

NFL Instant Replay System

His team down by a touchdown, Green Bay Packer quarterback, Bret Favre, fades back for a pass. He looks, he pumps—and the ball is suddenly knocked out of his hands by a charging linebacker who falls on it. Fumble? Incomplete pass? Only one way to tell for sure. As 60,000 fans in the stadium and millions more watching on TV wait tensely, the answer will come in 90 seconds or less, coursing through video and audio cable provided by GEPCO International, Inc.

Long a much-discussed way to settle close calls, instant replay was on the agenda of NFL owners meetings for several seasons until the NFL Board of Governors finally approved it. To implement this system, video interconnects and distribution to the referee's sideline video monitors needed to be installed at every NFL venue.

With only four months to go until the kickoff of the first pre-season game, there was very little time to research, design, fabricate, ship and install a complete replay system for the 30 different venues in which NFL football is played. The



Denver Field

pressure was on because this was the NFL, where high stakes and high drama take to the field every Sunday and where a breakdown of the system in the midst of a close, nationally televised call could conceivably provoke rage and frustration from coast to coast.

To oversee and coordinate installation of cable and affiliated interface boxes for the instant replay system, the NFL contracted Sportvision,

Inc., with whom the league works for all technical matters that affect the broadcast coverage of the game. Sportvision, in turn, appointed GEPCO to supply and ship specific lengths of audio and video cable to each of the 30 NFL facilities throughout the country.

"We had our first meeting with Sportvision at the end of May to specify the products to be used in the instant replay system," said Ken

A Logistically Challenging Job Simplified with GEPCO

Bernd, GEPCO's manager for the instant replay project. "Everything had to be ready by the first week in August. That didn't leave any margin for error."

Consistent Standards Customized for Each Stadium

Each stadium was required to be consistent with every other in terms of type and quality of equipment. The TV network technical team expects to work with identical electronic components from week to week, no matter where the game takes place. Yet no two venues were exactly alike. The total amount of cable for each stadium, for example, ranged from 6,000 to as much as 25,000 feet. And cable lengths, of course, were different in each case.

"Logistically, it was one of the most challenging jobs we have ever been involved with," continued Bernd.

GEPCO High-Definition Coax



Dallas Replay Room

In effect, each stadium presented two different kinds of tasks: cable that was to be permanently installed and cable that was to be used remotely on the field between the instant replay station and a box attached to the stadium itself.

"The job was demanding in a lot of ways, but working with GEPCO helped simplify it," noted John Leland, Sportvision's Senior Vice President, Operations. "They were

with us from the start and took care of whatever came along in a very timely fashion. We had worked with GEPCO several times in the past and knew that they were capable of meeting a wide variety of our needs in addition to the cable itself."

To ensure optimal picture quality and reliability, Gepco VSD2001 and VPM2000TS High-Definition coax was specified. Both cables feature Gepco's proprietary gas-

injected dielectric, which significantly reduces the attenuation of the cable and is exceptionally crush resistant. These attributes are exceptionally critical in an application such as the NFL's instant replay system, where both durability and extended distance runs are required.



Gepco High Definition Coax

GEPCO also supplied all the connectors required for the cabling installed between the truck bay, replay booth, home and visitors coaches booth and the custom field boxes—five different field boxes, each designed by

Sportvision, located in stadium truck bays, replay booths, field mounts at the 20 yard line, inclement weather positions in tunnels and coaches' rooms.

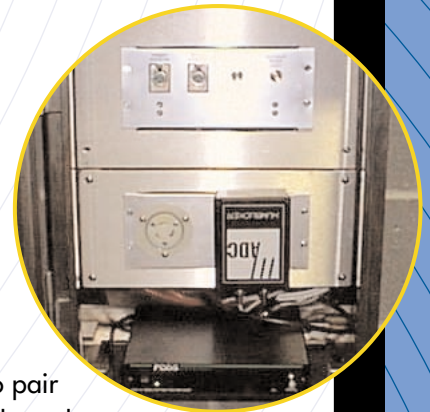
Not only did GEPCO provide the cabling and connectors for the various field boxes, it supplied the boxes, themselves. Each box was complete with custom-engraved and loaded panels that included audio, video and electrical connectors, barrier strips and a hum-bucking coil (a filter that eliminates ground loops in long video cables).

One-Source Resource

"We're uniquely set up to accommodate these types of projects," noted Bernd. Our one company can provide wire and cable plus connectors plus custom metal fabrication. Typically it would take two or three suppliers to meet all these needs."

For the cabling that runs from the field boxes to the replay stations, GEPCO put together a custom-assembly of three cables. A dual serial digital video cable, originally designed by GEPCO for the 1996

Olympic games in Atlanta, with BNCs on each end, was combined with a two pair audio cable and a 12-gauge, three-conductor, heavy-duty electrical cable terminated with a twist lock, corrosion resistant connector.



Charlotte Inclement

"Over the last ten years or so, we've worked on 37 different sports venues, including 15 different football stadiums," according to GEPCO's Bernd. "There's no doubt that this gave us an enormous head start on the instant replay work. In many cases, we were already familiar with the kinds of problems we could expect to encounter."

Sportvision executives had worked previously with GEPCO on several of its stadium projects, including the Transworld Dome in Saint Louis, Jack Kent Cooke Stadium in



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According to Sportvision, when it came to specifying the resource for the instant replay job, GEPCO was the best choice.

"The quality and range of the company's products, and most of all the quality of GEPCO's service, speak for themselves," noted Leland. "For example, we had originally hoped to be able to place one comprehensive order for the total amount of cable needed to wire the NFL venues for instant replay. Instead, we were forced by various circumstances to place multiple, small orders.

"GEPCO took it in stride and was able to supply everything, cable,

connectors and interface boxes with no increase in per unit costs. You can't ask for better performance than that," he concluded.

Products provided by GEPCO included plenum video cable (VPM2000TS), plenum audio cable (61801HS), dual video cable (VSD2001) and two pair audio cable (GA61802GFC).

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HD/SDI Coax Specifications

Part #	Nominal OD	Conductor	Insulation (type, OD)	Shield	Jacket Type	UL Type	Impedance	Return Loss (100kHz-1GHz) (1GHz-3GHz)	Vel. of Prop.	Nominal Atten. (dB per 100 ft)		
										360 MHz	1 GHz	3 GHz
VSD2001	.272"	18 AWG Solid BC DCR 6.4 Ω/Mft	Gas-injected Foam PE, .180"	95% TC Braid, 100% Foil	PVC	CMR	75 Ω (+/-2)	>23dB, >21dB	83%	3.40	5.87	10.65
VPM2000	.242"	20 AWG Solid BC DCR 10.2 Ω/Mft	Gas-injected Foam PE, .146"	95% TC Braid, 100% Foil	PVC	CMR	75 Ω (+/-2)	>23dB, >21dB	83%	4.38	7.57	13.36

Triax Specifications

Part #	Nominal OD	Conductor	Insulation (type, OD)	Inner Shield	Inner Belt (type, OD)	Outer Shield	Jacket	UL Type	Impedance	Return Loss (100kHz-1GHz) (1GHz-3GHz)	Vel. of Prop.	Nominal Atten. (dB per 100 ft)		
												360 MHz	1 GHz	3 GHz
VT61811	.475"	14 AWG Solid BC DCR 2.5 Ω/Mft	Gas-injected Foam PE, .285"	93% BC Braid	PE, .365"	93% BC Braid	PVC	CMR	75 Ω (+/-3)	>22dB, >15dB	84%	2.68	5.00	9.60

Multi-pair Audio Specifications

Part #	Conductors	Insulation (type, wall thick)/ Color Code/ Capacitance	Pair Shield	Pair Drain	Pair Jacket (type, OD)/ Color Code	# of Pairs	Overall Shield	Overall Common Drain	Master Jacket	UL Type
GA618GFC Series	22 AWG (7x30) Stranded TC DCR 15.3 Ω/Mft	PE, .010" / Red & Black/ 26 pF/ft between conductors	100% Foil	22 AWG (7x30) Stranded TC	PVC, .140" / Base 10	2, 4, 6, 8, 12, 16, 20, 26, or 32	100% Foil	16 AWG (19x29) Stranded TC, 20 AWG (7x28) Stranded TC for GA61802GFC	Riser Gep-Flex TPE, Blue	CMR

For More Information:

Corporate Headquarters and Main Warehouse
1770 Birchwood Avenue, Des Plaines, IL 60018
800-966-0069 • PH 847-795-9555 • FX 847-795-8770
www.gepco.com • email: gepco@gepco.com

Branch Office and Warehouse
1000 N. Lake Street, Burbank, CA 91502
PH 818-569-5222 • FX 818-569-5226

