



**Better Fiber Connectivity
Essential In Today's
Broadcast World**



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It's late in the fourth quarter of the Super Bowl. The Outside Broadcast (OB) team – armed with a phalanx of cameras, audio equipment and transmission gear – is onsite at the stadium, seamlessly delivering the feed to a billion eager fans worldwide.

All's well in the mobile control room – until a technician stumbles into the fiber frame. Circuits are disconnected and the entire signal – audio and video – gets interrupted. Seconds of downtime turn into a frantic two minutes, as a rat's nest of cabling interferes with a prudent reconnection.

Meanwhile, the winning touchdown is missed. And those precious seconds of downtime? They now equate to millions of dollars in lost revenue, costly make-goods and a permanently stained reputation for the network.

That was quite an expensive stumble, indeed.

This nightmare scenario is not all that far-fetched, especially in a confined OB space crowded with equipment and frenzied personnel. While broadcasters have always been concerned with maintaining signal flow without interruption, today's new world – where fiber is the network of choice, but often without the redundancy offered by copper – means critical missteps can happen in the blink of an eye.

It's a simple business case; high network availability is essential to protecting revenue and reputation. Further, if a broadcaster can demonstrate superior availability to customers, it may be able to charge premium prices or win additional business from competitors.

This white paper examines fiber's impact on OB, and the processes and products that broadcasters may take to ensure that signal flow – not to mention cash flow – is under control.

Broadcast's Migration to Fiber from Coaxial

For years, television broadcasters have relied on copper coaxial cable to route video and audio control signals and RF around their facilities. Coax has proven itself to be easy to work with and reliable, often with ample redundancy throughout the network to mitigate downtime.

However, mega-events like the Super Bowl, NASCAR races, political conventions, concerts and other spectacles are the catalysts for driving consumer adoption of HDTV and other high definition services. Along with HD demand comes an increasing need for more bandwidth, and broadcasters are consequently shifting away from copper and embracing fiber optic cable feeds. With the high data rates associated with HD, copper coax simply doesn't have the capacity to handle the signals for more than a few hundred feet from the cameras.

So, for high-bandwidth HD signals, fiber transport is becoming a necessity. This is also true for trucks, editing rooms, switchboards and any number of high bandwidth applications, especially those in an OB environment. Today, when broadcasting from a large stadium or convention center, broadcasters are regularly encountering a fiber optic base. Not just in new facilities; stadium and arena renovations are occurring all over the country, and usually include a fiber infrastructure upgrade. A transport or server-based plug out is also likely to be fiber-based.

Five years ago, broadcasters might see two or three fibers in an on-location truck or broadcast office; now you may encounter hundreds or more fibers in some extreme applications. Even traditional newsrooms are evolving from a single pair to 24/ 48 fibers.

Minimize Signal Interruptions – or Else

Within this new fiber-rich environment, the need to prevent signal interruptions is all the more critical. Especially those that can result from failures in—or damage to—the optical cable plant. Even the subtle degradation caused by jostling adjacent connections at a patch panel can cause serious incidents affecting network availability. Similarly, the speed with which a broadcaster can provision or re-arrange a circuit can make all the difference.

Let's return to the Super Bowl scenario for a moment. What if, during the broadcast, the soundboard feeding the lead announcer's microphone suddenly goes down? Quickly, the backup soundboard is located, and the broadcaster will rapidly try to reroute the signal to it. However, the lead announcer's microphone is only one signal – and there are 48 ports on the panel. The problem could be with any one of them, especially if they're not clearly marked.

So, the technician needs to safely access the panel, identify the troublesome connection and patch it to the second soundboard without disturbing the rest of the signals. If done incorrectly,



or if that effort causes an adjacent cable to bend, the team might also lose Camera #2, too – or worse, the next round of advertising spots.

Paying attention to the unique requirements and potential problems demanded by the greater availability of fiber in OB trucks, editing suites and production studios has only recently become a priority for broadcasters. Vendors supplying the market are beginning to design relevant fiber management products that cater to the specific needs and nuances of the broadcast industry. And ADC is helping to lead that transformation.

Broadcaster-specific Fiber Products

Creating a sound infrastructure at handoff point – be it where networks meet, or where signals between active equipment meet – is absolutely critical. The most effective solution is coming from purpose-built broadcast fiber connectivity products combined with sound fiber cable management practices.

In the past, connectivity product manufacturers have offered broadcasters modified data center solutions or telco-based solutions in a piecemeal fashion, with limited success. Often these products are too cumbersome or not customized for the rigorous requirements imposed by broadcast scenarios.

The ADC Pro Patch® Fiber (PPF) Optic Panel is the first product of its kind specifically targeted to the broadcast market space. It is designed to maintain the unique broadcaster architecture, without requiring the users to change their industry best practices.

Features common to other equipment used in these environments are incorporated into the design of this panel to provide a unified look and feel of a broadcast product. Each frame option is designed with an emphasis on superior cable management and ease of use.



ADC's Pro Patch® Fiber Panel is the first product of its kind: Specifically targeted to the broadcaster.

Broadcasters want small-form factor equipment in their trucks and studios. Often locations are very space constrained, with equipment – including an ever-growing array of large-screen video monitors -- stacked floor to ceiling. Within this environment, there is simply no need for a large-scale fiber frame that houses thousands of fibers, as in a central office. The panel has a small form factor with 19" EIA rack spacing. Also, the 2 RU (3.5") with 48 fiber ports is large enough for current and future needs, while small enough to be manageable.

Aesthetics and security go hand in hand, and are very important to broadcasters. An old rule of thumb is, "A clean closet is better than a messy closet – especially if something goes wrong." All PPF panels are configured for broadcast-style cabinets and include a flush mounting front panel. The product design maintains the rack footprint that has been dictated over the years, meaning the patch panels are flush to the rack rail. Because it doesn't protrude from the rack, the panel minimizes

the danger of inadvertent physical contact. Of course, it is painted powder-coated black – the traditional color in the broadcast industry.

Broadcast applications can tend to be more environmentally severe than in the central office. The cabinets may be subject to vibration, salt spray, and moisture as doors are frequently opened to outside environments. Moreover, the heavy usage required with frequent journeys to different venues on a daily or weekly basis further add to the need for durability. So, unlike its plastic predecessors, this panel is designed to hold up under extreme use. Tested to military standards, it is fabricated from heavy gauge metal and even has a swing-open drawer with heavy hinges.

Best Practice: Dressed to the Rear

In broadcast, there is typically more activity in the front of a rack – and, thus, more manipulation of the active equipment, more patching, and more chance that something could go wrong. As a best practice, broadcasters are used to dressing their equipment from the rear. This practice kept any kind of mistake or prying hand confined to the rear of the rack behind the bulkheads. This includes not just the connectivity patching, but all the active equipment like switches and servers that would be used in the equipment rack.

With everything clean up to the front of the rack, it is inconvenient for technicians to gain easy entry to cabling, electrical and grounding that is routed to the rear. Enhancements to this panel, such as a swing-open drawer with heavy hinges and front-facing access, provide flexibility in crowded locations where rear access is limited.

None of the fiber components are exposed. All the patching, like the copper patching broadcasters are familiar with, is closed behind a bulkhead. The swing-out drawer arrangement virtually eliminates the accidental movement or dropping of circuits. Technicians must make a conscious effort to open the panel up to access connectors and splice trays to change a circuit. They always know where the fiber is, and can take comfort in the fact that it's secure.

Additionally, an Outside Broadcast (OB) unit always presents the risk of contamination at the end of a fiber patch cord or connector, so technicians need access to clean individual fibers from time to time. Individual fiber maintenance or rerouting must be able to occur without having to turn down the entire network that is traveling through that fiber panel.

Addressing this need, the PPT incorporates ADC's Sliding Adapter Pack, which allows access to any panel fibers without disturbing adjacent fibers. A technician can take a series of fibers (6 in a pack) and basically slide them upwards, momentarily removing them from the rest of the fibers in a row. This prevents fingers from brushing up against adjacent fibers and inadvertently disturbing them.



Flush mounting panel to rack rail minimizes inadvertent physical contact

Proper Cable Management is Key to Performance

The right frame aids in broadcasters' successful conversion from coax to fiber, but it's not a panacea. Proper cable management procedures are extremely important, and these best practices are built into the design of the panel.

Ease of use and protection against fibers being accidentally pulled are extremely important in broadcast facilities, as fiber panels are typically installed in high traffic areas. Unfortunately, the knowledge that broadcast engineers have gained about working with coax cable isn't particularly transferable to using fiber. Issues unique to fiber optics -- such as signal attenuation or complete loss from severe bending, proper troughing, crush load tolerance, and cable density and accessibility — must be considered when managing a fiber optic network.

The following principles of fiber cable management stand the test of time, and should be rigidly adhered to:

- bend radius protection
- cable routing paths
- cable access
- physical protection

These principles are described in detail in a previous ADC White Paper (Fiber in Broadcast and Production Facilities Top Ten Things to Know, 2007).



Sliding adapter packs allow access to any fiber without disturbing adjacent fibers.

With regard to bend radius protection, the PPF panel has been built to prevent improper bending of the cables. Fiber simply won't work properly if bent like copper cable. Tighter bends than industry recommendations may cause micro-bending of individual fibers that allow light to escape the signal

path, resulting in signal attenuation. More severe bends can break fiber strands completely, resulting in signal loss. Today, industry standards for traditional single mode fiber typically specify a minimum bend radius of ten times the outside diameter of the jacketed cable.

In a nutshell, good cable routing will guide users to understand and follow good installation practices, including the elimination of exposed cables (which can be snagged by a hand or foot, accidentally); good troughing systems to protect the fiber from out-of-tolerance bends; cable segregation; patch cord slack storage; and the avoidance of cable pile-up and density. Proper adherence avoids fiber damage that can result in signal attenuation.

Perhaps most importantly, the use of the this panel with a detailed labeling system will lead to the quick identification of fibers, thereby reducing maintenance time and the risk that a maintenance technician will make a hasty routing or patching decision.



Proper cable management avoids fiber damage that can result in signal attenuation.

Summary

Accidents come in many forms and broadcasters need to protect against them. Somebody is walking in front of rack and a tool belt is snagged. Or another piece of equipment falls across the front of the panel. If there is exposed fiber in the front, or unprotected connectors, the accident can knock down the signal.

Implementing a proper cable management system, buoyed by a usage-specific fiber panel like the broadcast-oriented Pro Patch® Fiber panel, will go a long way toward eliminating signal disruption, or efficient patching.

Without the system, or the broadcast-friendly frame, the manager of an OB unit may be sacked harder than a losing Super Bowl quarterback.



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