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Supplement to:

TV TECHNOLOGY™

Jablonski Speaks Out
See Pages 2-3

Games Challenge NBC

by Carmel King

BARCELONA, Spain Most things are supposed to be easier the second time around. But with Olympic broadcasting, that's not necessarily the case.

Even though NBC achieved higher than expected ratings—and much higher than it garnered in Seoul in 1988—putting together this year's Olympic telecast was, by many accounts, more challenging for the network.

And while the reasons for that were many, the biggest, according to Jack Weir, V.P., Olympics Operations and Engineering, was the post-produced nature of this year's telecast versus the live Games in '88.

Demanding days

"The demands that a post production operation places on the staff are much greater. Live television happens and it's over. With post production, you have to agonize over it for hours," Weir said.

Other difficulties associated with the Barcelona show included delays getting equipment through customs, living within a tighter budget, operating in a PAL environment, working with a new production team, worrying about power problems, and getting accustomed to Spanish culture and work schedules.

"If you're doing a doctoral thesis on stress, (the Olympics) is the place to be," according to Charlie Jablonski, managing director for Olympic engineering. "No matter what you plan or what you think your problems are, it's always going to be something," he added.

While many of the challenges were great, so were some of the successes. Most notably, the network built a 70,000 square foot, state-of-the-art technical facility—its third largest behind 30 Rockefeller Plaza in New York and Burbank.

"Awesome," commented Canada's CTV Television Network's V.P. of Operations and Corporate Planning Gary Maavara, after a tour through NBC's setup.

"The size of it, the state-of-the-art of it, the infrastructure, the way it's been engineered, it's really thoughtfully done," he added.

NBC also successfully pulled off the first major utilization of a digital tape format. Weir rated Panasonic's D-3 as "very good."

"This was a big post production show. Not having to worry about generation quality was a great advantage," he said.

Pay as you go

The network also proved the feasibility—at least technically—of pay-per-view Olympic broadcasting.

The pay-per-view staff "put a good plan together," Weir said. "I think if it were possible for people at home to see what the product was ahead of time, there would have been a lot more people buying the service," he added.

Weir credited his technical and operations staff, which numbered about 700 total, including 300 at the International Broadcast Center and 400 at the venues, for their efforts in making the Olympic broadcast successful. "(The crew) has been excellent...very, very good," he said.

NBC Cameraman Ken Walsh (a former Olympic swimmer) and Utility Michael Martell capture the moment as the U.S. Women's 4x100m freestyle team celebrates its Gold Medal victory.

For complete Olympic venue coverage, see pages 29 to 38.

Rising to the Task of Olympic Engineering

by Randy Hoffner

BARCELONA, Spain The job of engineering NBC's coverage of the 1992 Olympics in Barcelona was a big one, to say the least. If coverage of the Games for broadcast television was not enough, the addition of three pay-per-view cable channels further complicated the task.

NBC's International Broadcast Center, or IBC, located in the exposition center complex at the foot of Montjuic, was the nerve center of NBC's Olympics coverage.

Heart and soul

During the course of the Olympics, the IBC was required to take in 24 NBC unilateral venue feeds, 31 host broadcaster feeds, 17 pay-per-view commentary feeds, and a satellite return circuit from NBC headquarters in New York. It was required to send out primary and secondary broadcast signals, three pay-per-view programs and an NBC News feed, plus half a dozen program return feeds to venues. The IBC complex additionally had to integrate three studios; four control rooms; eight small and one large edit suite; three pay-per-view mini control/edit rooms; a large graphics facility; four announce booths; and a music post-production suite.

NBC's IBC technical facilities may be divided into two broad categories: core systems and production systems. The core systems included those used for signal transmission and distribution and those facilities shared by the production systems. Core facilities included transmission; broadcast operations and communications (BOC); central videotape; graphics; the central equipment room; communications systems; and the master routing switcher (MRS).

Signal switching

Transmission's function was to verify and adjust the parameters of all incoming and outgoing signals and to switch those signals to their proper destinations. Five full-time satellite circuits to the United States were maintained, and, like all incoming and outgoing program circuits, these were designated with color names. The Gold circuit was the primary broadcast signal path, while the Silver circuit carried the secondary broadcast signal. The Gold circuit was a Ku-band satellite link, uplinked from a transportable earth station located just outside the IBC.

The Silver circuit was a C-band link that was uplinked at an earth station operated by Telefónica, Spain's national telecommunications company, which is situated in the midst of vineyards in the wine and cava producing Penedés region some 40 kilometers south of Barcelona. Olympics viewers who saw the road cycling competition saw some of the Penedés region.

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Hindsight, Insight, Outta Sight:

Charlie Jablonski, managing director for Olympic engineering, talked with TV Technology's Associate Publisher Carmel King in the final days of the Olympic Games about the network's operation in Barcelona. Both were in Seoul for NBC's broadcast of the 1988 Games.

TV Technology: *What were your main considerations in designing the core plant?*
Jablonski: The fact that it had to work in a completely PAL environment. It also had to be cost effective. We had to be able to find a user for the equipment at NBC and have it convertible, or lease it. We also had to give production the flexibility that they hardly knew they needed until they got here.

When you design technical facilities for production, it's a lot like being a pediatrician. You have this crying, whining baby that knows it wants something but can't tell you what, so you have to take your best guess.

TV Technology: *Do you think you were successful in guessing?*
Jablonski: Yes, reasonably well. There doesn't seem to have been a lot of problems in terms of the design and execution of the design.

TV Technology: *In the graphics area, you used serial digital component routing. How did that work out?*
Jablonski: Fine, better than expected. I did that because I needed to build a component facility for graphics. In Seoul, I built a parallel analog facility which was a bit cumbersome, and I wanted to (1) make sure Grass Valley was in the business of serial digital routing in an expeditious fashion, and (2) provide an operational and technical test bed because this is a technology we are considering using for our 30 Rock project. So I wanted a place to try it. And I also wanted an excuse to get everybody in the serial digital business. We've been moderately successful with all these goals.

TV Technology: *Did you consider using serial digital routing for the entire plant?*
Jablonski: Yes, we did. The problem was that there was not a big enough routing switcher available soon enough, nor big enough production switchers available. In other words, there was no digital equivalent of a Grass Valley 300 switcher in time, in PAL. That was one of the first things I looked at.

TV Technology: *In Seoul, the graphics operation featured a showcase, state-of-the-art facility that was such a big part of the NBC story. Here, it seems to be a little less flashy. Is that true?*
Jablonski: Yes, but even though it was less flashy, it was as difficult, because all those elements are very complex to make. And the money was a lot tighter this time in terms of body count and equipment count, so all that contributed to making the operation a much more challenging job for our graphics folks.

TV Technology: *What about standards conversion. What were your considerations going into that?*
Jablonski: I wanted something that would bring the best possible images back to the United States. One of the first things I did when we got the rights to these Games was have staff engineering start looking into standards conversion technology.

We basically covered all four corners of the globe and finally settled on the Thomson converters. But (those converters) did not exist as a product, they barely existed in time for the Winter Olympics.

> ***". . . it's always hell on wheels the first two weeks before you go on the air."***

TV Technology: *Aren't the Thomson converters using a new algorithm?*
Jablonski: Well, algorithm is a generic term. They are using a new conversion process between the 50 frames and 60 frames. The generalized term is motion vector conversion, they happen to use something called luminance radiant estimation. The Vistek used block matching. There are some other developments coming down the pike courtesy of the BBC called phase correlation, which you'll see eventually from Vistek.

But yes, the standards converters did make the pictorial differences. And they made the images look as good for us as they did for CBS.

TV Technology: *I understand you cooperated with CBS on standards conversion. What was the relationship?*
Jablonski: One direction that came from senior management was to cooperate in the equipment areas where we could. When we evaluated converters, we worked with CBS for two years and they worked with us. They happened to choose Vistek because they were a little cheaper and were going to be ready sooner. We chose Thomson. We lent them our Thomsons for Albertville, and they lent us their Visteks for these Games.

TV Technology: *Did you cooperate in any other areas?*
Jablonski: No, nothing else worked out because of timing. Any other thing that could have been shared was just too big and too cumbersome, like a routing switcher or communications. We attempted to, but schedules were just too tight.

TV Technology: *Isn't it unusual for networks to cooperate?*
Jablonski: It would have been unusual five or 10 years ago, but not now.

TV Technology: *Why?*
Jablonski: Money. With converters being several hundred thousand dollars a pop, why should we buy eight and they buy eight? It doesn't make any sense, plus it's not something that gives a competitive advantage to either company.

TV Technology: *Did you ever consider doing an NTSC plant?*
Jablonski: I did the exercise but it just did not make economic or operational sense. Because in the Summer Olympics there are about 180 or 200 host feeds at the venues that we have to take. We certainly couldn't afford converters for those.

The Winter Games are different because you have far less venues to deal with and you can do your own unilateral coverage at several events. But it just doesn't work for Summer.

TV Technology: *What about the tape format? Why did you choose to go digital?*
Jablonski: First of all, it had to be a cassette-based format. There was never any question about that. We proved in Seoul you had to have cassettes. We wanted digital because we did not want to worry about generation count, in terms of how many generations we could go down while editing. We also wanted four real editable audio channels. The only way to get both those factors was digital.

TV Technology: *Has the digital format met your expectations?*
Jablonski: Yes. There are always a couple of little bobbles here and there. On the whole, we have about 260 tape machines here, and 15,000 pieces of stock. The odds of any one of them breaking every once in a while is (there).

TV Technology: *How would you rate Panasonic as far as support?*
Jablonski: It's been superb—not a problem. Then again, when you do a project like this, you choose companies that have more to lose when they screw up than you do. It's a corollary to the rule, "Never sue somebody who has more lawyers than you have."

TV Technology: *Where do you think the future of tape technology is headed? Do you think it will be D-5? Are you looking*

(continued on next page)

Jablonski Speaks Out

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at that in a serious way?

Jablonski: It all depends on who you believe. It's fairly obvious to me that Sony wants to try and split the market with digital Betacam as one path because Betacam has become so entrenched in the production market, and then a high-end digital format above it. Panasonic still wants one tape format to fit all.

I'm beginning to think that shopping for tape formats is a lot like going to the grocery store to buy bread: You look on the shelf, you like the rye bread, you buy it. When it goes stale or you need some more, you go to the store again. The white bread looks pretty good, you take that.

You can consider it fortunate or unfortunate. The odds of Panasonic and Sony ever cooperating are so small. But it benefits the point-of-sale consumer because it's cheap. Betacam SP wouldn't exist if it wasn't for M-II, and it wouldn't be priced where it is. It's become a very competitive business. If those two (companies) ever decided to cooperate, it would become like cellular telephone companies—one expensive price fits all.

The problem is, the marketplace and the end users can't absorb this change anymore. And I think the slow sales of D-2 and D-3 reflect that. People are just getting tired of tape formats.

But when you have to make a decision and buy today, you're going to want to get the most bang for the buck. And four years from now, when someone sits down to do Atlanta, there will be something else to choose from, whether it's D-5 or digital Betacam. In Norway, the host broadcaster has chosen digital Betacam, and it will work fine.

Quad lasted 20 years, 1" lasted 10 years. Now we're down to five or six years for the life of a format. NBC made the M-II decision in 1986-87 and now we're moving to D-3, not because we're dissatisfied with M-II, but we needed to do something different. We looked at the marketplace and decided to go with D-3.

TV Technology: *What about stereo? How are you using it here?*

Jablonski: Actually, we're doing very little true stereo because of the complexity of the pick-ups and the tape turnaround that (stereo) compromises the flexibility of editing at a venue. You have to do turnaround very quickly and preserve both tracks.

One thing we found in editing that we never expected people to use as much as they have is the preread feature on the digital tape machines. Never in my wildest dreams did I expect editors to cut into their masters and do prereads, but it has now become a natural course of nature of the show. So other than a few music pieces and Opening and Closing Ceremonies, very little has been in true stereo.

Charlie Jablonski, NBC's managing director for Olympic engineering, shown here in the network's Barcelona facility.

TV Technology: *Isn't that a departure for NBC, which was a real pioneer with stereo?*

Jablonski: Yes, but we made the decision because turnaround time was so short. What we learned in Tokyo (at the World Track & Field Championships) is (The editors) have all gotten used to it. That genie is out of the bottle now and not going back in. (Preread) may be the one feature that sells digital tape, above all others.

But (not doing stereo) doesn't seem to have hurt the numbers at all. They've been exceedingly good, unexpectedly good.

TV Technology: *Why is that?*

Jablonski: It's the "produced" nature of events because it saves time and energy.

TV Technology: *What about pay-per-view? What demands has that put on your operation?*

Jablonski: It was a completely separate operation in a technical sense. It required its own mini control rooms, its own studio control and it used the host video feeds. But there were certain kinds of distribution and switching required because it was a 24-hour-a-day operation. The time zone delay units, the ability to do the channel IDs, and the ESPN sports update kind of thing made it a little more challenging. We have five feeds going out of here, where in Korea the parallel would have been two, so it made transmission a little more complex. It increased the tonnage but not the depth.

TV Technology: *Technically, how do you think it worked?*

Jablonski: Fine, superb, no complaints.

TV Technology: *Do you think pay-per-view has a future in Olympic broadcasting?*

Jablonski: No. It's a marketing problem. I'm not an expert but I think right now, because of the low buy rate here, you're not going to see it in Atlanta. And there it's a live Games, so it's a much harder sell.

TV Technology: *How would you compare this experience to Seoul in '88?*

Jablonski: It's a tough comparison. As I've said before, the thing about (the Olympics) is, if you're doing a doctoral thesis on stress, this is the place to be. No matter what you plan or what you think your problems are, it's always going to be something. Here it was customs and shipping and adapting to the Spanish culture. In Korea, it was stuff completely different, but it's always something.

And it's irrespective of who the production people are and who the executives are, it's always hell on wheels the first two weeks before you go on the air.

TV Technology: *If you could do it all over again, is there anything you'd do differently?*

Jablonski: There are always things you would do slightly differently, but I think the overall concept has worked. Knowing we had so many customs problems here, yes we would have shipped things sooner—those kind of things.

TV Technology: *Overall, how would you rate the experience?*

Jablonski: Educational.

TV Technology: *What happens to you after this?*

Jablonski: No idea. In 1988, by the time the Games started, I knew what I was going to be doing when they were over. Here, I don't have the slightest idea.

But I knew I wouldn't think about it until it was over because the stress and pressures here give you the wrong kind of lens in which to view your future. So after I take a little time off, after this is all done in September, I'll figure out what I'm going to do and who I'll be doing it with.

Associate Publisher: Carmel King
Marketing Consultant: Albert Leon

Ad Coordinator: Caroline Behan
Circulation Director: Tiana Hickman
Circulation Mgr.: Rebecca Seaborg

rooms. They took in feeds, editing segments and feeding out to their respective channels. D-3's 180 minute cassettes allowed producers to package one day's programming on four cassettes.

trol room. In the control rooms, a director, producer, technical director and audio engineer inserted graphics, mixed audio and coordinated VTR segment rolls for

Ralph Biesemeyer is Digital VTR Product Manager for Panasonic Broadcast & Television Systems Co.

Panasonic Digital Put to the Test

No T-Squares or Pens Here

shared user bus (SCSI). A Paintbox shared user bus also had a magneto-optical removable drive (650MB) and a Sabre drive (2.2GB). Each local

Barnathan Aids Host Broadcaster

Set Reflects New Design Approach

by Alan Carter

BARCELONA, Spain Designing the glass and steel space-age looking set where Dick Enberg and Katie Couric anchored the morning broadcasts was like writing a book on trigonometry. Convincing the "officials that be" to approve the unorthodox plan was a game of cat and mouse. Building the facility was a lot easier—if you can believe that.

The man whose concept the project was, Production Designer Jeremy Conway, best described the structure if you didn't happen to see it:

"The only way you can appreciate something like that is to understand how complex the structure is. It's a ceiling piece that's suspended by steel truss work sloped from the north to south at five degrees. The east and west window walls, which clip in under it but do not support the ceiling, rake out at 10 degrees. Then the north and south walls rake out at 15 degrees. The whole shape is trapezoidal."

That's geometry for a plane figure with four sides, two of which are parallel.

A team project

Conway and his team, including Art Director Kim Jennings and Assistant Art Director Alan Good, were responsible for sets used by NBC: morning, prime time, late night and pay-per-view. But the morning set, which Conway described as a building built on a building in the Athletes Village, was the most intriguing and unique.

Conway designed sets for Chicago theater before moving to New York, where he went to work in television. On his resume is seven years as set designer for "Late Night with David Letterman." He also was art director for such films as "Angel Heart" and "Crocodile Dundee II."

When he started work on the Barcelona Olympics, Conway remembered that everyone was sensitive about doing a job outside because of the problems the network had with the outside pagoda from which Bryant Gumbel anchored the 1988 Games from Seoul. ""All I heard about was how they had about a cabillion foot candles of light trying to light Bryant Gumbel," Conway said.

NBC Morning Show set. Tilting the glass out drew the ire of many old-school lighting directors.

But Coordinating Director Joe Cortina wanted to do something outside that had a roof but really didn't look like it had a roof— a stencil-like structure.

"You couldn't do a stencil structure, especially on top of a building they won't let you anchor into," Conway said, "because it would just blow away. So I just came up with this whole translucent polyclip ceiling that is used for swimming pool enclosures."

The structure could be described as a twin wall 16 mil thick of a translucent material, Conway explained. That fit the bill because it let the sunlight through so excessive lights inside were not necessary and the balance would be good.

The next hurdle, however, was lighting directors, many of whom Conway said were from the old school, and who screamed in opposition because they predicted nothing but reflections.

"Most of the old school lighting directors thought I was crazy for tilting the glass out instead of in, which was exactly what I did in prime time, too," Conway said. "They said, 'You can't do this,' 'It will never work.'"

Good balance

But Steve Brill, of Verner and Brill, and Conway did a test. "We wanted to know if we'd be in trouble, because it was such a radical departure from what we normally do."

It worked. "The balances were really good. We were only two steps down from the light inside, outside. When we started looking at it on camera, I thought the images were great. They were like something you had never seen before; they were so sharp and clean."

One unforeseen problem was the extreme brightness of the Barcelona sun, which caused problems for Katie Couric. But Conway solved that by installing neutral density Plexiglas (ND Plexi) in the windows. (Conway, however, thinks she was bothered by the HMI lights that had to cycle at 50 Hz to sync with the video.)

The only way to get rid of light was to take the background down, Conway said. The only way to take the background down was by putting ND Plexi on top of the glass. It worked very well in close ups, he explained. "The cameras could balance for outside," he said, "and with the wide shots, you didn't quite get as translucent a feeling.

Steel and glass

"The whole idea of the structure was that it would be an atonal structure of white steel and glass so that you wouldn't even really notice it," Conway said, "and your eye would go immediately to the background, which it did perfectly.

"So when we put the Plexi in, you noticed the windows more—before you saw what was outside of it so it was still successful," he said.

Conway said he and Cortina were very pleased with the results, even though the lighting directors constantly questioned the use of all that glass and the reflections.

"We actually got some great looks both in the morning set and in the prime time studios by using the reflections in the glass," Conway said.

Bringing the Signal Home

by Kenneth C. Fuller

BARCELONA, Spain At NBC's Barcelona broadcast center, venue feed interconnections and transmission operations were designed for maximum flexibility with a minimum amount of control positions.

NBC Barcelona transmission was the interface point within the NBC plant for all feeds external to the broadcast center. The area had five operating positions, and was responsible for more than 65 remote feeds: 32 from RTO (the host broadcast); 24 NBC unilateral venue feeds; five outbound feeds to the U.S.; one return feed from NBC New York, 17 Pay Per View commentator circuits; and a courtesy feed between RTO and other world broadcasters at the International Broadcast Center (IBC). Each of these feeds had at least one or two audio channels.

QC matrix

To successfully and logically manage this amount of equipment, NBC linked a special quality control matrix on the Pesa routing switcher to all of the remote feeds. This QC matrix allowed direct addressing of the remote inputs pre-processing, post processing, and directly from the main master routing switch matrix. The transmission router call-ups were also linked directly to a Graham-Patten UTECS (Unified Television Equipment Control System) for remote control of each input's processing equipment. This included the video and audio remote amps, frame syncs, and audio delays into NBC's Pesa router.

All outbound feeds from the broadcast center were protected with dedicated 10x1 switchers that were fed directly by all studios, bypassing the MRS. The output of these switchers then fed a 2x1 switcher by selects between the two 10x1 switchers. The output from the first switcher then fed another 2x1 switcher that selected between the 2x1 #1 output and a feed from a PAL 20x10 source matrix (which was also fed directly from the plant studios). The output of 2x1 #2 then fed into a standards converter. The converter outputs fed into an NTSC 10x20 destination matrix that then fed back into a 2x1 switcher that selected between the direct converter output path and the converter substitution path.

This switching arrangement allowed for switching and substitution of any converter in the outbound signal path in a controlled and seamless manner.

John Bracco checks out one of NBC's four Thomson standards converters at the IBC facility in Barcelona.

Pesa router

The central equipment core of the NBC broadcast center was the Pesa routing switcher. The router was configured with five levels of switching and three levels of quality control monitor switching. The router also had an associated machine control system for 40 devices.

Figure 1.
NBC's MRS Configuration

SIGNAL	CONTROL LEVEL	ACTIVE INPUTS	ACTIVE OUTPUTS
Video	1	192	256
Audio Left(L)	2	224	320
Audio Right(R)	3	224	320
Time Code	4	72	192
Key	5	72	112
QCMRS video	6	192	7
QCMRS audio (L)	7	224	7
QCMRS audio (R)	9	224	7

Figure 1 shows NBC's MRS configuration.

Control of the router was through the microprocessor control unit. Daily changes to the router configuration were made based on the changing feeds from the host broadcaster.

While it was in operation, the broadcast center was the third largest facility operated by the National Broadcasting Company. The knowledge the network gained from its Olympics experiences in Seoul and Barcelona should prove invaluable as it plans its core rebuild at 30 Rockefeller Plaza.

Ken Fuller is principal engineer, transmission systems, for NBC Operations & Technical Services in New York.

Pay-Per-View: 1,100 Hours Later

by Jeffrey Kulliver

BARCELONA, Spain Starting at 11 a.m. (Barcelona time) on July 26 and continuing until 11 a.m. August 10, NBC aired pay-per-view (PPV) coverage of the Olympics 24 hours a day on three separate cable channels, named Red, White, and Blue.

The programming consisted of 12 hours of live coverage and 12 hours of taped repeats. In all, almost 1,100 hours of Olympic programming was aired.

On June 7, the 100 operations people who would run PPV met for the first time and asked the big question: what is PPV, and how are we going to put it on the air?

The pay-per-view staff endured the cramped working conditions with good humor.

Six-week dash

That started a six-week period of training, experimenting, and the making and remaking of procedures. PPV was a concept that had never been done before at the Olympics, and procedures and concepts that looked wonderful on paper didn't work or weren't quite right in practice.

The rehearsal phase of the project was a constant stream of evaluation and problem solving.

Spain's RTO, the host broadcaster, provided the basic video coverage of the action from the venues. The PPV announcer's audio was transmitted via commentator's equipment that was supplied by RTO and supplemented with NBC equipment to be able to air up to four announcers.

The main PPV technical setup encompassed 3,400 square feet located within NBC's portion of the International Broadcast Center (IBC). The PPV facility consisted of three mini control rooms, one large control room, and a studio. The large amount of programming being aired each day demanded that each room perform multiple functions.

The mini controls were the release points for the PAL signal fed to the Red, White, and Blue channels. Each mini control was equipped with a Ross RVS 216A switcher, a Ramsa audio board, a Grass Valley 151 editor with Graham Patten D/ESAM audio mixing, and four Panasonic D-3 tape machines.

Because each of the mini controls would spend large amounts of time airing one event or tape, they were designed as combination live control rooms/edit suites.

Each room had a 10x1 switcher downstream from the main switcher. This allowed a tape machine or Pesa router output to be fed directly to the converter, freeing the main switcher for editing.

The control room and studio served as a service to the mini controls, feeding openings and closes, bridges, and fill material. The control room was equipped with a Grass Valley 300 switcher, a Ward Beck audio console, and four Panasonic D-3 machines.

During the night, the control room served as an edit room, using the Grass Valley 151 editor and D/ESAM audio. In the studio were three Panasonic cameras on pedestals and a hand-held camera mounted on a Merlin crane.

The 12 hours of live material fed to the three channels during the day had to be taped and turned around for the nighttime repeat. Because the mini controls were used for the editing rooms during the overnight period, three Time Logic automatic playback delay units (APDUs) recorded the output of the each of the mini controls and delayed the playback 12 hours.

Necessary bug

Complicating the playback was the need to add a channel identifier, affectionately known as "The Bug," and the word "live" over the 12 hours of original material. During playback, these were replaced by the words "Triplecast encore."

To meet these requirements, the PAL output of each of the mini controls was fed into a D/A. Outputs of the D/As were fed to Thomson standards converters and to the APDUs.

A Leitch NTSC still store device was installed downstream of the converter, giving each mini control the ability to key in the still store. This meant that the composite signal with the keyed material leaving the IBC was NTSC, but the encore recordings were PAL, without "The Bug" or the "live" graphic.

One of the most enjoyable things about working on the PPV project was that there were no set procedures. When a problem was found, small groups of engineers would huddle together trying to work out a solution. It was always exciting.

Jeffrey Kulliver is a free-lance operations producer/technical manager. He was the EIC of NBC's Barcelona PPV Operation.

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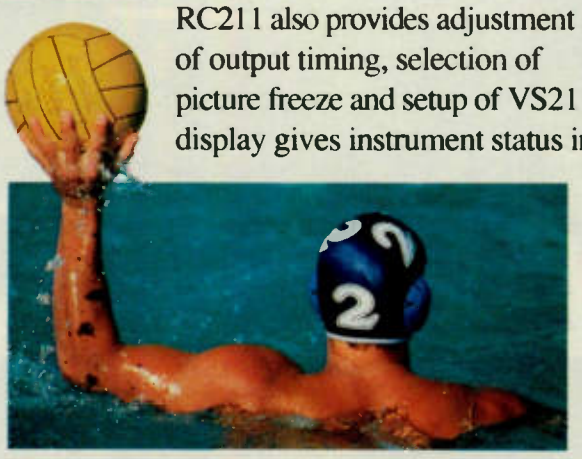

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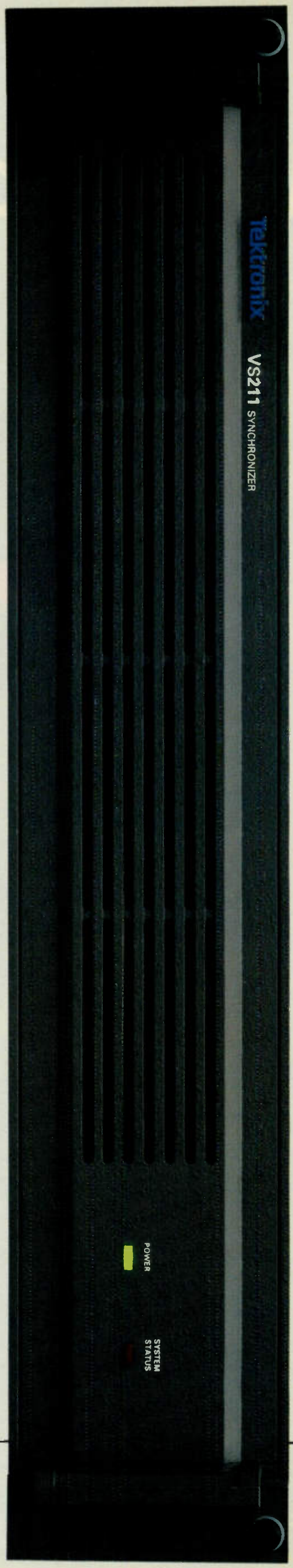

Tektronix

Computers Behind the Scenes

by Lori Durig

BARCELONA, Spain The NBC Olympics System staff—comprised of Michael Gabriel, director of systems; Michael Jackson, manager of systems; and Joi Tamber, LAN administrator—was responsible for the development and support of all production support systems for the Games.

A wide area network (WAN) bridge—a combination of hardware and software used to connect two Novell LAN (Local Area Network) systems—and a 64KB digital fiber optic line were used to allow the Barcelona and New York LANs to communicate. The wide are network (WAN) connected more than 100 PCs in the New York Olympic LAN to an almost identical LAN in the International Broadcast Center (IBC), which contained 150 IBM PS/2 Model 57, 70, and 95 computers.

A pair of Novell file servers, utilizing Novell operating system 3.11, were used to access the systems and files stored on the network. A pair of Microsoft SQL servers were used for the People+ client-server-based system. Using front-end software designed by DataEase International, the SQL servers took requests for certain information from the client or user and returned the requested information to the user.

A fully integrated, multi-user system, People+ allowed users to access personnel, contracts, manpower tracking, accommodations, credentials, travel, financial reporting, and payment authorization modules.

Before People+ was transferred from New York to Barcelona in mid-June of 1992, users in Barcelona were provided full access via the WAN. The same was true for New York users after the transfer. Thus, access to the same information base was available from both sites.

On-line facts

The Research System, which was based on specifications developed by Gabriel in 1990, gave researchers and writers complete access to the research manuals. Using tools developed by Quantum Access Inc., software was developed that allowed fast access to information that at times was required at a second's notice.

Athletes' biographies, information on the participating countries, Olympic history, and a history of Spain were just a few of the many things that could be retrieved from the system. Many of the facts and figures heard during the prime time, late night, or morning shows were found using this system.

Microsoft Mail, an E-Mail package used by NBC in Barcelona and New York, provided quick and easy communication between the two sites via the WAN and was effective in bridging the six-hour intercontinental time difference.

General application packages utilized on the LAN encompassed the functions of spreadsheets, word processing, presentation graphics, and calendar scheduling.

Remote PC workstations were installed at the Feria Palace and Le Meridien, two of the primary hotels used for NBC housing. These computers were attached to the IBC computer room via leased 9.6KB analog lines. This allowed the logistics coordinators to prepare for check-ins and check-outs using the most current People+ information. Similar setups were installed at the two press villages, Montigala and Vall D'Hebron.

The Barcelona Airport was home to two other workstations used to run People+ reports on flight arrivals and departures. This was essential because without the system the airport logistics department would not have known who was arriving each day.

Two other systems written by Jackson were Pay-Per-View Scheduling and Tape Logging. Pay-Per-View Scheduling was used throughout the past year and during the broadcast to schedule events to be aired on the Red, White, and Blue pay-per-view channels.

Studio workstations

Perhaps one of the most difficult areas in which to locate workstations was the studio set. It was essential that researchers be able to access information on the set during the broadcast.

The set of the morning show, for example, was a triangular-shaped glass room on the roof of the Mapfre Building at the Athletes Village. After installing the terminals, it was necessary to construct black cardboard covers to block the sun's glare from monitor screens.

In the prime time studio, a rolling desk capable of being moved from the camera's view, was set up to allow researchers to be as close to the commentators as possible. In the late-night set, the computers were on a desk out of camera view and the printer was hidden behind a wall.

The NBC/CableVision Triplecast cable venture also used the system in its control rooms.

The tennis, volleyball, basketball, boxing, swimming, track and field, diving/water polo, and gymnastics venues were given standalone machines and printers that gave operators access to Calendar Creator, OfficeWriter, and Lotus.

Keeping track

Nesbit Systems, a consulting and software computer firm, provided tape and equipment tracking systems.

The Tape Library System, which runs on a PC-based platform, is a videotape tracking and information system that was used by NBC in Seoul. In Barcelona, NBC implemented the system on a network, although it also works on standalone machines.

Using the system, an assistant director (AD) entered information that could be retrieved later by other users. This information, which included the tape title and subject, tape subtitle, owner, and borrower, became a permanent part of the system until the tape was edited or changed.

The ADs also used the system to find tapes for broadcast while tape librarians used it to locate available tapes. To maximize the effectiveness of the tape tracking, the videotapes had bar codes that were scanned each time a tape moved to a new room.

Nesbit's equipment tracking system was custom-developed to match specifications provided by Gabriel and Jack Walters of the operations and engineering department. All of NBC's Olympic technical equipment, such as PCs, printers, and monitors, were labeled with bar codes, and Intermec Trakker laser bar code readers were used to scan all the equipment for fast and efficient inventory. This ensured that hardware was tracked at all times.

The Olympics in Barcelona have come to a close, but the computer work will not be completely wrapped up for months. The People+ system will be used after the games are over for post-Games departure information, for creation of final payment authorizations, and for providing financial and historical information to NBC.

Several months after the athletes have returned to their hometowns and the excitement of the Games faded, NBC Systems will still be hard at work.

The final Olympic-sized task will be to document all of the systems developed for the Games; to provide recommendations for system improvements for future Olympics; to archive data and software; to unpack and test the PCs and file servers and reconfigure them for their new tasks; and to deliver the PCs and file servers to their new locations at NBC.

Lori Durig is a Colgate University graduate with a B.A. in Computer Science. She worked as a computer consultant to NBC Sports during the Olympics.

Pesa Present in All Key Areas

BARCELONA, Spain No single vendor had more presence at the XXV Olympiad than The Pesa Group, which provided routing systems, monitors, signal processing, graphics and editing workstations and a host of other products and services to broadcasters worldwide.

Particularly prominent were Pesa's massive routers, Pesa Chyron iNFiNiT!s and CMX OMNI 1000 editors.

If there had been a medal event for signal routing at the 1992 Summer Olympics, Pesa Switching Systems would have proudly accepted the Gold. Every analog signal originating at the Olympics was routed through a Pesa switcher at least once—and in some cases up to ten times—before it went to the satellite uplinks and land lines for distribution to the world. And all 546,412 crosspoints and 1,000 control panels performed flawlessly, like true Olympic champions.

The NBC Broadcast Center in Barcelona had the largest matrices of the more than 20 significant systems manufactured and supported by Pesa Switching Systems of Huntsville, Alabama. The system consisted of eight separate switching levels. The master video matrix was 192 inputs and 272 outputs. In addition, the NBC system had time code, video key, and video and stereo audio quality control matrices.

System 5 routing switchers were also used at five different NBC venue locations. Crosspoints totaled 233,664.

Pesa Electronica in Madrid, Pesa Switching Systems' parent company, was the Official Equipment Supplier to RTO, the host broadcaster. Pesa Electronica had the awesome responsibility of building the entire International Broadcast Center and venue facilities, aside from some independent islands such as NBC. A number of System 5 venue switchers operated by RTO fed signals into the master grid in the IBC. From the master grid, signals were distributed to the various world broadcasters for further processing and editing. Retevision, a Spanish company, handled the domestic broadcast and satellite feeds.

World broadcasters using System 5 routers included the RTO, the EBU, TVE, Telefonica, Retevision, BOJP (Broadcast Olympic Japan Pool), NHK, Korean Broadcasting System, Channel+ (France), CTV Canadian Television, NBC, and Mobile Image from the U.K.

Besides the 20 "large" System 5 routing matrices, Pesa-Huntsville provided over 200 smaller switchers in the range of 8x1 to 16x2 with video and stereo audio, and several thousand audio and video DAs. Pesa Switching Systems truly "Carried the Torch" for the XXV Olympiad.

Pesa also scored big points for its Chyron iNFiNiT! graphics workstation, which proved to be a vital tool in helping NBC achieve its goal of creating an Olympic look that "would educate as well as be visually appealing, something that was different. Not your standard sport stats, but yet your standard sports stats," according to Susan Bennett, NBC Olympic manager of graphics design and operations.

Bennett said the iNFiNiT!s, which used a new release of software, worked "great."

One of the new features that NBC utilized was Flashfont, which allows operators to instantly change typeface attributes such as size, edge type, italic angle, aspect ratio and the like. This gave the graphics operators the creative advantage they needed to deal with fast-breaking stories and last-minute requirements.

At NBC Broadcast Center, iNFiNiT! played a significant role in the extensive graphics operation. Each system was fitted with a serial 601 interface and connected, via a digital router, to other digital systems. This gave the graphics operators quick access to a wealth of images, which would then be manipulated and layered within the iNFiNiT!

Many graphics and special effects were created during the Olympics. New countries and states were being formed up until the day before the Opening Ceremonies! As a result, carefully prepared graphics had to be changed, new flags created, and databases modified. And the iNFiNiT! handled it all like a pro.

Nexus: Turnkey Consultant for NBC

Editor's Note: Compared to the 1988 Olympics in Seoul, Korea, where construction on the main technical facility continued seemingly right up to Opening Ceremonies, this time around NBC's plant was in good order with plenty of time to spare.

And most of the credit for that, according to several NBC executives and staff members interviewed during the Games, rests with the turnkey vendor, Nexus.

Based in Southampton, England, Nexus, an international consultancy, was hired by NBC in the fall of 1990 to provide detailed design, system construction and finally, maintenance on site during the Olympics.

The following is an excerpt from a technical paper by Nexus Managing Director John Buckley detailing the company's involvement in the NBC Olympic facility build.

BARCELONA, Spain Work started in December 1990 and by the end of January 1991 (two months), the first project milestone was achieved, a life size construction in polystyrene foam of the control rooms and editing suites.

The site used for the foam core was the NBC OB workshops in Fairview, New Jersey.

Each of the areas was marked with 2" wide tape on the floor of the OB shop, to correspond exactly with the dimensions in the architectural drawing. The polystyrene sections corresponded exactly in shape and size to the real items, i.e., desks, racks, monitor walls, etc., and each had a full size ACAD drawing or full size photograph pinned in place. The audio consoles, vision mixers and editors were mostly photographs, and the remainder were ACAD drawings finished by Nexus and photocopied in quantity for such items as monitors.

The polystyrene sections were cut to Nexus drawings and dimensions by a specialist company in upper New Jersey. In total, three 40' box trailer loads of polystyrene were used in the build.

Once all of the above areas were in position, about 300 NBC operational staff visited the site over a three day period. Various changes in the position of equipment within the racking sections and position of desks, racks, monitor wall heights, etc. were made, and in many cases, remade, and remade, and remade yet again.

The final layouts were used as the basis for equipment layouts, desk and rack positions, and by being photographed, then became the basic starting position for the design engineers and later, for cutting metal, wood and cable.

The total project required the prewire and test of approximately 200 19" racks, 300 miles of video cable, 25 miles of 12-pair audio cable, 50 miles of twin screen audio cable, 25 miles of power cable and about 60 miles of other cables. We purchased approximately 100,000 BNC connectors and over 1500 stereo patchcords for the project. Distribution alone utilized about 1500 video DAs and 2500 ADAs.

In addition to the Nexus supplied items, NBC shipped over $5 million of free issue equipment to the Nexus construction workshops in Southampton (for test and prewire purposes). This involved 196 international imports against special duty drawback arrangements done with Her Majesty's Customs Office. Detailed records of every shipment were maintained by Nexus to satisfy HM Custom regulations.

As a large number of the racks were bolted together and prewired into sections of from two to eight racks, any prewire of two or more racks was assembled and prewired on wooden plinths.

In total, about $30 million of equipment was used for the U.S. coverage.

This arrangement allowed the racks to be moved around the 10,000 square foot Nexus workshop by pallet truck and subsequently lifted for shipment using a 3-ton fork lift truck. The largest eight rack section, for instance, weighed over 1 ton when prewired with audio, video cable and jackfields.

The technical area of the International Broadcast Center was built around a computer floor and special consideration had to be given to the weight of equipment on this floor.

This problem was solved by designing and building steel framed plinths that exactly fitted the appropriate multirack 19" bays. No cutting or fitting of the steel edged computer floor tiles was necessary.

The original plan was to prewire and accept one of each of the main areas at the Nexus site in Southampton, but over the time period, this became a shipment of two 40' sea containers to Tokyo for NBC's live coverage of the World Athletics Championships in August 1991.

Nexus provided a studio and three editing suites in Japan for the Championships.

The equipment used in Tokyo was subsequently shipped to Barcelona for storage, to await the on-site installation program.

In December 1991, the first part of the IBC accommodation space was released and we started shipping the major sections that had been built and tested in Southampton.

The equipment was shipped to Barcelona using 40' tilt-sided trailers, with airride suspension. Fourteen full trailer loads were required to transport the equipment to the IBC.

In December 1991, the first wiring crew was put into Barcelona, and later this crew was increased in size twice to complete the interarea cable network and handle additional work from NBC.

After the Games were completed, Nexus had the responsibility for dismantling the IBC.

In total, about $30 million of equipment was used for the U.S. coverage. This equipment was made available by a wide mixture of purchase and lease from many companies and countries.

To keep track of the equipment, a specialized barcoding system was commissioned by NBC so that as soon as any piece of equipment came into the NBC Olympic system, it was tagged with an NBC Olympic bar code label.

This system tracked everything about the piece of equipment, from its original NBC order number, through type number, manufacturer, price, delivery date, shipping dates and locations either in the U.S.A., U.K. or Spain.

Tagging could be done by various computers and scanners located at NBC headquarters in New York, the Nexus building in Southampton and the IBC in Barcelona.

On a regular basis, the information generated was transmitted to the home computer located in New York, updated and then retransmitted to the appropriate control computer, wherever in the world it happened to be.

Communications for Olympic project management was done via the GE QUIKCOMM mail system. Everyone involved in the Olympic project had access to a computer fitted with a modem. This was used for all internal communications between NBC Olympics staff, subcontractors, suppliers and shipping/airfreight brokers.

Apart from being a normal messaging system, files were attached to messages so that engineers could exchange AUTOCAD drawings, commercial staff could exchange SuperCalc, Lotus files and standard word processing files, plus of course the barcoding files used in the Olympic Tracking System.

For more information, contact John Buckley at Nexus International Consultancy in the U.K. at phone: +44-703-834058 or FAX: +44-703-636132.

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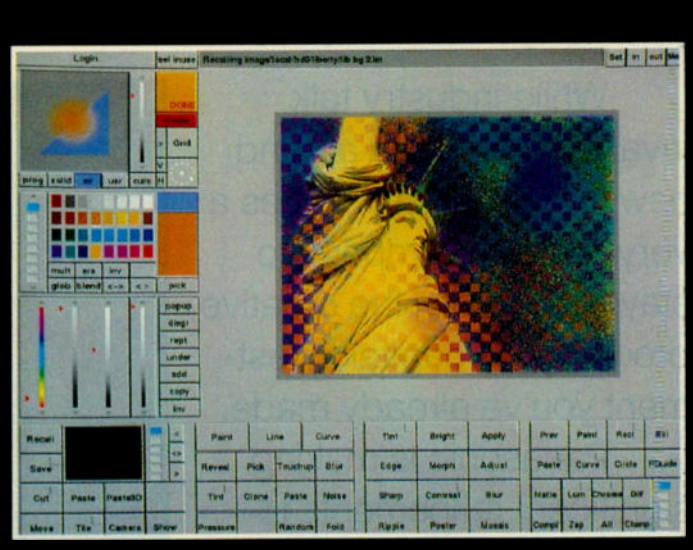

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NBC Puts Team on Training Schedule

by Sheldon Hoffman

BARCELONA, Spain Imagine providing training for more than 250 editors, video tape operators, camera operators and maintenance personnel who would use and support the latest in digital recorders, audio mixers and cameras.

And on top of that, helping editors, who were mostly from the U.S., adapt to the European PAL broadcast standard that was used throughout the NBC and Pay-Per-View (PPV) facilities.

NBC and PPV chose Panasonic D-3 recorders as the VTR of choice. NBC used the D-3 VTRs at the IAAF Track and Field World Championship in Tokyo in August 1991. That experience, and the feedback from the editors and operators, provided a level of confidence that gave support to the decision to choose D-3 for the Olympics.

In addition to the D-3 VTRs, the Graham-Patten D/ESAM 800 audio mixer was chosen for the nine NBC edit rooms and three PPV control room/edit rooms in the IBC and for 12 venue edit rooms.

Quick-study courses helped NBC's Olympic staffers learn the vast array of new gear. Shown here is an edit team, fully up to speed at the IBC facility.

Equipment on site

The NBC edit rooms in the IBC and at the venues all had GVG-251 editors. The three PPV control/edit rooms had GVG-151 editors. Two of the nine NBC edit rooms, 11 venue edit rooms and the PPV control room also were equipped with GVG DPM-700 picture manipulators. NBC's two main control rooms and the graphics facility shared 13 GVG Kaleidoscope channels.

Three new Panasonic cameras and a new super slo-mo system were used in Barcelona. The Panasonic AJD-310 D-3 camcorder was used by ENG units and at various venues. The AQ-20Ds were installed in the IBC studios and at the basketball venue. The AQ-225 cameras were installed in the three NBC/PPV IBC studios.

Few of the editors, video tape operators, camera operators and maintenance personnel had ever worked with D-3 VTRs, the D/ESAM mixer or the new cameras. A training schedule had to be developed to provide quick-study courses on each of these devices.

The training schedule that evolved was based on the arrival dates of the personnel and their job function. For the early arrivals training was scheduled to begin two days after their arrival day. But as time grew short, training sessions were scheduled to begin the day following their arrival in Barcelona.

Classes were arranged in four-hour sessions for each of the following: Panasonic D-3 VTR, Graham-Patten D/ESAM, GVG-251 editor and DPM-700, Panasonic AJD-310 camcorder, AQ20D camera, AQ225 camera, slo-mo system and GVG multi-channel Kaleidoscope. Training on the Kaleidoscope was limited to the four TDs who would operate the units and consisted of two all-day sessions.

Back to school

In every case, vendor-supplied instructors were used. Classes were limited to a maximum of 10. On some days only one person was scheduled because only one person had arrived from the U.S. on a particular day. It was better to train one person as soon as possible rather than wait until another group could be assembled. Time was getting short and we wanted to get as many people as possible through the training schedule before pregame editing activity would begin.

Adding to the complications of training scheduling was the fact that not all of the edit rooms were ready to be turned over to operations when the training sessions were scheduled to begin.

In addition to the classes, the editors needed to use the rooms for hands-on practice with all of the room's devices. This became increasingly difficult as the number of trained editors was growing faster than the edit rooms came on-line.

Training sessions

Training began on July 1. By July 5 production personnel were given access to the available edit rooms and training sessions had to share access with production. Because there were only two DPM-700s available within the IBC edit rooms (a third one was in the PPV control room), and those rooms were in constant demand, it was decided to conduct DPM training at two of the venue edit rooms that were available.

Wherever possible we tried to group the training classes according to the assignments of the personnel, e.g., editors, VTR operators, maintenance, etc. In most cases however, the groups usually ended up consisting of a mix of personnel from various assignments.

Manuals for the equipment were another problem. D/ESAM manuals for all editors were printed in New York and shipped to Barcelona. They were no sooner distributed when rendered obsolete by the introduction of new software. New manuals were then printed by our Xeroxing staff and distributed to each edit room.

Manuals for the cameras were still being written when the cameras arrived in Barcelona. These too had to be duplicated locally when they finally arrived.

Fortunately the technical staff covering the Barcelona Olympics was an experienced, professional and eager to learn group. They absorbed the rush of new information and operating techniques quickly, and produced the finest Olympic coverage to date.

Sheldon Hoffman is director of News Production Planning for NBC News.

Tek Tests, Measures Before Games Begin

by William C. Bean

BARCELONA, Spain For the many months preceding the Opening Ceremonies, broadcasters from virtually every major network in the world spent countless hours planning, negotiating and testing.

But from the broadcaster's point of view, the real testing events for their equipment began in late April 1992. Cables were starting to get connected. Power switches were being engaged and bars and tone were applied. Circuit continuity from here through the end of the Games was now of prime concern.

Put yourself in the shoes of the host broadcaster (RTO) and, to varying degrees, the shoes of the attending networks. Try to imagine how you might: deliver signals from approximately 500 cameras at over 25 locations into and out of nearly 1,800 videotape recorders; add graphics, effects and voice; and then re-deliver these signals to a fleet of earth stations for their eventual journey to viewers' homes. And it had to be done right.

RTO and the major broadcasters went immediately to the top manufacturers of test and measurement equipment for their signal generation and monitoring needs.

At the International Broadcast Center (IBC) as well as at 25 venues and within 70 or more OB vans, reference black and bars signals were provided/generated by the Tektronix TSG271, a performer with previous Olympic experience; the Leitch SPG-1500P, another Olympic performer; and by the Pesa VG6140, a relative newcomer to the Games that proved itself up to the task.

Various signals from the venues were then passed through over 120 Tektronix VITS201s, where interval test signals were added for a standard on-line testing configuration. I.D. signals were also added by the VITS201. The VITS201, along with 120 companion Tektronix ASG100 audio signal generators gave RTO and Telefónica the ability to continuously monitor the integrity and identity of all assigned signal paths.

With numerous signal paths going through coaxial cable, fiber optic cable, and microwave/RF circuits, consistent signals and rapid identification proved to be invaluable to rapid fault isolation and correction.

The "tried and true" performer in over 200 measurement/monitoring positions throughout the IBC and the venues was the Tektronix 1751 PAL waveform/vector/SCH monitor.

Along with the 1751 were 1700 Series waveform monitors and vectorscopes in graphics, videotape, and other areas.

For those few occasions where technical discussion got into depth, Tektronix measuring and monitoring equipment was the source of final reference. The 1781R waveform/vector/SCH monitor was chosen for RTO distribution monitoring and transmission quality control.

The measurement and monitoring needs of NBC, Telefónica, and other organizations for a tool that would address multiple standards (PAL & NTSC) and audio and that would provide an extensive set of reporting, configuration, remote control, and other facilities was delegated to a fleet of Tektronix's television measurement set: the VM700A, equipped for NTSC, PAL, and audio.

Incoming signals, both video and audio, were expected to proceed to their ultimate destinations with minimal degradation added by subsequent processes. The video signals entering the IBC for RTO to distribute were timed through a large bay of Tektronix VS211 PAL frame synchronizers. The associated audio signals were also timed through accompanying Tektronix 118AS audio synchronizers that were controlled automatically by their respective VS211 video synchronizers.

NBC also used an extensive array of the VS211/118AS A/V synchronizer combinations. These devices processed the signals as many as three times within NBC's plant in support of their four-channel production schedule.

The world received numerous hours of program material that may have begun or ended up as NTSC, PAL, HD1250, HD1125, D-2 or D-3. But it had to be brought together, it had to be tested, and it had to be right.

And "off-tube," program video was generated, recorded, synchronized, edited and otherwise massaged in dozens of ways. And then it was transmitted. And it was right.

William C. Bean, product services manager for Tektronix' television division, supported Tek customers at the Games.

Taking Control from the Start

by Dave Mazza

BARCELONA, Spain I arrived in Barcelona on June 8. I would be there for two and a half months. During my stay in Spain, I experienced a birthday, a wedding anniversary, and 97 hours of Olympic programming. My initial task as senior technical director was to debug and commission the four main control rooms at the NBC Olympic facility in the International Broadcast Center (IBC).

During the Games, in the last fortnight of my stay, I would be the technical director for the prime time and weekend afternoon shows.

Due to the time zone differences, the coverage plan for Barcelona was very different from that of the 1988 Olympics from Seoul, Korea. Korea was predominantly live. With a few exceptions, Barcelona was predominantly all tape.

"Almost Live"

Tape delay coverage has its good and bad points. The good part is that the viewer winds up seeing hand-picked segments of the most exciting and appealing events of the day. The bad part is that even though the producers tried to maintain what they called a "plausibly live" feel, the very nature of a tape delay production is less exciting to work on than a live production. You just don't get the same adrenaline flow that you experience when your first chance is also your last. We did, however, have a great crew, including our Director, Bucky Gunts, who made our overnight shift "plausibly enjoyable."

The main control rooms in Barcelona (Control A and B) were two of the most powerful control rooms in which I've had the chance to work. The only two rooms that come close were the same two rooms used in Seoul. Control C was actually a full blown on-line edit suite that could be used as a "preset" control room for either Control A or B. The fourth large control room was the main pay-per-view (PPV) control room, which was used to produce studio wraparounds for all three of the PPV channels.

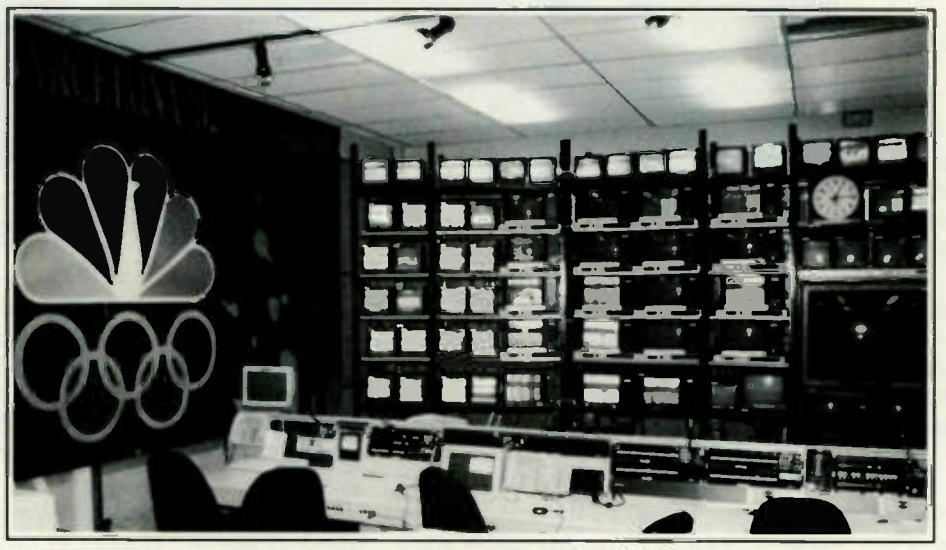
Control rooms A and B were essentially identical.

This was done primarily for the sake of redundancy: If one room had a catastrophic failure, then the other could pick up the broadcast with a minimal amount of time and effort.

The basis for the design and layout of control rooms A and B began almost six years ago with the initial mockups of the control rooms for the 1988 games in Seoul. Input for these rooms was gathered from many people—initially the production staff of the 1988 Games—including Terry Ewert and Bob Levy, coordinating producer and director, myself and several other TDs.

This input was compiled and reviewed by the Olympic Operations and Engineering Group, headed by Vice President Jack Weir and Managing Director of Engineering Charlie Jablonski, and Project Manager Phil Shaw, and Director of Systems Engineering Ed Goldberg.

The rooms were built around two tiers of production consoles and a huge monitor wall of 115 monitors, including a 37-inch program monitor. The monitors enabled the production staff to see all the host and NBC venue feeds, in addition to the transmit and receive circuits, cameras, VTRs, graphics, and other control room and edit room outputs. Twenty of the monitors had Pesa status display panels under them, which reflected what was dialed up into the 20 routing switcher feeds to the production switcher. The displays also indicated VTR status and time code.



NBC's Control Rooms A (shown here) and B each featured two tiers of production consoles and 115 monitors.

In the room

Each room had a GVG 300 switcher with a master E-MEM, E-DISK II, key extender, and 12 aux busses. The two rooms shared a ring of five fully loaded Kaleidoscopes with full input and output routing. The Kaleidoscopes were operated with custom software that provided separate front and back source selector panels and input monitoring.

Twenty inputs to the GVG switchers were fed by Pesa routing switcher outputs, both with video and key. The main Pesa control panel was a multibus panel with machine control. Each of 16 destinations on the panel had both a program and a preset window that you could toggle between. The machine control portion of the panel allowed the TD to start and stop tapes, check the VTR status and gang roll multiple machines.

Several smaller Pesa panels were used for the graphics sources, and a user-programmable panel provided the TDs with one-button access to any of the 50 sources.

Each studio had access to a pool of three Ultimatte 6s. The background and foreground inputs of the Ultimattes were on Ten-X composite and component switchers.

Central graphics

The central graphics area provided Chyron iNFiNiT! and Quantel Pictureboxes for all the control rooms. All the routing and signal flow within the graphics area utilized a serial D-1 router. The Pictureboxes supplied their own linear key signal outputs, including the ability to simultaneously dissolve both key and fill signals. This feature enabled us to play back irregularly-shaped keys in a stack using a single linear keyer on the production switchers.

The communication system was built around an RTS (McCurdy) matrix system that allowed both PLs and point-to-point squawks to anyone in the plant. All the four-wire coordinating circuits to the venues, New York, and any other remotes were also interfaced into the RTS system. In addition to the IBC studio IFBs, the producer and executive producer positions also had override IFB panels that allowed them to speak directly to the talent at any of the venues or remotes. The IFB panels also allowed the producer to "pre-hear" any of the incoming venue or remote audio sources.

All sources into the Pesa routing switcher were timed and phased. All incoming NBC and host feeds went through Tektronix frame synchronizers, with companion audio delay units slaved to them. The audio delay was critical to maintaining lip sync, especially considering the eight-field color frame sequence that PAL frame synchronizers must maintain.

All of the control room and edit room outputs were retimed back into the routing switcher using Tektronix synchronizers operating in the Zero Studio Delay (ZSD) mode. The ZSD is an old NBC invention that basically is a line synchronizer. This differs from a frame synchronizer in that the amount of propagation delay is so small that it is not necessary to delay the associated audio.

The ZSDs made it possible for any control room to punch up the output of any other control room or edit room.

As is the case with any television production system, the extra effort that goes into the design and fabrication of a flexible, routable, zero-timed system is well worth the cost, considering the benefits it gives you in the operating of the system.

The operational payoff in this case was the ability of the system to perform under the extremely demanding and dynamic requirements of a premier sporting event such as the Olympics. This system provided the engineering and production staffs with the tools necessary to meet those challenges while maintaining their focus on the most important part of the Games—bringing the Olympic competition and drama into the viewer's home.

A project of this size and complexity requires an incredible amount of dedication by a large group of professionals . . .

A project of this size and complexity requires an incredible amount of dedication by a large group of professionals—some of whom worked for years on the project, some who worked only weeks (but none who gave less than 110 percent of their energy to creating the best two weeks of televised athletic competition that they know how).

The sad part, as always, is that all of the work, all of the effort, and all of the relationships that were formed had to come to an end...for another four years.

Dave Mazza has been working on remote sports and entertainment productions since 1978. For the past three years he has been focusing his efforts on teleproduction systems design, from both the engineering and operations points of view. He can be reached at 508-462-0412.

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An Olympic Feat for Engineering

(continued from poge 1)

The Red, White, and Blue circuits carried the three pay-per-view Triplecast programs. The Ku-band Red circuit was uplinked by a Telefónica earth station located at Guadalajara, near Madrid, while the White and Blue circuits were C-band circuits uplinked at Penedés. Additionally, a news circuit was occasionally used.

With the exception of a portion of news production, the entire IBC plant employed the PAL television system, with standards conversion to NTSC being applied to each signal just before it left the IBC.

Central Videotape consisted of about 55 D-3 composite digital videotape recorders that were used for general videotape operations, plus a small number of one-inch, M-II, Beta SP, D-1, U-matic, VHS, and Hi8 machines that provided multiformat capabilities as required. There were also three Automatic Program Delay Units (APDUs). Each APDU automatically recorded the 12 daily "live" hours of a Triplecast channel, and its replay filled the second 12 hours of each Olympic day.

The state-of-the-art graphics facility that was used for NBC Olympic coverage is described on page 6.

A vital part of the core equipment was the communications systems. There were two separate intercom systems, one of which was used for broadcast operations and the other for pay-per-view operations. These systems provided communications between locations within the IBC, including those of the host broadcaster, and between areas external to the IBC, such as the venues, NBC operations areas in New York, and several other locations where communications were necessary. These systems were capable of integrating intercom communications, interrupted feedback (IFB) circuits, telephones, and VHF communications radios into a single communications matrix.

Both Control Rooms A and B featured Ward-Beck ST4842 audio mixing consoles.

The large array of telephonic and intercom communications that was required between NBC Barcelona and NBC New York was carried on a 2048 megabit-per-second E-1 carrier. This is a bidirectional digital communications link that connected New York and Barcelona via a Ku-band satellite. An E-1 carrier is a big brother to a T-1 carrier, several of which were used in NBC's 1988 Seoul Olympics coverage for both the above-stated uses and to return stereo program audio to the United States.

The master routing switcher (MRS) was just what its name implies: a large routing switcher. It furnished all audio, video, and key signals for the control rooms, edit rooms, and videotape facilities.

Production systems facilities were used to produce and post-produce all NBC Olympics coverage. These included three studios at the IBC. Studio A was used for the prime time programs, while Studio B was used for late night programming. The studio that was used for the morning program was remotely located at the Mapfre Tower in the Olympic Village. Studio A and Studio B each had a video control room and an audio control room. The three cameras at the Mapfre Tower studio were returned to the IBC on individual video and audio circuits, enabling Control Room B at the IBC to be used for controlling the morning program.

Each Triplecast channel—Red, White, and Blue—had a mini control room that functioned as both a control room and an edit room for its respective channel. There was also a pay-per-view studio that had its own audio and video control rooms. It was used for host segments, interviews, and the like.

The post production activities at the IBC were supported by eight small and one large edit rooms. The D-3 digital VTRs and digital audio mixers facilitated a unique feature of the edit rooms: all audio editing was done in the digital domain. It was only necessary to handle analog audio in the edit rooms when audio entered or left the room via the MRS.

Other digital audio equipment in the edit rooms and audio control rooms included compact disc players, digital audio tape (R-DAT) recorders, digital audio processing equipment, and digital audio cartridge machines, in which conventional audio tape cartridges were replaced with Bernoulli discs. Four announce, or voiceover, booths and a music post production suite rounded out the editing and post production facilities.

Randy Hoffner is director of research and development at NBC Labs. He may be reached at 212-664-4733.

Selecting an All-Star Team

by George Wensel

BARCELONA, Spain What do you get when you take 120 cameras, 135 videotape decks, 20 graphics systems, 16 mobile units, 60 cabin trailers, 800,000 feet of cable and 25 of the strongest tech managers in the business?

Well, you get what I experienced in covering the Barcelona '92 Summer Games for NBC. Creative Broadcast Techniques was contracted as consultants two years ago, to help and troubleshoot in a variety of areas. Seven weeks before the event, Ken Aagaard and I were asked to take on the responsibility of the venue operations and free up existing personnel.

We were already doing some of the engineering and sub-assemblies at NEP in Pittsburgh, so we were familiar with some aspects of the project. But our learning curve still was massive. As in any project this size, all you can do is get the best people you can and start breaking the whole event down into areas.

Finding the right stuff

From my experience, I've found that for any multi-venue to be successful, it must be preplanned down to the details. In today's world of budget constraints, the only allies are time and competent people.

"Sure time" was at a premium. We started pulling our technical people in early. We were fortunate to get some of the best in the business.

The challenge for this event was that the show was tape-delay with short turnaround situations. Edit systems were tied to the mobile unit, then interfaced to host and graphics systems. Taped turnaround shows are advantageous in that any mistakes can be fixed, but the system complexity and length of production day grows.

In looking at the task, we saw that we needed to get comfortable quickly with thousands of details. We also had a great deal of new technology known only to a few. Therefore, training time was crucial and the pressure to get venue facilities up eight days earlier than planned—due to feature editing—became a priority. After a few days of figuring it out, we started and didn't let up until the Games were well underway. Then, at times, we turned into the Maytag repairmen, waiting for something that needed fixing.

Because many of the venues were 24-hour operations, we had a night staff of five tech managers who were troubleshooters. They went to the hot venues to make sure the edits were OK and that the venue tech managers got a break. The night managers were all savvy in maintenance and had some edit experience.

The three "C"s

In addition to fixed facilities, we had three "C" units and two Super EJs. These units moved to cover a variety of sports, but were crucial to the day part programming. The tech managers in these positions were our street fighters. They traveled at night from venue to venue with little sleep, and had to have the units working in the morning. This crew was also part of the early crew to get the venue systems in place.

In looking back on the past few months, several moments stand out. But one in particular comes to mind. Dan, my driver in Spain, asked me about 10 days into the Games, "Is all this worth it?" I still can't fully answer the question. I am not sure after doing remote television for all these years if I am qualified to do anything else.

If I reflect on the memory of leaving my 10-year-old son on a Little League field as I scrambled for the airport, I would answer no. If I think of the stomach acid and sleepless nights, the answer is no.

But, if I remember the challenge and being able to work with this group of tech managers, I would answer yes. If I think of the tingle at the back of my neck when it all works; and when the electronics become transparent to the story and emotion, then I would say yes. For some odd reason—maybe a disease—I think I am talking myself into doing it all again.

George Wensel is vice president of NEP and CBT. He managed venue operations for NBC at the 1992 Olympics.

He may be reached at NEP in Pittsburgh at 412-826-1414.

Take One Element at a Time

by George Wensel

BARCELONA, Spain When you look at the complexity of staging the television coverage of the Olympic Games, it is easy to become overwhelmed. However, if you divide the event into subsets and venues, many of the details are similar. Once you allow for a commonality of technical information, the differences in coverage are concerned with the specific details in each sport.

With all of television production, preplanning is the most important element. Whether the show depends on one mobile unit or 30, the same planning needs to take place. No other element is more crucial.

The second-most important element is adequate setup time. Experience shows that the correct amount of setup time will ensure a smooth transition when production arrives.

Key to it all

The key to making that work is the tech manager (TM) and a strong crew. The engineering staff's job is to have the necessary information simplified and consolidated so that the TM can quickly access the needed resource, whether it's gear, people, or information. To that end, the NBC venue group provided a technical manual with venue specifics tied to the assigned mobile unit; a CAD set of single line drawings showing the audio and video interface of the unit to the NBC added gear; and a "Tech Manager Briefing Book." This last was to be an encyclopedia of technical tidbits and instructions for the TM and the truck EICs.

The challenge was to provide production facilities in Europe with the features and comforts that our American production staffs expect. To that end, a variety of areas were considered.

Right from the start, the European trailers are smaller than American units. Our units would not be able to navigate through most European city streets. Thus the space constraints dictated the layouts. Most units had the audio area alongside production and not behind it. We outboarded videotape because it normally shares space with the video compartment, which in this case wouldn't have allowed enough space for tape ADs and PAs, not to mention the light levels or high ambient noise.

Air conditioning

Air conditioning is always a remote engineer's favorite issue, next to power. Many of the remote units we used were from the U.K., Holland, or Denmark. When you take all of those and put them into the Spanish summer with 100 percent humidity, you tempt fate. Luckily, we had some supplementary units and a crafty HVAC specialist and we made it through.

Estadi Olimpic, site of Opening and Closing Ceremonies, and track and field competition

Video monitoring

We needed to add or reconfigure all of the mobile units' monitor walls. They either didn't have enough monitors or they were configured without a producer's position. Thank God for triple five-inch monitors. At track and field, we built a double-wide cabin that held a monitor wall with 78 monitors in it and two large consoles. In all of the tape areas we needed to add repeat monitors to see camera isos for operators and ADs.

Video switchers

Only a handful of trucks had GVG 300 three-ME switchers. Most of the units had GVG 200s or two-ME versions of the GVG 300. Also, not all of the switchers were 24-input; many were 16-input. This certainly made the input decisions more critical and also put more pressure on adding routing switchers.

Routing switchers

Due to the many host camera splits and feeds—along with NBC cameras, VTRs, graphics, etc.—the ability to manipulate inputs to VTRs and switchers was important. Few of the trucks actually had enough routing. We either compromised, had the mobile unit increase theirs, or built a stand alone system that integrated with the venue. We added a 96x96 video router with two levels of audio to track and field and one in an NEP transmission truck for gymnastics.

To Swimming and volleyball we added a 48x48 router with two levels of audio. All of the units were made by Pesa, which also provided the NBC Broadcast Center router. The company had good technical support in Barcelona.

Even though we had four-channel audio VTRs, we agreed early on, for cost and complexity reasons, to use only two levels of audio routing. Many of the mobile units could handle limited two-channel routing, but a few were one-channel only. In these situations, we worked with the production staff to determine the exact audio channel needs and then we created a compromise plan.

Audio setup

Early on we projected console input size and knew where we should add submixers. Because the show was not done from the field in stereo, this potential problem got easier. We had an inventory of Panasonic RAMSA mixers that we used as needed.

We added dbx 160X limiters to all of the units so that our U.S. audio mixers had a familiar reference. R-DATs and CD decks were used for audio playback and loops. No analog cart machines were used, which is a sign of the future.

We added Sennheiser HMD 224 announcer headsets for a uniformed look and sound; Fostex speaker/amps filled any monitoring gaps; and an audio clapboard from Tektronix was used to sync the frame synchronizers to the audio delays in the Broadcast Center.

Cameras/lenses

In the United States, when we provide a hard camera (studio), we assume that it comes with a long lens. Well, this is not true when it comes to European units. Most of the hard cameras come with 20:1 lenses. Therefore, we needed to do some work to get the needed long lenses. With the help of Jay Ballard at NBC, and Canon, we "kluged" the rest.

We used Panasonic's new digital cameras for NBC's basketball coverage. The pictures were wonderful, considering the less-than-perfect venue lighting.

Communications

Communications is the most important system in any mobile unit, and getting production comfortable so that it can talk to the necessary people is of the highest priority.

This area is the single largest difference between how U.S. units and European units operate. In our U.S. system, we insist upon using channels so that anyone on that buss can communicate—basically the RS two-wire standards.

By contrast, the European units are four-wire matrix-based, where point-to-point communications are desired, with the field boxes being four-wire units. In a four-wire system, it is impossible for a camera operator to key his or her mic and shout for a VTR to iso him if he sees something important (the inverse, where a VT operator tells a cameraman that he is being recorded, also is impossible in a four-wire system). Also, camera operators cannot hear each other. With fast-moving events, such as gymnastics, this is crucial.

(continued on page 30)

Technical Managers: 'Days of Our Lives'

David Raynes
Broadcast Technical Group
Dover, N.H.
Rowing and Canoeing

Our biggest challenge was covering rowing. It was 110 degrees every afternoon we were out there, and I had air conditioners die in my tape truck. Between that and the RF, it was more of a challenge because of the possibility of failure.

Covering canoeing was almost a cake walk because all the cameras were hard wired. And everything was there. We were right next to the host broadcaster. If we had any problems with the host we could walk next door and yell at them.

The host was very helpful at both venues. It turned out that both venue tech managers were close friends who worked together at Television Espana. In fact, I think the one at Banyoles called the one at the canoeing venue, because things were easier there.

D-3 performed very well, except for two minor glitches in the last two-and-a-half weeks. In one case, a truck lost its air conditioner. The temperature in the truck rose to 80 or 90 degrees, and we started to see some digital noise. But we got the air conditioner back, and we didn't see any problems after that. Another one of the machines acted up on time code readout on the front panel, not on the actual output to a monitor.

I liked the D-3 machines. They worked out fairly well.

Dean Walker
Dean Walker Television
Burlington, Ontario
Super EJ Trucks

I had two Super EJs. They were called Super EJs because they were more capable than the old take-a-camera-and-go-up-and-shoot-something vehicle.

They were switchable, so we could cut cameras in the show. We had an audio setup available, as opposed to other trucks that simply relied on tape machines as their audio source. The trucks were capable of doing a free-standing production, or they could be connected.

We covered weightlifting, wrestling, canoeing, volleyball, the marathon and table tennis. It was a case of "have small unit, will travel."

The toughest part of it all was the moves. You had to move, set up and really try to give the producer and director as much as you could in a very short time.

We had D-3 tape machines, and we also had a Panasonic D-3 EJ. It came in handy one day when we lost one camera. That happened five minutes before a gold medal match. We fired up the EJ and had it covered.

Dean Walker (right) with the super EJ crew

Ultimately, you are measured by what the end product is, not necessarily by how you got there. Overall, we probably laughed about a lot more than we cried about.

In the '88 Olympics in Korea I was the tech manager at the Velodrome and road course. Yes, we're junkies. Just give me another Olympics!

Build from the Basics Up

(continued from page 29)

The other benefit of using a two-wire system is that you can get two separate channels on one mic pair. This is crucial for beltpacks on a venue floor and eliminates additional audio mults.

Therefore, depending on the size of the venue, NBC required that four or six channels of two-wire (RTS compatible) systems be married to the four-wire intercom matrix. We also required that the systems have an assignment panel to quickly reconfigure and troubleshoot. We were very concerned that the nulling between the four- and two-wire hybrids was correct in order to eliminate feedback on phasing problems.

A variety of four-wire systems had subtle problems that needed to be overcome. For example, some systems had ducking when the master station's mic was "keyed." This was unacceptable for a channel configuration. Other four-wire systems were not built to accept headsets. Slowly, we worked through all of the problems until everyone was happy.

The IFB systems were all separate RTS 4000 series. This was a requirement that had no compromise.

Interface racks

Because the camera splits were generated by the host broadcaster, we had to make sure we had proper isolation, level control, and phasing, so NEP constructed for NBC a variety of interface racks. The incoming camera split would pass through a GVG clamping DA and then onto a BAL Fastime active delay line and then onto the truck. The swimming and volleyball systems were married directly to the stand-alone router.

Graphics interface racks were constructed to quickly integrate the Chyron iNFiNiT! systems and the Quantel Pictureboxes with the mobile units and edit rooms.

VTR racks were laid out to allow for audio patching, black burst distribution, program distribution, and time code to take place within the VTR area.

Cable

As for triax and audio multicable, there is no European standard. Because triax and audio multi-cable can be reused and integrated into the NBC system afterward, we decided to use the U.S. standard.

The triax standard used Kings connectors. We constructed adapter pigtails so each company could put its connectors on them to interface with the already-installed NBC triax.

The audio mults were a DT12 standard, with XLR breakouts. To insure that all the timing within the compounds stayed correct, we designed all of the video systems to be compatible with 150' lengths of 8281 coax. From outside the compounds into the venues, we used a mix of 245' and 150' 8281 coax looms.

Miscellaneous systems

Voiceover (VO) systems were developed to ensure that when an announcer entered a VO room it could be quickly reconfigured to work with the mobile unit, edit room 1, or edit room 2. We developed a single three-position rotary switch that switched video and IFB inputs to the booth. The mic outputs were normalled out through a DA.

The IFB boxes were standard RTS boxes, so the talent was familiar with the usage. This eliminated much of the confusion.

Talkback boxes were all designed by CBT. They were passive units that would interface with any mic or system.

Tally systems were built to allow monitors and camera tallies to be remotely controlled from switchers in the Broadcast Center on a single phone line. This helped PPV (pay-per-view) in letting the announcers in the commentary booths know which feed was selected back in the Broadcast Center.

Because D-3 and the new edit system were sensitive to SC/H phasing, we added appropriate scopes to monitor and fix any problems. We were ready, except that many of the host trucks had component PAL systems and did not care what the composite SC/H was. After some days of negotiating, we got procedures worked out to adjust SC/H each day.

In the U.S., once we get close to air and during the weeks of air, we never shut off the truck completely. Knowing that most failures occur on power up, we didn't push the envelope. The host didn't feel as strongly about this as we did and most nights it would shut down, losing the reference to the rest of the compound. The big problem then was waiting for the systems to stabilize the next morning.

Because the frame syncs were all eight-field due to the PAL color sequence, audio delays were necessary. We added them in a sub on the audio consoles so that the audio people had a chance when they used a microwave camera with hard-wired interview microphones.

The most interesting issue of our Barcelona experience was venue technical and domestic power. Over 400 different generators were used on the Games. Consequently, skilled operators were hard to come by. Many operators did not understand the concept of sync generators before paralleling two on-line. This caused some interesting moments and frustrating conversations. NBC hired two of Aggreko's top mechanics, along with two electricians from England, to keep us out of trouble.

In conclusion

As you can see, there are many differences between working in Europe and working in a way we all take for granted in the U.S. However, the mobile unit engineers were wonderful and were very willing to work with us to learn our ways and to modify their units to accomplish this.

George Wensel is vice president of NEP and CBT. He managed the venue operations for NBC at the 1992 Olympics.

He may be reached at 412-826-1414.

Colin Callow
Managing Director
Mobile Image, Brentford, Middlesex, U.K.
Tennis, Road Cycling

The tennis coverage was fine. We used five cameras. Two were Ikegami studio cameras in the high talent fixed positions on court one and center court. Three Sony BVP-7s roamed around all the courts on cable drops. We covered center court, court one and court two.

The host broadcaster happened to be the BBC. They were all friends of mine from Wimbledon, so getting extra feeds and other things was not a problem.

This was a good venue. It was a typical international setup, with good cooperation all around. Some of us in this unit broke away from tennis and went to road cycling. That was a totally different operation, using two radio motorbikes and helicopters. We had to completely shut down and rebuild the truck to accommodate a live edit mode. Our three cameras were then acting as ENG cameras, with common time code to the three cameras on the motorbikes and in the air. The tapes were brought back, synced up and the service was recut live. It was hard, but fascinating.

It was a good experience. You had to duck and dive with the change and the pressure from one day to another. But working with George Wensel is always a pleasure. He's an old pal.

Chip Adams
Free-lance Engineer
Florence, Mass.
Unit C #3

Unit C #3 was one of the units that went around to different venues to cover events that didn't go through the whole length of the Olympics or just didn't have that much appeal to a wide audience. We covered a portion of them, and then moved on.

The unit moved around to three different places. We started out at the Velodrome, where we stayed for five days, then we moved to tennis for two days to take care of a new shipment of equipment there, then moved on again.

We had two trucks—a tape truck with Chyron equipment and a truck that had production on it, which the Brits call a scanner. Both were from Birmingham, England.

When we were first at the Velodrome, the hours were pretty regular. We had a few days to set up. But once that ended and we got into moving to tennis and then moving again, things really got hectic. Moving from one facility to another so quickly was a challenge. Also, we had to reconfigure things for different producers and directors.

My experience was "typical Olympics" (I was in Seoul in '88), but this was the first time I moved around so much. The technical part of it was almost easy as long as I had the time and the manpower. The other aspect of it was a matter of give and take and pull to make things happen.

Dan Barron, Engineer
NEP, New York, N.Y.
Unit C #1

We did six different venues: the preview show, equestrian endurance, the jumpers, whitewater, wrestling and football. We had a French truck from Paris with two French engineers who didn't speak English. We had a good time—they were great guys. The company was Canal Television, and its truck was one of the best equipped in Barcelona. The guys were excellent engineers and the equipment was first rate.

The biggest challenge for us was moving. We moved at night, set up during the day, did the shoot and moved again. There were three C-units, but ours was the one that moved the most—almost daily. Sometimes the power didn't work, sometimes the phones didn't work, you never knew 'til you got there. What did we do? Ah, we faked it! We had the power go out in the middle of the show during endurance and, luckily, once again, the French saved us. They had a generator on board and we fired up the generator, plugged in the adaptor and continued to do the show.

Another challenge was simply communicating. We had to deal with three different languages—sometimes four. We communicated very well with the French guys. They spoke a little English, but TV people tend to speak TV. That's the bottom line.

George Wensel (left) & Dan Barron

Steve McKeown
Free-lance Engineer
Jacksonville, Ore.
Gymnastics

We felt that the gymnastics venue was going to be one of the biggest venues we had at the '92 Olympics and it did indeed evolve that way.

Our primary idea was to separate the television compound into major working groups. The first was the broadcast truck or trucks, which handled the cameras, and audio and video processing. The second major area was the video tape recording area, with 18 D-3 VTRs , super slo mo and others that would record the video inputs.

Steve McKeown (left) and Mike Matthews

The third group was the video editing facilities. One was a large editing suite, and the other was more portable so it could be shuffled to other venues as the need arose.

At gymnastics we had some 32 venue host cameras in addition to our own 14 cameras. The RTO host for the Olympics had a great number of cameras from which we took feeds and associated audio. So at any one time we were looking at nearly 50 separate video inputs.

Of course this required us to modify the major mobile unit, the Carlton LB3 unit out of London. We added almost 30 monitors to the control room in every nook and cranny. We also had to convert the control truck into a quick edit turnaround truck after we were finished with the daily activities. This enabled us to voiceover and do simple repairs to segments that were to be aired in the United States and that needed to be shipped out right away. We were very proud to make that conversion in less than three minutes. We did this every night.

Lanny McKeegan
Free-lance Engineer
Pittsburgh, Pa.
Field Shop Manager

This Olympics we had the tech managers come in and start before the venues opened, so we could orient them to the equipment they'd be using. Then, if anything happened—if they were missing anything, or something broke, or they had questions—263-2152 (the field shop number) seemed to be the "answer hotline."

George Wensel and Bruce Middleton were based at the field shop, too, so the phones really rang a lot. We got all the equipment that came in from the States. Then we distributed it "per need, per truck." We also took care of some transportation for tech managers. We were responsible for moving the trucks: when one event was over and the truck had to move, we made sure there were drivers.

Also, there were 10 or 20 OB vans and some extra utility vans. We had to get them all accredited.

We were the ones to call if you needed something. We'd do our best to get it. If you needed the most expensive equipment, we'd try to get it for you. If you needed water, we'd get you water.

Mike Matthews
Tech. Mgr., Studio Operations
David Letterman Show, N.Y.
Gymnastics

My biggest challenge was working with so many new faces and dealing with so many nationalities. That and trying to get something done on schedule. We were constantly testing and retesting the generator systems we were using and making sure that they would turn over to their backups with no interruption in service. They did work out in the end, providing us with very reliable power. Two Belgium-built generators were used.

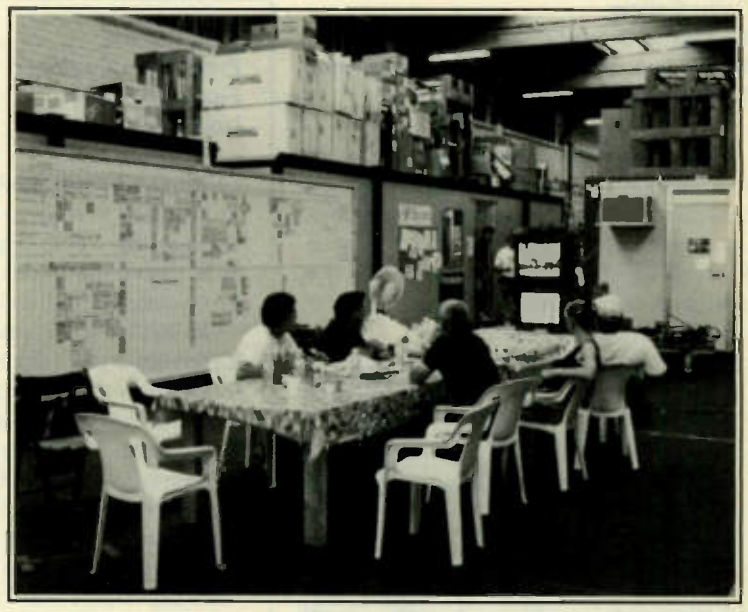
I wouldn't want to do the Olympics every year, but once every four years I think I can handle.

Art Parker
NBC Tech. Mgr., Sports Tech. Ops., N.Y.
Diving and Water Polo

The most difficult thing was communicating with the Spanish television people. And my mobile unit—the people that really set the whole thing up—were from Denmark (Nordic Film). So I had three distinctly different television backgrounds to deal with.

I went around for two days with the fellows from the truck, just to try to get them to learn our terminology. If I'm ever in this situation again, the first thing I'll do is probably draw up a little glossary of all of our terms to distribute to these folks so we all know what we're talking about.

We put in long, hot hours. I didn't go anyplace but from the venue to the hotel. Our crew was a very good crew. Our audio man came from Canada, and our maintenance man from England. When everything was fixed, the crew sat around outside the truck and sang. As long as they were singing, they were happy.



The field shop served as home base for NBC's tech managers and venue staff.

Mark Emmons (left) & Tom McCracken

Tom McCracken
Vice President, NEP West, Corona, Calif
Opening and Closing Ceremonies/
Track and Field

We had 16 cameras and two POV-type cameras called LTS's. We took 18 separate feeds and four studio feeds. There were quite a few things coming in.

The challenge of this venue was that we changed from doing the Opening Ceremonies to doing track and field and then changed back to Closing Ceremonies and the marathon. We put in a lot of long hours.

Technically, things went along very smoothly. The group of people involved in this particular venue did a lot of track and field before and really took the lead.

Our biggest adventure was changing over to Closing Ceremonies. We had to move six cameras within a half hour. The worst part about doing not-live stuff is that it's never over. It was like doing news.

This is my third Olympics. I was at Seoul and L.A. In Barcelona, the challenges were more in surviving the weather and overcoming communications barriers. I look back on Seoul and think that everything was very well put together as far as interaction between the venue and the people coming in. I thought it was a little bit lacking here at first. It will be like (it was in Barcelona) in the United States, too, I think.

In Korea, the one driving force in Korea was the Olympic Games. Everybody was focused. In Barcelona, the customs man said, "Barcelona has been here many years before the Olympics and your equipment may be here as many years after that." The Olympics was not the most important thing in Spain and they let you know.

Mark Emmons
Free-lancer, Indianapolis, Ind.
Opening and Closing Ceremonies/
Track and Field

I think the hardest part of the Olympics was the long hours for us, not only from the tech managers' standpoint, but especially from the crews'. Once everything was up and running, the tech manager was just there to make sure it kept on running. We tried to keep people happy, fed, well and rested so they could adjust to the long days.

If the equipment had been human, you could say that it got a little tired, too. Little things began to wear out. Besides long hours, communications was a challenge. We had to deal with the track stadium, where there were a half a dozen events happening at once. We had to be able to communicate what was happening in each place. Communications was always the main concern, especially helping production talk to the people they needed to talk to when they needed to talk to them. That included communicating with things that were 1,000 feet in the air, like the blimp.

It's been wonderful. I knew going into it that it would be a lot of work; I knew the hours were going to be long; I knew it would be summertime; and I knew the accommodations would be dorm-room-type. You had to adapt. If you didn't you would make yourself miserable. There were a lot of little accomplishments that made me feel good, like hitting the communication sets to the blimp. When that or seven years. They're really good. They knew the shortcuts, and they knew what they were doing. So five or six days didn't hurt us.

I'm most proud of getting it all done. With what we were presented with and with all of the delays, people were taking bets at the IBC that it would never come together. So we took that as a personal challenge and got it done.

My guys called themselves "the renegades." There were a couple of times when they worked hard enough to be the renegades. Basically they were combatants: they went in and took care of anything they could possibly take care of, like fixing other people's problems and mistakes. They were, effectively, the cable crew.

We laid about 186 miles of cable with a crew of two teams of six. The toughest venue we had was equestrian endurance. (RTO) was a real stickler in that everything had to go in pipes. We're talking about a 7.5 mile course! We didn't lay all that. We had three camera positions, but our farthest camera was 5,800 feet away. And it all had to go in pipes.

John Roche (left) & Jerry Williamson

Well, when we got there to cable it, we found all the pipes were crushed. RTO still insisted we go in the pipes! If I had to do it all over again, I would get rid of RTO and COOB, and put the Games in Hawaii.

It's a major thrash to have to go through 18 different people to achieve something. But we were accustomed to this kind of thing because we did this in Seoul and the same thing happened. In a couple of places we did it our way and they followed us.

Jerry Williamson
Technical Producer
Canadian Broadcasting Corp.
Manager for Tech Managers
for Montjuic
Diving, Swimming,
Synchronized Swimming,
Track and Field, Gymnastics

The politics of it all were unbelievable—everything from the negotiations for the power to getting into venues. That was the most frustrating part of it. Dealing with the language obviously was also a big challenge. But it was fun.

Luckily, the two biggest venues, track and field and gymnastics, had tech managers with expertise. They did it all themselves. And they did a fabulous job. We had 16 tape machines at each of the two venues, and roughly 19 cameras of NBC's. It was a huge setup and they did a great job.

The other thing that was impressive was the quality of the crew NBC put together, from the cable people to the tech managers to the supervisors. And George Wensel and Bruce Middleton pulled this all off technically; they deserve a lot of credit.

I worked with Bruce before, but it was the first time I met George and I can't say enough about the guy. He's brilliant, and he has lots of energy.

The experience was great, but I can't say I'd do it again. I have a young family, and I don't like being away from home for an extended period of time. I was gone for three months.

John Roche
Engineer, NEP, Pittsburgh, Pa.
Manager, Outside Venues

Right off the bat we were five days behind schedule. But the people we brought in were guys I'd been working with for the past six

Keith Scammerhorn
NBC/NBA Tech. Mgr.
Sports Tech. Ops.
New York, N.Y.
Basketball, Dream Team shoots

At this venue, we had Panasonic fiber optic cameras and one Sony super slo mo triax package. There were five D-3 machines in the truck and one super slo mo. In the edit room, there were four Panasonic D-3 machines and one Beta machine for dubbing crossover. In graphics we had the Picturebox and a Chyron iNFiNiT! using two keyboards.

We were lucky with the equipment. With the exception of a couple of head failures on one machine, we didn't have any problems. The fiber optic cameras held up tremendously, considering the fact that it was about a 1,000-foot run inside the venue. We had no problem at all with the fiber optic cable or anything.

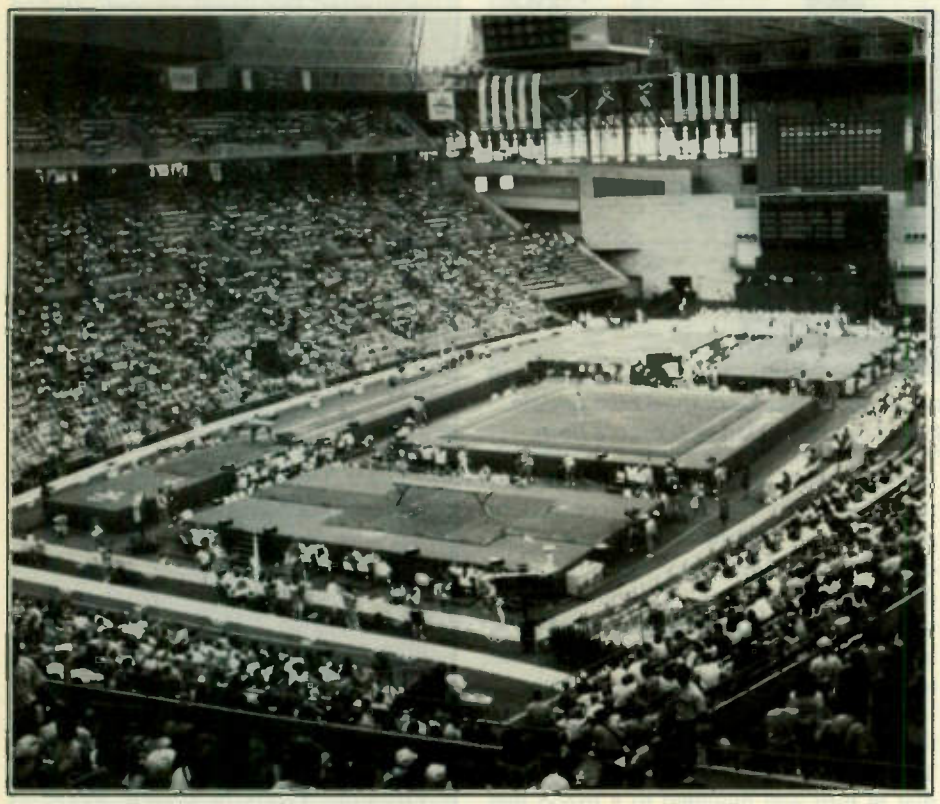
I had the super slo mo prototypes on the NBA for several months so I was very used to it.

My biggest challenge was finding the right connector to fit the right thing. We had an English maintenance truck and equipment that needed to plug into Spanish mains. Also, the lack of having a Radio Shack (was a problem). In Barcelona, it took two days to get an adapter from an anything to an anything.

Being at the Dream team venue, the security was awfully tight. We had to have a special ticket as well as a credential to get into the venue. And it worked backwards, too—the team couldn't even get out to get hamburgers at our venue. We were just isolated from the rest of the world.

I did the Olympics in Lake Placid in 1980. At least in this one, no one froze to death standing in line for the bathroom. Instead, they roasted to death.

I wouldn't do another Olympics, it's not my cup of tea. I want to get into a place, set up and get out. I'm a gypsy, and I'm not used to staying in one place very long.



At the gymnastics venue, NBC had 14 of its own cameras, in addition to the host broadcaster's 32.

Bruce Middleton
Free-lance Engineer
Calgary, Alberta
Canada
Director of Venues

I started working on these Olympics in March of '91 to set up the operations and systems for the venues. We had rough times. There were a lot of politics involved. It took time to get out of production exactly what they wanted, and there was a lot of negotiating and trying to figure out what we could do with the budget we had. We ended up having to cut a lot of corners to meet the budget and still get more or less what production wanted.

My biggest challenge was trying to tie all the loose ends together and keep it all straight. When you're dealing with planning for 20-some venues, it's very easy to think that you did something on one venue when in fact it was for one of the other venues. You start to get a little paranoid that you've missed something.

I worked on a couple of other Olympics, including the one in Seoul. There were a lot of similarities between Barcelona and Seoul. I think that in Barcelona, (power) negotiations were more difficult than anywhere else.

We had to sort of convert a lot of systems to make them work for the Americans, because we used European trucks with American people. That was a bit of an effort with the truck people. But we managed to work our way through it. For example, there were the four-wire intercoms versus the two-wire in America. Although on the surface this difference seems very simple, it was hard to get across to people how the two-wire was to be set up and how we (Americans) use it. But we managed to work our way through it.

I think the production team was pretty happy with its facilities, with a few minor exceptions. Given what we had to work with and the scope of the project, I think it went very well.

Bob Hepworth
Free-lance Engineer
British Columbia, Canada
Boxing

We had a Cinevideo mobile truck out of the Netherlands. It was first rate. We started setting up about the 19th of July and we had major, major problems with power. It was basically a ground fault problem. We worked on the problem with RTO and the generator people. It took time because of the language problem. We had outboarded tape rooms because the Netherlands truck didn't normally carry them in their main mobile unit. We wanted more anyway, so we had four additional machines in the tape room. We also had a distribution room and an edit suite, Picturebox. All that was outboarded.

When I saw what the D-3 machines could do, and the speed at which they were able to read information as it went by, I noted it was a vast improvement over the equipment I'd used in other Olympics. Also, I was impressed with the Picturebox. It's quite unique, and so is the Chyron iNFiNiT! character generator.

We were in a pretty clean environment. In some of the other venues there was a lot of dust. And we were reasonably lucky because we were informed when powering down would occur, so the machines didn't get too hot. The service reps were very good.

The most unique thing we had was the boxing punch count from Seiko. There was a problem (not technical) in getting the signal in; there was a controversy over how it counted and the speed in which the judges could actually push the button. It was quite heated and quite contentious.

Pay-per-view was at this venue. They sort of shared our facilities. The relationship worked very well. Personally, I think pay-per-view is a great idea, because so many people want to see specific events. As a fan of track and field, I'm driven crazy when I see just a two-minute piece of it and then all of a sudden find I'm watching rowing.

I don't think the cost was that high, and I think more people would have paid for it if they had realized that. I think the marketing of it was the problem.

Joe Commare
Dir. Eng., Educational TV
Oklahoma State Univ.
Stillwater, Okla.
Volleyball, Rhythmic Gymnastics

I think the biggest thing we had to do was make the trucks compatible with our system. We had one truck from Videohouse in Brussels, and we had that tied into the RTO truck parked down the street. We had to add a lot of monitors to the Videohouse truck and, in turn, couldn't repatch all the monitors. It all had to be hard wired so that our wiring and their wiring matched.

We've all been doing this kind of thing for a long time; otherwise we wouldn't have been in Barcelona. This event was really no different from the Superbowl or the Rosebowl, except it was on a bigger scale. What we did was treat each event independently. You had to do it that way because it made life easier.

But it was fun. What I liked about it was that I saw people I hadn't seen in five or 15 years. And I met new friends who I hope to see again. That is 90 percent of what this business is all about, because we're a very small group of people.

I'll do Atlanta if I can. Right now I'm working for Oklahoma State University. We have a broadcast tower there, and in order to keep up with the technology I like to keep my hands in all the goop.

This Olympics was fun. I'll always have my memories of this place. We could take all the pictures in the world, but there are some things—the people and the fun things we did and things that happened—that you can't capture except as memories. I've had a good time, I really have.

Joe Commare, setting up the volleyball venue on the fly

One TM's Poolside Memoirs

by Steve Ulrich

BARCELONA, Spain I have been asked to write an article about what it was like to be a tech manager at an Olympic venue. In a word: exhausting.

I was assigned to swimming, synchronized swimming, and water polo. All three originated from the Bernat Picornell swimming pool. Our technical complement included a full editing facility with four Panasonic D-3 machines, one Sony Beta VCR, Graham-Patten D/ESAM audio, a Grass Valley Group 110 switcher, a GVG 251 editor, and a GVG DPM 700 digital video effects.

Our camera complement was five cameras of our own: three mini-cams (one was RF); one hard and one remote control camera. We also received a feed from all of the 13 host cameras, including the underwater camera.

Our VTR complement was six Panasonic D-3s for replays and event support. During the recording of each event, the four D-3s in the edit room would be used to record dirty and clean program, world feed, and another feed that would not require immediate playback.

Our product unit was from Cinevideo Group in Holland. The OB van supplied the cameras, switcher, intercom, and production control room.

Our graphics were the Chyron iNFiNiT! with two keyboards, a telestrator, Quantel Pictureboxes, IBM venue graphics, and Seiko timing.

Cabin fever

Most of the equipment listed was installed into small cabines (cabins). One cabine was used as the edit suite and then came the graphics cabine, the videotape cabine, the distribution cabine, the production office cabine, the voiceover cabine, the operation office cabine, and the catering tent.

Yes, a nice and cozy little city.

Our first day in, we met with all the folks who had been in for a month or two installing cables, making the arrangements for the cabines, installing electric, and making sure that all the equipment was delivered to Barcelona. That last chore was the most difficult.

My second mission was meeting the host venue manager. I quickly discovered that his favorite saying was, "That is not possible."

Diana Butler, the broadcast manager, would assist me for the first week in building the facility. Rich Assenzio took over for Diana after the first week.

It would be a few days before we would see the members of our crew. Our main objective during this time was to get to know our venue and the host venue manager and to make sure everything we needed to operate was at the venue by the time the crew was on site.

Technically, I was in good shape. And after a few days and several problems, the host broadcaster became a little warmer.

High voltage

When the technical crew arrived, they found most everything they needed to build a working venue. Most equipment we used was 220 volts and all of it was PAL. For the equipment that was not 220 we had transformers. All of the AC strips we used were European standard. This included the 110 strips. It did not take the crew long to figure out that plugging a 110-volt, 10-watt amp into a 220 volt line did not produce 20 watts. Instead, it produced smoke.

Our audio guru and audio mixer, Sam Abousamra, had assembled within the first two days all of the items he would need, including a feed from all the host microphones. Sam had also pulled together his three A-2s as a working team. This freed some of my time to work with the video crew.

As we got closer to the first day of competition, the hours became very long. With a 45-minute drive to and from the media village where we were staying, and a 14- to 16-hour day, it did not leave a lot of time for sleep.

The POV camera and the underwater cameras gave us some interesting angles of the competition.

The underwater camera rode on a track at the bottom of the pool. It was controlled by a person pedaling the submarine from one end of the pool to the other. Mechanically, it was great. Using it to iso one or two swimmers was great. But there was no way to white balance the camera once it was in the water. We used a frame sync and a color generator, but we could never get the colors right.

Point of view

The POV camera we used was mounted to the stands. This camera, via remote control, could pan 360 degrees, tilt from straight down to straight up, zoom, and focus. It could also be triax-controlled, giving us full control of the camera. The operator, Don McClusky, operated from the distribution room. The remote controls of the lens and the pan/tilt head were so smooth that you never knew the operator was 150 feet away from the camera.

NBC's high-tech underwater camera was powered by old-fashioned bike pedals. Shown here: Inventor Garrett Brown (right) and operator Darick D'ercole (left).

In training

Most operators were assigned to training their first few days in. There were a lot of stories about problems with some of the new gear. The Panasonic D-3s were very sensitive to dirt, and we had a lot of dirt available. Due to the sensitivity of the heads, a Panasonic engineer came by nightly to clean them. In fact, most manufacturers and engineering reps on site were able to work through the problems, and they all made house calls.

Electricity was also a problem. All of the venues, as well as our main broadcast center, ran on generators. There was not enough power in the city to supply all venues, technical facilities, and events.

The signal route

Distributing the signals was also very interesting. As I mentioned, we had a distribution cabine. This room housed a Pesa 48x48 router. Our plan was to time all signals to the router and then feed each input of the switcher via the router. Once our director arrived on-site and looked into the cameras he would need, we were able to limit the number of router outputs we would use to the OB van. The other router outputs fed the IBC, VTRs, graphics room, and loggers, etc.

As far as timing and the PAL standards, I was lucky. Our maintenance engineer, also from England, Andrew Biller, understood the PAL system and SC/H phasing. He was able to stay on top of it and it was never a problem.

Another camera we had the opportunity to see and use was the Snorkel camera. This camera was mounted on a jib arm that in turn was mounted to a tripod that had wheels and rode on a track. The lens housing was waterproof and could be lowered under water. The operator had full control of zoom and focus. The shots of the swimmers from this underwater camera, and the shots from the camera tilting up above the water, were incredible.

Now, of course, I saved the best for last. The crew. I had the best. NBC elected not to air crew credits. However, I would like to thank the following people: TD Roz Storey; for audio, Sam Abousamra; A-2s, Scott Bremmer and Gary Baylor; for cameras, Ken Walsh, Figg Newton, Steve Bennett, and Pascal Charpentier; Utility, Michael Martell, Diane Keith and Lillian Cereghino; for graphics, Carol Mark and Linny Daniels; editing, Jeff Hargreaves, John Moore, and John Grote; videotape, Bill Thomas, Sean Mahan; the crew from The Cinevideo Group, Eiko, Walt, Alfonse, Diane and Rich; runners Amanda Autry, Michael Biondi, Brian and Sean Scully (wherever you are); and the best maintenance man in the world, Andy Biller.

Steve Ulrich is senior vice president, operations for WKPC-TV in Louisville, Ky.

Underwater On Pedals

by Charles Taylor

BARCELONA, Spain You may not have seen it from your living room recliner, but along with track and field and diving, an event that picked up kudos at the Summer 1992 Olympic Games was pedaling—camera pedaling, that is.

Thanks to an ingenious, albeit curious invention, NBC was able to track swimmers from within the Picornell Pool with a miniature camera submarine on rails. The unit's dash down the lane with swimmers was controlled poolside with manually cranked cables resembling bicycle pedaling.

The camera was devised and operated at the Games by Garrett Brown, inventor of the Skycam and Steadicam, at the request of NBC's Vice President of Olympic Programming Peter Diamond.

"Manuel Romero of the RTO had requested the development, and after several unsuccessful schemes failed at the bidding stage, I was brought in because of Peter's enthusiasm for my earlier inventions," Brown said.

The camera setup utilized a Hitachi miniature camera, riding on 30 lengths of recessed rails within the trench in lane 3 of the pool. The wide angle 7.5mm lens was panned and tilted by a remote control operator. The cable that sent the camera down the lane was hand cranked from the sidelines at a maximum capable speed of 4.4 mph.

Lane 3 was chosen because it allowed a view of lanes 4 and 5—the same angle that the surface camera used to look into the pool. "It was a much more congenial cut," Garrett said. "If I was looking straight up and cut that shot to (the other), it would be very disorienting. But people are used to this kind of cut across the line that is the water."

Between August 1991 and the Olympic Trials in March, every aspect of the system was tested, including its hydrodynamic and optical invisibility.

"It had to be proven that the ship (the submarine camera) didn't make a wave that would have any effect on the race," Garrett explained.

The decision to keep electricity out of the camera's dash down the lane was two-fold. First, Garrett was concerned that Spanish electrical inspectors might question the safety of cable coming out of the pool.

As well, the hand-operated cable allowed meticulous control. "When you're doing this by hand, it's like riding a bicycle," he said. "You can feel if there's something wrong right away, or if there's any friction."

Despite the camera's Olympic triumph, its future is cloudy, according to Garrett.

"I have no idea what we wish to do with it now," he said. "I don't really intend to get into the submarine business."

Marathon Coverage on Course

by James Malone

BARCELONA, Spain It is always an honor to be asked to help in the production of the Olympics. The feeling you get from the Opening Ceremonies pushes all beyond their limits—not only the athletes, but the production and engineering staffs as well.

In Barcelona, equally satisfying was the triumph of successfully directing a television signal to its destination despite the numerous challenges making the job particularly difficult—everything from foreign language barriers and local government regulations to frequency coordination.

Covering the marathons at the beginning and the end of the Games kept us thinking about what systems worked best and where equipment was most advantageously placed. We dealt with a lot of first-time endeavors that kept us on our toes for every event.

We dealt with a lot of first-time endeavors that kept us on our toes . . .

Guinea pig marathon

Because the women's marathon was placed at the beginning of the Games, it acted as a sort of a guinea pig. Even though there were many checks and engineering rehearsals, when the final event—the men's marathon—commenced, it was a different production with more experience.

Among the unique logistical challenges of the marathon events in Barcelona was the fact that the course was in a straight line. A lot of marathons are in a circle, or start and stop in the same place, simplifying setup at the start line. This race required one OB at the start and another at the finish. Fortunately, the finish was inside the track and field venue.

Also, because there was no repetitive course involved as in most events, the engineering team couldn't get in any practice. Once they went through the course in the marathon, that was it. They either mastered it or blew it. There was no second lap for a second chance.

One interesting aspect of covering the marathon was how the camera crew kept up with the runners. To avoid possibly asphyxiating the athletes, we used electric vehicles to transport our cameras near the runners. NBC specially built electric motorcycles just for the Olympics.

The electric cycles had side cars with two seats; the rear seat was for the cameraperson and the front seat was for the talent. On a second bike, we placed a technician for the course service. (Because these bikes were not street legal, they required no license. When we tested them on the street, the Barcelona police gave us trouble until we continued our trial with the aid of "an escort.")

We had some problems with power, duration and speed. These dilemmas were eliminated by using oversized motors and twice the battery power to run the course.

Because the coverage was live or "live-to-tape," the motorcycles had to be outfitted with transmitters, which sent the signal to a helicopter, which in turn relayed the signal to various receive sites. Here, the signals were judged, subswitched and routed to the control room, so that the best possible pictures were available to the TD and RF team for recording.

Same feeds, different sites

Because we were using more than one receive site and it was relayed to the IBC on different lines, the control room had the same feeds from different sites. The quality varied based on the position of the runners on the course.

One of the trouble areas in ensuring good signal delivery came from the marathon course's location near water. When the aircraft were over water and at certain elevations, multipath caused by reflections off the sea was quite bad. Communications also was hampered at the start line because it were a bit far from our communication system's radiation pattern (which usually was limited to indoor venues).

One way on-channel interference was dealt with was by using numerous receive sites.

Having an experienced crew in marathon work was the only way to make coverage of an event like this possible. Most of the guys I worked with have many marathons under their belts, and most of us work together throughout the year to make coordination better once the big event arrives.

James Malone is president of EE-VON RF Consulting in Ivyland, Pa. He may be reached at 215-672-7080.

'Almost Live' from Barcelona

by Bob Barzyk

BARCELONA, Spain Due to the time difference between Barcelona and the United States, every event of the XXV Olympiad was taped for later broadcast on NBC. This allowed us the opportunity to edit the program so it was tighter and more interesting to the prime time viewer. It still aired the same day, though, so time was critical. We had to be as efficient as possible to make the feed to New York on time.

One of the ways we tried to "beat the clock" was to edit as the competition was under way. After each round (or some other designated time period), tapes were pulled and the on-air final edit began.

Cut as though live

Everyone looked at the coverage as though it were live, so editing was minimal. Long pauses between competitions were cut out, and on those rare occasions when the hosts fumbled, lines were later replaced in a booth and cut in over a mix-minus copy of the line cut. All Chyron was inserted live in the truck, but when there was a problem with the automatic scoring transfer system, it was inserted in post.

At most venues, two remote editing rooms were built: one with six Panasonic D-3s and a Grass Valley Group 251, and the other one with only four D-3s and a 110. Otherwise, both rooms were identical in function and equipment. Standard equipment at the gymnastics venue included two-channel Grass DPM-700s, Graham-Patten D/ESAM 800 digital audio mixers (fully loaded), Zaxcom remote TBC controllers, a Technics CD player, a Sony DAT machine (controllable by the GVG-251 editor) and a Beta-SP machine just in case anything came in on Beta (it was practically never used).

Preread on the D-3 machines changed the "look" of the 1992 Olympics quite significantly. I edited many three- to four-minute feature vignettes about the key athletes so viewers could get to know them and become attached to them, as I have.

Pre-read improves production

These vignettes had great production value and, mainly because of preread and the clean quality of the DPM-700, were done efficiently. Many of the vignettes had numerous layers; a typical feature might include slow-motion close-ups of athletes dissolving slowly in and out, sometimes three or four at a time (repo'd in the DPM-700 with soft-wipes and keying), all over a background layer.

Without preread, many work reels would have to be created, which would take too long to be practical. I also never had to make a B-roll! Of course, you must preview a lot doing it this way, because if you make a mistake and you're four layers in, you're in trouble. Preread was also helpful in cutting music, because you could do cross-fades easily since the output of the record machine fed the mixer.

Bob Barzyk was an editor on NBC's gymnastics coverage in Barcelona. Back home, he works at Pacific Ocean Post, 730 Arizona Ave., Santa Monica CA 90401. He can be contacted by phone at 310-458-3300.

On-Site Editing Adds a New Twist

by John Wesley Nash

BARCELONA, Spain One of the major differences for NBC at this Olympics, compared to the 1988 Olympics in Seoul, was the extensive amount of editing facilities located in the field at the Olympic venues.

Outside of the International Broadcast Center in Barcelona, NBC constructed nine venue editing suites. Seven of these were built in temporary cabins located within the NBC compounds at the Olympic Stadium, gymnastics, basketball, boxing, swimming, diving and volleyball venues. Two other suites were constructed in mobile units that moved between venues at Olympic Stadium, gymnastics, tennis, road cycling and flat water canoeing.

These suites were designed in two versions: large editing suites, of which there were three, and small editing suites, which numbered six.

The equipment complement of the three large suites was identical with the exception of the number and type of video tape machines in each suite.

At gymnastics, the suite was equipped with six Panasonic D-3 composite digital video tape machines and one Sony Betacam SP machine. The large edit suite at Olympic Stadium featured one less D-3 machine. In the mobile unit that traveled between venues for tennis, road cycling and flat water canoeing, the large edit suite contained two D-3 machines and five Betacam SPs.

All six of the small edit suites had four Panasonic D-3 machines and one Sony Betacam SP.

In the large suites, the video production switcher was a Grass Valley Group Model 250 with a full complement of options. Eight of the primary crosspoints and associated key inputs were timed feeds from the routing switcher located at each venue. This allowed video and key signals from other rooms and production trucks located at the venue to be used in the edit suite.

The video switcher in the small suites was a Grass Valley Model 110, in which two of the primary crosspoints and associated key inputs were timed feeds from the venue routing switcher.

Each suite used a GVG Model DPM-700 for digital video effects. These were two-channel units with the TrailBlazer Enhanced Recursive Memory option.

The GVG VPE-251 was the editor used in all suites. This editor provided direct serial control of all VTRs, the switcher, audio mixer, DPM-700, DAT recorder/player and TBC controller.

GPIs were connected to control the following functions: Play on the CD player and DAT recorder/player, freeze and run forward on the DPM-700, mix-minus on/off on the audio mixer and the auto-transition function on both the production switcher and audio mixer.

The audio mixer used in all venue editing suites was the Graham-Patten Systems D/ESAM 800. These mixers were configured with 24 digital and 16 analog input channels which mixed to four output channels. Both digital and analog outputs were available for each channel.

This configuration allowed the editor to intermix both digital and analog audio sources, maintaining a totally digital audio path whenever possible and accommodating analog audio sources and output paths when necessary.

A Zaxcom MTBC1500 Time Base Corrector control system was installed in each room. The Zaxcom remote control panel was mounted in the edit suite within easy access to the editor and waveform monitors, allowing full control of all VTR time base corrector functions from one location. The MTBC1500 was connected serially to the VPE-251 editor, so tape set-up data could be stored and retrieved to the edit decision list.

Each suite was equipped with a Technics Model FL/120/B compact disc player and Sony Model PCM-7030 digital audio tape player/recorder. The large suites featured UREI 809 speakers, while JBL Model Control 5 speakers were used to monitor audio in the small suites. Tektronix Model 760 stereo audio monitors handled audio phase monitoring.

Efficiency and flexibility were two major design goals for the venue editing suites. Console design, equipment layout and monitoring were all customized to allow one person — the editor —to easily operate the suite.

Four production people, in addition to the editor, could work comfortably in the large suites. The small suites could accommodate two people plus the editor.

To maximize flexibility, inputs to each VTR were fed from routing switcher outputs of each venue, allowing them to record venue feeds when not being used for editing.

The output of each VTR fed an independent video/stereo audio sub switcher. This was used when it was necessary to feed tapes back to the venue routing switcher from the edit suite without disturbing the editing activity.

These suites were used 16 to 20 hours a day, often by several different editors and production teams. Most sessions were held to a very tight schedule in order to make air.

This demanding schedule made reliability a must, and the suites met the challenge. During the 16 days of the Olympics, not one editing session was lost.

John Wesley Nash is vice president of engineering for Communications Engineering, Inc. (CEI) in Newington, Va. CEI was contracted by NBC to design and build the venue editing suites. John spent seven weeks in Barcelona supporting this project. For more information, call him at 703-550-5800.

A New and Different Point of View for NBC

by Bob Davis

BARCELONA, Spain NBC Sports required unique camera placement and control systems for its coverage of the XXV Olympiad. The team from Image-Cam, Inc. of Scottsdale, Ariz. was the right company to help bring home the gold.

Image-Cam's involvement with NBC began over a year ago, when Ron Prociw, Al Meis and I integrated point of view (POV) cameras into the production of athlete profiles produced by the network. The results were outstanding, with angles and perspectives never before seen.

For coverage of the Olympic Games, NBC wanted cameras placed on top of mountains, buildings and grandstands. The catch was that they needed to be controlled from a distance of up to five miles.

Accepting the challenge

Ron Prociw, owner of Image-Cam, and Al Meis accepted the challenge. They began with five Matthews Cam-Remote systems as head and control assemblies. To operate these systems over great distances, Ron and Al developed both fiber optic and modem links. These interfaced directly to the Matthews Serial Link.

Placement of the Cam-Remotes was anything but standard: The units were mounted from towers, swing arms and hanging brackets. All mounts were designed and built on location by the Image-Cam machine shop. Additional LPS camera mounts required for volleyball, basketball, boxing, wrestling, and track and field venues also were assembled on location.

With three weeks of constant exposure to the humid conditions of Barcelona, equipment protection was essential. Custom-designed environmental housings were used. Each housing contained a remote head, Ikegami HL-55A camera, Canon light-weight 33:1 internal focusing lens, anti-fog blower and fluid bottle.

The anti-fog blower was used to prevent lens condensation. The fluid bottle contained a solution to clean the front element of the environmental housing's lens port, allowing for remote lens cleaning by the camera operator.

Covering a vital position

A vital position for NBC's coverage of the track events was the finish line at the Olympic Stadium. The network found, however, that it had no room to place both a camera and operator at the finish line.

Image-Cam had the solution: Place a Cam-Remote unit in the limited space with an HL-55A and Canon 33:1 lens, and position the operator in a production trailer outside the stadium. This arrangement proved to be indispensable to the NBC production staff.

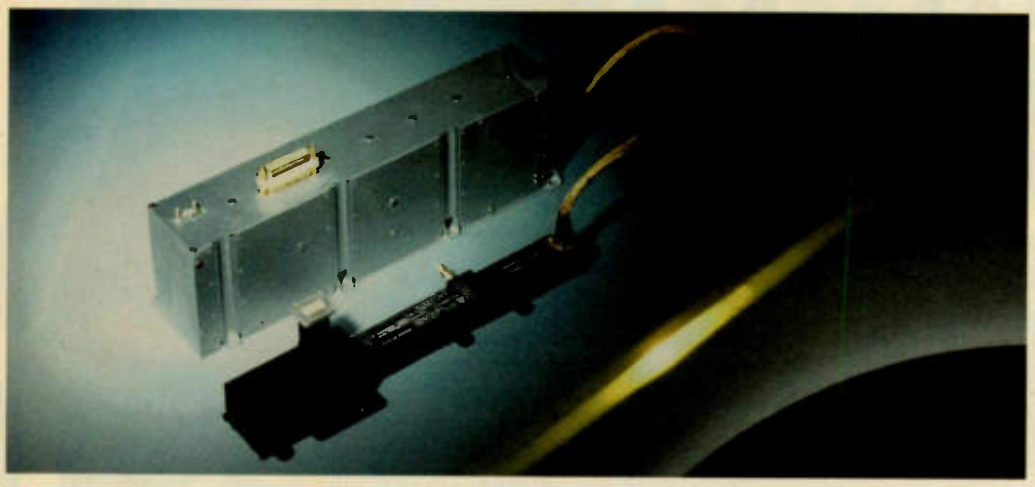
PAL POV systems were developed for underwater operations at the games. White water and flat water events made excellent use of these camera packages, while track and field and cycling incorporated dry environment equipment. These cameras were used both in live coverage and in special features such as "Dick Enberg's Moments."

Video engineer Steve Gaughn prepared all cameras and lenses to optimize each for its respective applications. Cam-Remote operators/technicians included award-winning cameramen Don McCluskey, Larry Wood and I.

The team from Image-Cam was proud to be a part of NBC's Olympic effort. Now preparations will begin for the 1994 Winter Olympic Games in Norway.

Bob Davis has 14 years of experience in remote television production. He won an Emmy for his camera work during the 1984 Olympics, and is the production facility design consultant for the Sports News Network. Davis is president of Davis Visual Communications, 634 St. Lawrence Ave., Reno, NV 89509.

Electron Tubes, HDTV and the Olympic Games



Satellite TWT amplifier

The Olympic Games of Albertville and Barcelona are the arena for a new challenge, that of high-definition television. In cameras covering the events, in the satellite transmission systems and in public displays, electron tubes are contributing to this success. Thomson Tubes Electroniques is engaged in this technological leap forward with its projection cathode-ray tubes, Primicon® pick-up tubes and transmission tubes.

Competing in the Olympic Games

Displays: HDTV will allow viewers to watch large images "comfortably", so giving a greater feeling of presence. Front- or rear-projection units combining red, green and blue CRTs offer the large-screen capabilities necessary for this. Already on high-end simulators such as used for pilot training, the application of projection techniques to TV is opening up new forms of communication.

More advanced dispenser cathodes, new focusing techniques or new phosphors have all contributed to the resolution and brightness of projection CRTs. Furthermore, this work has also led to considerable gains in overall efficiency for the display systems.

Thomson Tubes Electroniques developed the 9-inch diagonal TH 8467 for high-definition front-projection units with screen sizes of up to 170 inches or more. The electronic cinema can now become reality, and multi-media stations, videoconferences or high-resolution graphics applications will all benefit from this technology.

TH 8467 projection CRT

HDTV pictures of the winter and summer Olympic Games are being projected to audiences using Thomson's TH 8467.

At the picture source, electron tubes offer the performance required for HDTV cameras. They combine high resolution with excellent light sensitivity and low lag, which is why the THX 898 Primicon® pick-up tube is in cameras covering the events.

Picture transmission: Thomson pioneered high-power uplink TWTs with such tubes as the TH 3640 (3 kilowatts, C band) or the TH 3591 B (600 watts, Ku band). These tubes are in service throughout the world, with more than 1000 TH 3591 Bs having been produced. In a family of medium-power klystrons, the TH 2454 (3 kW, C band) offers an enlarged instantaneous bandwidth of 80 MHz. These 3 tubes are powering the satellite uplinks at Albertville.

In space, Thomson is a leading manufacturer of communications satellite TWTs. It has developed the latest generation of Direct-Broadcast Satellite tubes which are equipping the future American and European satellites now being built. With the Ku-band TH 3754 (100 to 160 watts), Thomson Tubes Electroniques has brought the state-of-the-art to 60 percent efficiency, and a tube weight of 800 grams for an output of 120 watts.

Telecom 2 is equipped with Thomson 55-watt tubes from the same family, and is transmitting the Albertville pictures to the outside world.

Thomson Tubes Electroniques' long-term commitment to the development and manufacture of electron tubes for radio and television has led to such tubes as the TH 563 UHF tetrode (42 kilowatts vision only). Thomson alone offers high-power UHF tetrodes, and as the first tubes are logging 20 000 hours, more transmitters are turning to this solution. Our advanced technology is employed in satellite transmission and direct-broadcast services worldwide, with our comprehensive range of klystrons and TWTs. Our foresight prepared us for the future and HDTV. Whatever your projects in radio or TV, you should be gaining from Thomson Tubes Electroniques, the leading-edge in electron tubes.

High-power UHF tetrode

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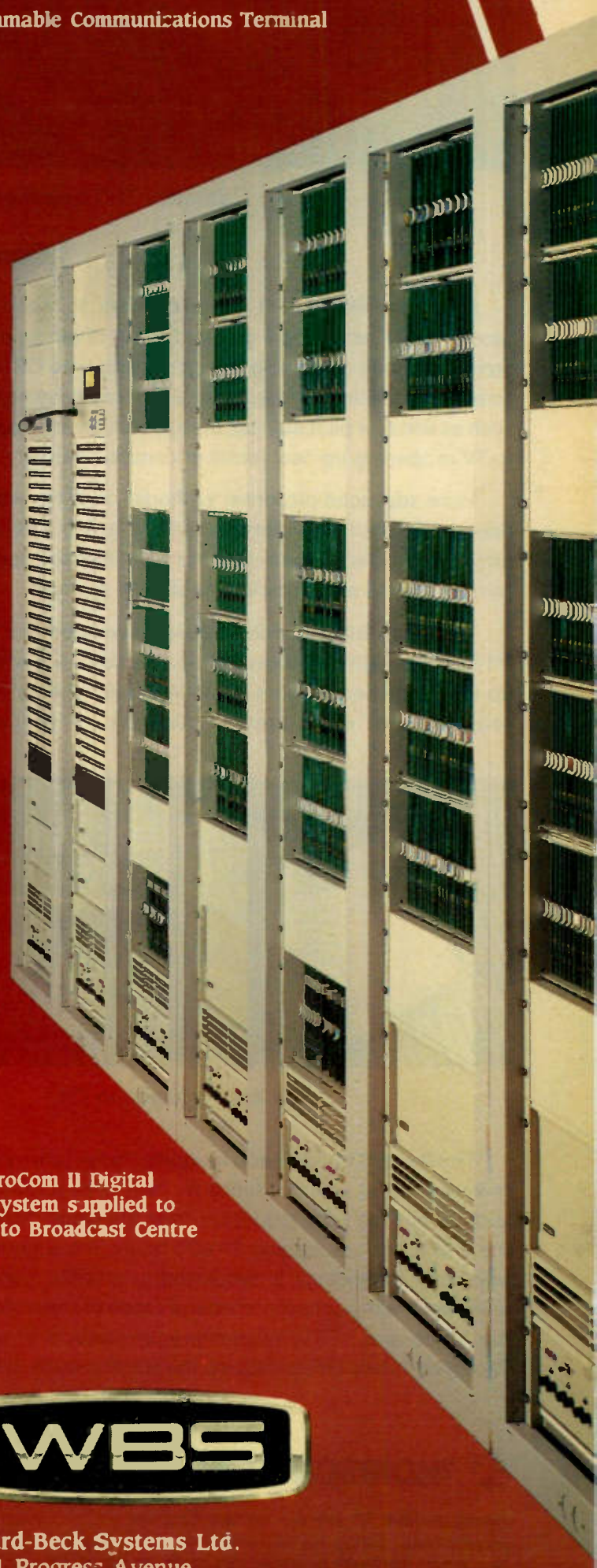

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