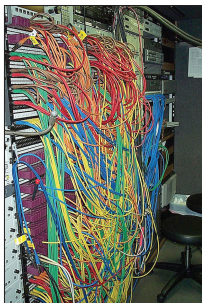


Figure 2.86 All the sources and communications feeds that converge on a production truck go through external connector panels (ECPs) like this one. Video feeds in and out of the truck go through the panels on the left. Most video I/O goes from this panel to patch panels. Camera triax is seen lower right.

Figure 2.87 Video patch panel full of patches for a truck at the Super Bowl. Most trucks have extensive patching. Patching makes a truck flexible, a must for satisfying clients' everchanging needs, but also more reliable by allowing the truck engineers to easily troubleshoot and reroute signals when systems fail. Television routers — as they have gotten denser (more crosspoints per rack unit), more flexible and more reliable — have taken on some cross connections of desired input to output that patching has historically done manually. (Source: Marty Eibeck)



Cables Everywhere

Truck I/O

Communication between the crew during the show, and even before the show, is vital for a successful production. Next to losing video or audio out of the truck, nothing tends to be as catastrophic as the loss of intercom. Early on, intercom was referred to as party line (PL). Intercom systems used to be outgrowths of the intercom that was a part of the facility's cameras. Everyone involved with a production shared the same talk-and-listen circuit. As productions got larger and more complex, companies sprang up that catered to the need for communications. The two most common companies supplying onboard truck intercom systems today are Clear-Com and Telex/RTS. They originally supplied PL systems that truck builders and vendors would engineer into multiple, parallel PL circuits. These allowed offline communications between crew members without interfering with the director who was directing, or calling, the show. As an example, an AI could communicate with the A2s and not interfere with the director's commands. This was done with matrix switches that were used to select which operator was on which party line. Additional boxes were usually added to the intercom system that could momentarily take a person off their assigned channel and put them on a separate channel to carry on a private conversation. This would be used if the video engineer in the truck needed to discuss something with a particular camera operator, for instance, or a producer wanted to give a slo-mo operator instructions as to which camera to record for replay.

About 10 years ago the intercom vendors bundled the party line systems, matrix switching and circuit isolation capability into a single frame. Today any operating position can be programmed to talk to any combination of other crew members. Slo-mo tape operators' intercom stations, as an example, can be programmed to hear and talk to the director, but not to have any contact with the cameramen. Cameramen can have their communications set so that they hear the replay producer but can't talk to them. Today's intercom systems act like multiple phone conference bridges, with users able



Figure 2.88 On the left is an audio ECP. Mics and other audio sources connect to the truck through a panel like this one. Often, instead of running individual audio lines for each audio source back to the truck, a few cables with multiple audio pairs and shields are run instead, as was done here. Breakout boxes or "pigtailed" at either end of the cable combine or split apart these individual feeds. A pigtail is basically a large connector with multiple smaller cables emanating from it to smaller connectors. (See Figure 2.91). Intercom, as a form of audio, usually enters the truck through the audio ECP.

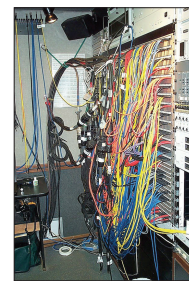


Figure 2.89 Audio patching at the Super Bowl. Notice the extra cables, referred to as multis, coming in through a "mouse hole." Each mult is connected to a pigtail where the individual audio circuits are broken out and fed to a patch. This approach would be needed if all the I/O on the truck's ECPs were already in use. (Source: Marty Eibeck)

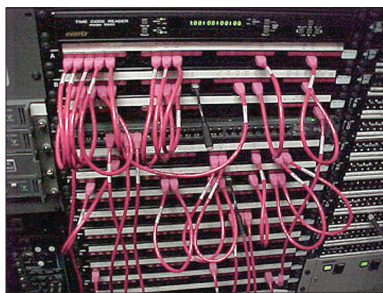


Figure 2.90 As in business everywhere, computer local area networks (LANs) are woven through trucks now, and LAN patch panels now show up on some trucks. (Source: Tim Stoffel)

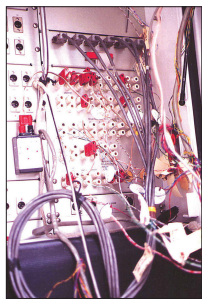


Figure 2.91 This panel on a graphics trailer used by FOX for NFL is for telephone connection. The six gray cables are machine control cables. These cables allow the main production trailer to control equipment in this trailer.



Figure 2.92 As this photo shows, the number of cables deployed can often grow from a river into a virtual sea of connectivity. (Source: Marty Eibeck)

to be on more than one bridge at a time.

Cable installation can be a major task. For large remotes, cable laying is often started weeks or months in advance. Many EICs have horror stories about times when careless crew members have run the cable with the wrong connectors at each end. One EIC at a shoot at Cape Canaveral a few years back discovered that after a few hours of cable runs, all 8000 feet of triax was run in the wrong direction.

Just like an AC extension cord you have around the house, most cables used in television are gender-specific. One end has male pins, the other female sockets. The male end of your power cord goes toward the power source; it is the same with television cables.

For most equipment involved with a shoot — cameras on triax, mics on audio cable, etc. — the truck is a power source. Male gender always points to the truck. The major exception is video coax, which has male pins at each end. A BNC barrel with female sockets at each end is used to connect coax cables. There is no “barrel” for triax. Some companies make short triax cables with female sockets at each end to handle triax cables run to difficult places that happen to be oriented in the wrong direction. The practice can potentially be dangerous, as fairly high voltage can be on the extruding male pin of the triax center conductor.

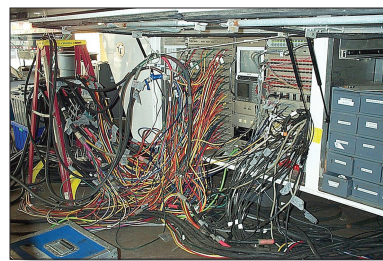


Figure 2.93 Things can get really complicated when multiple trucks need to operate as one large system. This picture shows some of the interconnection between trucks at Super Bowl XXXVI. This is the entrance panel into the Super Shooter 18 that collected feeds from cameras in all the various trucks and distributed those sources to the production trucks that needed them. This trailer also selected which production trailer actually went to air. (Source: Marty Eibeck)

Fiber Transmission

When fiber is used, all the signals to be transported down it are converted to digital number sequences, known as digital words, and are time multiplexed together. This means that, one by one, each signal sends a word until all have done so, and then the process starts over. These digital words are then converted to light signals for transmission over fiber optic cables. If OC-192 telephony techniques (current upper end of digital telephone transmission standards) are used on a single optical carrier sent down the fiber, then over 12,000 audio signals, 36 SDI video, six HD or some mix of all these signals could be sent over a single fiber. If that isn't enough, additional optical carriers can be sent down the same fiber. Most long-distance telephone carriers currently have between eight and 16 carriers on each of their fibers. A couple of these carriers have almost 200 fibers laid along their paths, most not used yet. One telco company believes that eventually more than 300 optical carriers will be able to be sent down a single fiber. That's over 3Tb/s on a single strand of fiber.

High-definition cameras are now using a modified fiber optic cable that has a pair of copper conductors bundled in it to supply power to the camera head since the fiberglass of the fiber optic cable is not conductive. The extremely high bit rates of an HD digital signal, 1.5Gb/s, produce spectral energy well over 2GHz, which is too high for them to travel very far on triax.



Figure 2.94 Intercom doesn't need to be run to the camera heads, as it is part of the traffic that rides the triax cables. But many other positions need intercom. These positions are referred to as drops. Another specialized use of intercom is IFB. IFB represents two terms that mean the same thing: Interrupted FeedBack or Interrupted FoldBack. IFB is the earpiece we often see falling out of a reporter's ear. In a game situation the announcers usually wear single- or double-earpiece, referred to as single- or double-muff, headsets. With headsets on the announcers can hear air audio, and with IFB the director, producer or any other programmed position can interrupt that audio to issue directions. When an announcer says something that the director or producer has relayed, they most likely heard it via IFB. (Source: Tim Stoffel)



Figure 2.95 A compound at the Olympic Winter Games, using a ladder as a makeshift cable tray. Fire marshals had decreed that no cables could be run on the ground. (Source: John T - NEP)



Figure 2.96 Cables often have to be off the ground because they can cause accidental falls or be run over, or simply because the local officials say so. So they may be "flown" as they leave the truck. (Source: Tim Stoffel)

We've said this before, and we will say it again, no two remotes are alike. Different crews, clients, venues and trucks make for a different mix of connectivity and equipment topology each time. Larger productions not only demand that more equipment be spread through a venue, but can also mandate larger crews with more complex communications requirements, which results in more cabling throughout the site. In the next section we will look at how we can obtain connectivity without all the "wires."

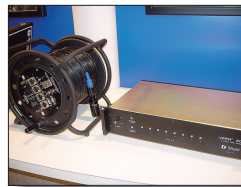


Figure 2.97 Reel of fiber cable with audio, video and data I/O on its side. Besides the strands of fiber in the cable, there are also copper conductors so that the base station on the right can power the necessary electronics in the reel.



Figure 2.99 Fiber I/O in a flight pack. This system is configured to support an HD or SD camera in a very remote location, along with a number of microphones, intercom and a couple of video feeds back from the truck. The yellow cable is the fiber back to the truck.



Figure 2.98 This marketing photo shows a recent addition to cable types spanning many venues, the fiber optic cable. One run could theoretically replace thousands of conventional copper cable runs. The practical limitation is the physical multiplexing and demultiplexing of those many signals at each end. But it is feasible to gather all the sources coming from a venue and multiplex them onto a single fiber going down to the truck. The drawback — a single source of failure. If anything happens to that cable... (Source: Telecast)

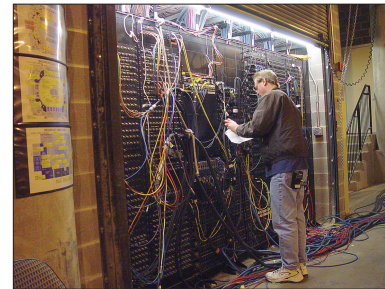


Figure 2.100 Many venues have I/O panels also. This one is at the American Airlines Center in Dallas. Permanently installed cables running throughout the arena terminate back at these I/O panels. The truck simply runs its cables to this point. Often short cables will also be required at the other end to go from breakout box to camera, microphone, etc.