mixers began employing them to get better mobility for the boom. Zaxcom is the first company to build a system designed particularly for use by boom operators. As a fully digital system, it promises hardwire quality with untethered freedom of movement. The Model 992 transmitter consolidates the microphone preamp with phantom supply, the transmitter and the IFB receiver into a single box weighing less than a pound. Part of an integrated system, it offers many features that are not easily duplicated, or even available, from other sources. Among these are: the ability to monitor directly from the mike preamp for optimum fidelity, the capability of recording, with time code, directly to a memory

card and built-in encryption and decoding software to ensure the confidentiality of recordings. The belt-pack transmitter and preamp runs from a single rechargeable battery, greatly simplifying the task of monitoring battery consumption.



We borrowed a system from Zaxcom to investigate how well it accomplishes these tasks and used it for several weeks on a feature. Afterward, we conducted a variety of tests to measure performance and we sought comment from several users. We used a matched set of Sennheiser MKH 8050 microphones to compare the 992 with both hardwire configurations and a radio boom system assembled from Lectrosonics and Sound Devices components. Since the Zaxcom is a premium system, we put it up against the best competitive system we could devise: a Sound Devices MM-1 preamp matched to an SMOV transmitter and a Model 411a receiver. A Sony digital system might also be a good competitive match but it was not readily available to us.

I can report that the Zaxcom system performed wonderfully well and provided excellent audio quality at all times. There was never a situation where the audio might have been improved by using a hardwire connection or by using another system. But there is more to the story.

The system arrived just as I was loading gear into a camera truck so I had no opportunity to familiarize myself with its operation before using it in production. Although light, the transmitter seems well and solidly made with an aluminum case and flush-mount membrane buttons. Operation of the transmitter is logically organized and most functions do not require any special instructions. The battery fits only one way, the microphone plugs into an XLR connection and headphones into the clearly labeled jack. Pressing the menu button brings up the commonly-used settings including frequency and mike gain. Adjustments are made with the up and down arrows and tracked by the LCD display. There is a 37dB range of gain settings and a level meter to assist in setup. A graphic display shows battery status. The only settings necessary for normal operation that are at all obscure are the mike-line selection and phantom power. These have switches inside the casing and are accessible with the battery removed. But these are "set and forget it" functions. I was able to put the transmitter and receiver into play right away.



Analysis showed slightly more dynamic range in the Lectro file and slightly more high-frequency activity in the Zaxcom

The picture, *Beautiful Boy*, was a good test ground. David Stark was my boom operator and Zaxcom guinea pig on the project. Michael Sheen and Maria Bello starred as parents of a boy involved in a school shooting. It was a dialogue heavy script with scenes that varied from very intimate speech to vigorous arguments, often in the same shot. I would set the level for the anticipated loud vocals and then push the gain from the mixer to get the soft lines. There were times I had the gain so high I thought I could hear leaves fluttering down onto the windshields of cars parked a block away but I never heard system noise. And I never heard distortion or audible compression.

I was initially concerned about battery life using the special cells required by the system. In practice, the battery performance proved to be one of the strongest pluses of the rig. The 992 was originally designed to use the VPX Lithium-Ion battery used to power Black & Decker tools. Murphy's Law is operating in full force; no sooner did Zaxcom complete development of the 992 than Black & Decker discontinued use of that battery. What should have been a power source available at any Home Depot quickly became impossible to find and Zaxcom had to scramble to get batteries made. The new batteries, now appropriately called ZPX cells, work just great. We found that by using normal conservation practices, turning the transmitter off during long setups, we could easily work an entire day on a single battery and still have capacity left. Rotating the batteries at lunch would permit leaving the system on at all times without ever coming close to tapping out. Since we were testing the rig, we observed no protocols in charging: we pulled batteries from the transmitter while still switched on and jammed them into the charger while powered up. Everything worked without a hitch.

Our initial experience with the IFB 100 system was less happy. The transmitter is designed to connect to a balanced source. When we connected to the unbalanced monitor-out jacks of the Cooper, a digital packet noise would bleed into the mixer. We could have avoided this by using the Aux-Out but that would have sacrificed the private line function of the mixer so we continued to use my regular IFB system. Later, we determined that cables permitting an isolation transformer, like the Sescom IL-19, would solve the problem.

After the picture wrapped, I made careful tests of the capabilities of the system. First, I ran frequency response curves using an Audio Precision analyzer and anechoic chamber. Using the matched Sennheiser microphones and comparing the Zaxcom with both the Lectrosonics/Sound Devices rig and a hardwire, I found that the response curves were identical over the 100 Hz to 10 kHz range. The hardwire performed out to 20 kHz (and presumably beyond) while both radio systems began to drop off around 12 kHz, effectively dropping out by 16 kHz. There were slight differences between the radio rigs at frequency extremes but nothing significant.

With the assistance of boom operators Chris Tiffany and Lucas Plouviez, I began a series of listening and measuring tests, trying to find weak links.

We first tested working range. I mounted the receivers next to each other on my cart with a mouse pad underneath to ensure there were no pesky problems caused by contact with metal surfaces. Each receiver operated with 1/4-wavelength whips. I used the Zaxcom RX900S to seek the best frequency and then set both units to work on the same frequency—one at a time, of course. We repeated this test several times and the Lectro system consistently produced slightly better results. With good line of sight, the Lectro's range (at the standard 100mW setting) potentially exceeded our 500-foot test area. The Zaxcom became susceptible to dropouts at 300 feet and was out of range at 420 feet. This isn't an exact science; results were slightly different each day we ran the test. Also, while the Lectro might take an occasional "hit" near the end of its range, the Zaxcom either performed perfectly or failed altogether. Both systems are likely to perform differently in actual production situations with many people around and with the use of high-gain antennas. Both systems performed well enough to be fully functional in the intended application. At range extremes, it's pertinent to recall that the Zaxcom is fitted with internal recording capabilities that permit recovering any compromised audio.

We adjusted the systems to a normal working level and then checked for headroom by feeding progressively louder signals from a Neutrik tone generator while watching the output of the receiver on an oscilloscope. This is an informal test partly because, with differently calibrated systems, it can be tricky getting exactly matching start points and partly because the limiters were engaged. (Although the limiter in the 992 can be disengaged, the limiter in the SMQV cannot.) With the systems set up to record the tone at 0 dB, we were able to add 40 dB, or slightly more, before the trace began to deviate from a sine wave. Results were nearly identical in both units. That's a lot of headroom and goes a long way toward explaining how I was able to successfully record actors whispering and yelling in the same scenes.

We then made some subjective listening tests, trying to distinguish one configuration from another. We found it to be a much trickier exercise than one would expect. With identical microphones and matching positions, the outputs were indistinguishable. If one system had only 1 dB of additional gain, that would fool the ear into favoring the louder sound. Sometimes just having the speaker shift weight from one foot to the other would slightly alter position relative to a microphone and produce results favorable to one system. There were several occasions when we thought we had a ranking only to find, on closer inspection, that circumstances favored one unit or the other. In the end, monitoring both systems and a hardwire, neither Chris Tiffany nor I could hear any difference. Lucas Plouviez thought he might favor the Zaxcom over the Lectro system but wasn't entirely sure. Later, Coffey Sound specialists Nick Hurtado and Robert Kennedy joined our session but they were also unable to choose one unit over the other.

We really tried to put the systems through their paces so, in addition to reading aloud; we also recorded quiet room tone, whispering from a distance of 10 feet, and screaming at the top of our voices. We recorded strumming a guitar so there might be complex musical material to help make a judgment. Listening to all these sources, we were unable to reliably choose one system over the other. Later, listening to the whisper recording through Adobe Audition, Don Coufal believed he could identify an advantage for the Zaxcom. The whispers were identical but he focused his attention on the sound of the refrigerator running in the deep background and said he could identify a more distinct motor whir from the refrigerator in the Zaxcom track!

We'll post some files online so others may take a try at choosing the best recording. (But don't expect us to be quick to tell which is which.)

In the end, there was very little cause to favor one over the other. If one system is superior, it's not a difference we can observe in normal listening. However, anytime someone expressed a preference, however hesitantly, it tended to favor the Zaxcom. Both systems performed marvelously well and both were suitable for high-quality professional recordings.

Once we had an inline transformer, the IFB system worked without any feedback into the audio track. Still we were unable, at first, to configure it to work to our satisfaction. When the 992 receives a strong signal from the IFB transmitter, the audio quality is outstanding. However, it is a 2.4 GHz system and, like other 2.4 GHz



Motel exterior night on Beautiful Boy

systems, does not have good penetration through walls. Even with a high-gain antenna, we were not able to get satisfactory results in anything but clear line of sight operation. On a stage that might be fine, but on working locations one cannot always set up in the most advantageous spot. On *Beautiful Boy*, we worked in houses where space was limited and I would often locate the cart in the kitchen for scenes taking place in an upstairs bedroom. One could move the transmitting antenna to a better place but it rather defeats the purpose of a wireless rig to be cabling out antennas.

There were also issues about IFB performance at its limits. Rather than a "hit" or simple dropout, the unit was prone to metallic "clicks" and to a noise like high-frequency mosquitoes. When present, this was very distracting. Zaxcom promises new software to smooth out the audio when the signal is momentarily interrupted. That is likely to resolve these issues.

When Glenn Sanders learned of our difficulties with the IFB, he immediately sent a one-watt antenna amplifier and a directional antenna. Billy Sarokin had reported good experience with this configuration. We tried it out and observed an immediate improvement. We were able to roam over a large area without any dropouts or interference and the sound quality was excellent. Comparing range, we found that the Zaxcom IFB, using the amplified antenna, had better range than a Lectro IFB, using the 100mW T2 transmitter. With the 250mW T1 transmitter, the Lectro had the greater range.

The importance of extended range is closely tied to how the sound crew uses the device. Billy Sarokin's crew monitors audio directly from the 992 and uses the IFB only for private line communication from the mixer. This offers the best possible audio quality to the headset and seems the obvious way to operate. When there is no audio in the IFB transmission, there are no artifacts even if the boom operator strays outside the operating range. At the edge of range, there might be noise when the mixer comes on line but otherwise no distracting noises.



The Zaxcom is 14.9 ounces with battery. The Lectro-Sound Devices package is 37.4 ounces including pouch and cables.

If the IFB system is used to monitor audio return from the mixer, then the issue of range becomes more acute and the antenna amplifier is really necessary. The system we tested, a Mobile Mark antenna and an L-Com amplifier, is reasonably compact. Cost is a few hundred dollars, not excessive for this sort of application. There are a few caveats: As tested, the system slightly exceeds allowable FCC power limits. Attention from the FCC is most unlikely since the amplifier-antenna combination only slightly exceeds permissible standards. I checked my own home WiFi and confirmed there was no discernable interference from the IFB system. Substituting a half-watt amplifier would bring the system into full compliance and probably not significantly effect range. A one-watt amplifier does use some energy; consumption is probably comparable to a DAT recorder and needs to be factored into battery use calculations.

In addition to sending audio, the IFB transmitter can be used to send time code, to change the operating frequency of the 992 and to adjust its gain on the fly. Remote changes can even be made during the take. When using other Zaxcom gear, like a Deva recorder, one receives a readout that the adjustment was received and activated. The remote control also works in a stand-alone application but the confirmation is absent. In practice, I found that the remote control was not really needed. The dynamic range of the system is so great and the RF performance so solid that adjustments could easily wait and be made between takes.

There are some aspects of the transmitter we would like to see improved:

- The mix and volume knobs are low friction and unprotected. These should be click-stopped or protected by a collar. One tester particularly favored click stops for the IFB-Direct program mix knob.
- A dummy battery pack that would facilitate operation from easily available disposable batteries would be welcome. Although the supplied batteries work well, knowing that one could readily obtain power anywhere in the world would offer considerable peace of mind.



The Zaxcom IFB 100 with directional antenna and amplifier components.

- The layout of controls on the top makes perfect sense when holding the unit in the hand but is entirely backward when it is worn on the belt.
- An input jack that would permit using outboard IFB receivers would be very welcome. If the boom is left on the set to listen to shot developments, the boom operator needs an alternate IFB receiver to be on call to the mixer.
- A rubber dot at the base of the battery would provide a better grip.

The Zaxcom unit has a unique feature set including encryption capabilities and the security of on-board recording. Results are consistently excellent-good enough to rival a hardwire. In fact, the audio advantage goes to the radio system because the freedom of movement it affords helps to always be in the best position. Even if a competitive system can produce similar results, the consolidation of the system to one reliable battery is justification by itself. Monitoring two batteries, one for the transmitter and one for the preamp or phantom supply, can be problematic. There is inevitably a time when one power source is marginally weak and that is likely to produce an inferior result until corrected. Operating from one strong battery avoids this issue. Anyone regularly employed in scripted work should give the system a close look.

Acknowledgments

Thanks are due Glenn Sanders and Zaxcom for entrusting us with their equipment. Coffey Sound provided primary support and helped with evaluating recorded files. Mark Lesonsky and Location Sound assisted in making frequency response tests and Chinhda Khommarath provided test equipment. Many helped with listening tests including David Stark, my boom operator on Beautiful Boy, Chris Tiffany, Lucas Plouviez, Robert Kennedy, Nick Hurtado, Don Coufal and my neighbor (and camera assistant) Scott Harris. Richard Lightstone, Jeff Wexler and Billy Sarokin provided welcome consultation but errors and conclusions are mine alone.

Poulsen Telegraphone **A REVIEW OF** EARLY MAGNETIC

RECORDING

netic recording.

DEVELOPMENT

The previous issue of "When Sound Was

Reel" covered the period from approximate-

ly 1930 to 1950, two decades that marked

the rapid development of optical sound

recording on film. Here, we take a look at

the technology behind the move to mag-

Early Development





As optical sound recording technologies began to mature during the post-WWII period, Hollywood began looking at alternatives to the cumbersome process of optical sound recording on film. Although research work in magnetic recording had been going on since at least 1878, it would be another decade before inventor Oberlin Smith published one of the first articles outlining the principles of magnetic recording in *Electrical World* in the fall of 1888. While these early experiments would prove the viability of magnetic recording, it was Danish engineer Valdemar Poulsen who would ultimately build and patent the first working prototype, which came to be called the telegraphone. This device, designed primarily to record telephone messages, utilized wire as the medium for recording. While of limited quality, Poulsen and his partner Peder O. Pedersen, continued their development, during which time they discovered that the application of a small DC current to the recording head would yield a superior sounding signal. This discovery led to further refinements, most notable, the use of steel tape in place of wire as a recording medium.

Poulsen Telegraphone

However, for reasons not entirely clear, Poulsen dropped his work on the telegraphone, and in 1902, turned his attention to radio. The American Telegraphone Company would subsequently acquire the patent rights to the system, and in partnership with the DuPont Company, went on to build 50 dictating machines. However, the signal quality was still deemed inferior, and the wire spools were unmanageable. By 1918, the company was in receivership and ceased manufacturing operations in 1924.

While it would appear that magnetic recording was on its deathbed, German engineers picked up where Poulsen had left off, and leading to the development of the Magnetophon. Manufactured by AEG (later AEG Telefunken), this machine was a marvel of technology. This machine (in its improved version) recorded on a thin acetatebase magnetic tape coated with ferric oxide, developed in conjunction with German chemical manufacturer BASF (a unit of chemical giant I.G. Farben). Running at 1.2 meters per second, it boasted superior frequency response and signal-to-noise ratio.

However, despite the fact that the Magnetophon was publicly displayed during the 1935 Radio Fair in Berlin, it would another decade before the technology was improved and brought to a wider audience in the United States.

Magnetic Recording Hits the States

Although a version of the German Magnetophon (probably a K3) had been sent from Germany to an AEG affiliate in New York in the fall of 1937, it apparently was not well received by the engineers at the General Electric Company who saw it. They wrote up a complete technical report, but totally ignored the obvious potential of the technology, dismissing it out-of-hand as crude and unreliable. It was ultimately through the efforts of a young Army soldier by the name of John T. ("Jack") Mullin to again bring the Magnetophon to U.S. shores, shortly after the end of WWII.

Mullin had been stationed with the Signal Corps in England, working on problems related to radio interference caused by radar installations. Often working late into the night, and needing entertainment, Mullin would listen to the BBC. However, the BBC ended their broadcasting day at midnight, which did not suit Mullin at all. In search of programming, he soon found that Germans were broadcasting programming 24 hours a days, including large-scale symphonic works. To Mullin's ears, the quality of these broadcasts was exceptional. Although he figured it was possible that the works he was hearing were live, he had doubts that even the Fürher (despite his other traits) would demand that symphonic works be performed around the clock. He knew there must be another answer, but it wasn't until after the Allied invasion that he would find it.



Jack Mullin's original German Magnetophon (Photo courtesy of Pavek Museum of Broadcasting)

The Fork in the Road

While on assignment in July of 1945, Mullin and a fellow lieutenant were sent to investigate a German installation atop a mountain north of Frankfurt. During their visit, he met a British army officer, who was there on the same mission. The subject of music and recording came up, and the British officer commented about a recorder being used at Radio Frankfurt, called the Magnetophon, and raved about the quality. The Germans, however, called all their recorders Magnetophons and Mullin had already run across a number of smaller dictation machines of only fair quality, so he dismissed the comments, figuring the guy just had lousy hearing.

Traveling back from assignment, Mullin and the lieutenant reached a fork in the road. Their options were: turn right and head back to their unit in Paris or turn left to Frankfurt. Mullin turned left.

Ultimately, they would discover what they were looking for in Bad Nauheim, a health resort 45 miles north of Frankfurt. The station had been moved there to escape the bombing in Frankfurt, and was being operated under the auspices of the Armed Forces Radio Service. As Mullin relates it: *"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 (photo above) 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 35 separate items. Any one of those boxes could have been lost or damaged, but all of them arrived safely."

Once back in the States, Mullin began the task re-assembling the transport and electronics, which took about 3-4 months. Once completed, he began showing his find to various audio professionals. The head of the IRE, (now the IEEE) heard of his efforts, and asked Mullin to give a demonstration of the recorder at the May 1946 IRE meeting in San Francisco. For this event, Mullin and his business partner, Bill Palmer (a bright engineer in his own right, who was already engaged in the film business), recorded some music at NBC, and at radio station KRFC in San Francisco, which owned a pipe organ. These samples would prove to be very effective demonstration pieces.

Jack Mullin (third from left) and Bill Palmer (fourth from left) demo their restored German tape recorder at San Francisco IRE conference May 1946.

Harold Lindsay was in that audience. Later, the Ampex Corporation retained him to help their efforts to diversify their product line in the audio field.

Subsequent to the San Francisco demonstration, in October of 1946, Mullin and Palmer took their show on the road to Hollywood, demonstrating the capabilities of the magnetophone at MGM Studios, recording a performance of the MGM Symphony Orchestra. In the audience at this demonstration was Bing Crosby's technical director, a gentleman named Murdo Mackenzie. Crosby was under contract at NBC Radio Network and had a particular interest in improved recording technology.

In June of 1947, Mullin was invited to give a demonstration of his system to Bing Crosby. Up until this time, Crosby had been doing *The Kraft Music Hall* show live, at the insistence of NBC engineers and management. Crosby chafed at the restrictions imposed by live broadcasts and wished dearly to convince NBC to transcribe broadcasts for later airing. NBC refused.

So, in the fall of 1946, Crosby took nearly a full year off from regular live broadcasts, and returned the following year with the Philco Radio Time show on the newly anointed ABC Radio Network (which up until that time had been part of NBC, and was referred to as the Blue Network). This time, he was granted the right to record his shows. Unfortunately, things did not go well during the first season. The shows were recorded on 16" acetate transcription disks, which were frequently edited, and then dubbed for time-shift broadcasts. After going three generations on this format, the loss of quality was evident to all. The show began losing ratings, and Philco began pressuring Crosby to either return to live broadcasts, or find a better a better way to record shows for airing. Mullin's timing couldn't have been better. When Crosby heard the demo, he immediately arranged to hire Mullin to record his shows, using standby facilities at the ABC studio (previously part of NBC).

Jack with Ampex 200s

With only 50 rolls of tape at his disposal, Mullin went to work recording the next broadcast season. However, the BASF tape was very inconsistent from roll to roll, and he was having a difficult time maintaining control over the quality. With some advance funding by Crosby, Ampex had begun the task of developing the model 200 recorder, a design based closely on the magnetophone. Serial numbers 1 and 2 of the machines were pressed into service starting with the 27th show of 1947-48. Despite the success of the system, ABC engineers still insisted on doing broadcast from transcriptions, but eventually were won over by the quality of the Ampex recordings.

At the same time, Ampex was working with the Minnesota Mining & Manufacturing Company (3M) to develop a more consistent tape to replace the tapes manufactured by BASF. This would turn out to be a very lucrative market for 3M in the years to come.

Rangertone recorder (Photo courtesy of Pavek Museum of Broadcasting)

The Competition

Col. Richard Ranger

Although Jack Mullin and Bill Palmer garnered much attention with the Magnetophon, there were others who were active in the development of magnetic recording during this period as well. Notable among these was Richard Ranger, who worked for RCA as a design engineer. Notable achievements include the "wireless photoradiogram," a forerunner of the current fax machine, as well at

the automated NBC chime, which replaced the familiar manual chimes in use by the network. In 1930, Ranger formed the company Ranger, Inc. Ranger had served in the Army Signal Corps during World War I, earning the rank of major. Subsequent to this, he took part in the post-war effort during 1944 and 1946 to examine and document the work the Germans had undertaken in relation to electronics, communications, and (most notably) magnetic recording.

After completing his service, he went on to develop a recorder based on the Magnetophon, dubbed the "Rangertone Recorder," which he demonstrated for various engineers, (as well as Bing Crosby). In general, however, the Ranger recorder was deemed to not be of the same quality as the Magnetophon units, and he faced an uphill battle in the marketplace. Undaunted, Ranger

continued his work in magnetic recording, focusing on applications related to the motion picture field, and in 1956 was granted a citation by the Academy of Motion Picture Arts and Sciences for his work on synchronous sound systems for 1/4" magnetic tape.

His work in this area became the basis for Stefan Kudelski's later development of the Neo-Pilot sync system used on the Nagra III recorder.

S.J. Begun

Hungarian born in 1905, Semi Joseph Begun (known simply as S.J. Begun) was a German-American engineer, whose early work included refinements of the Oberlin Smith recorder designs. After

emigrating to the United States in 1943, Begun went to work as Vice President of Research for the Brush Development Company in Cleveland, Ohio. At that time, Brush's primary business was the production of piezoelectric phonograph pickups, which were the least expensive and most widely used cartridge of the period. However, in cooperation with Western Electric, they were also producing a line of magnetic tape recorders, using hardened steel tape as a recording medium.

In addition, they produced a line of wire recorders, which utilized stainless steel wire for recording, as well as high-frequency A.C. bias circuitry. While wire recording had some definite advantages over steel tape, Begun was looking for a better medium to work with, and was subsequently awarded a contract by the National Research Defense Council for further development in the area of magnetic tape (the U.S. military had been a big customer for wire recorders during the war, and saw the potential in magnetic recording for military applications).

Marvin J. Camras

Starting in the late 1930s, a bright engineering student by the name of Marvin Camras was working at the Armour Institute of Technology in Chicago (now the Illinois Institute of Technology). His primary focus at this period was also related to development of wire recording technology, bringing together many of the elements of other designs, as well as adding his own engineering.

Chief among his accomplishments were perfecting the circuitry used for A.C. bias of the recording head, improved magnetic head designs, as well as solving some of the difficulties related to the handling of the stainless steel wire on the transport mechanism.

After living with optical sound recording technology for about 15 years, Hollywood was about to undergo another wrenching change. ©2010 Scott D. Smith, CAS

Next installment: Magnetic recording goes to the movies.

The author of "When Sound Was Reel" would be interested in any historical photos or documents that our members could provide for future articles, specifically for the period covering the late 1940s through the late 1970s. Photos relating to both set operations and re-recording are desired. Email to: 695photos@film-mixer.com.

Credit will be given where noted.

