CONNECTIVITY BEYOND THE PATCH BAY

by **Greg Hanks**

Three scenarios:

1 The room is a mess You know how it is. "We have the slickest audio post room in the city, but do they use our built-in conveniences? Noooo, they're bringing in all their own stuff from the outside! The lock-out session over the last couple of days has left keyboards, racks, video monitors and MIDI cables scattered over every inch of available control room space. And you don't want to touch it, 'cause it took the first day and a half of the session to get it working the way the client wanted. But you've got to, because the VAPP (video-audio-post-production) date is coming into the room in an hour. That means a day for the previous lock-out session to get back into gear, and they are *not* going to want to pay for it . . . ."

2 "Great, we've had the room working successfully for almost six months, all the cable hidden, and our synthesist has to be surgically removed from his programming position. The client wants to use his PC instead of our Mac, and the Jam Box will be replaced by the Cooper. SBX-land! SMPTE lines draped across the outboard, and on top of all that, he *doesn't like the location!* Oh well, it was too good to last. Just as well, we don't have the lines in place for the master controller anyway, so we just have to do it all over again. . . ."

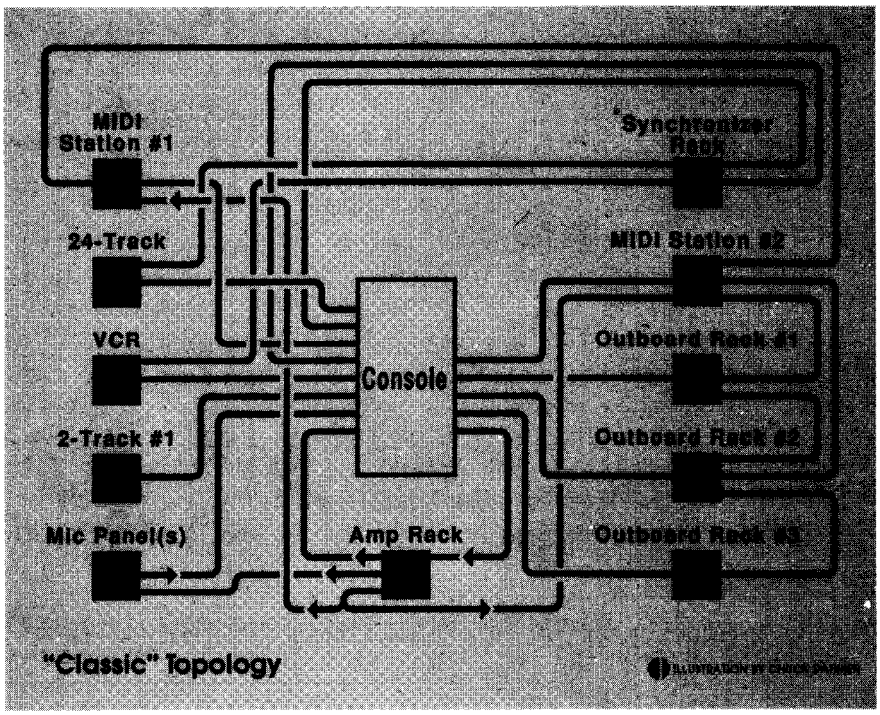
3 "While running the multi-track as a slave to the video machine, the room has no operational problems. But now the new "main client" wants a 32-track digital machine and everyone feels it's too noisy to keep in the control room. Now we have to rip out the transport control lines from the trough, move the audio feeds and put the synchronizers in a position that will be common to three different areas. We were warned that the maximum length we can run on the control line for the capstan is about 35 feet, and that's not even half the distance we have to cover. This is going to be a lot of work if they don't like working that way"

Change. . . it's one of the only constants of the recording industry As an industry, we have accepted the necessity of being able to "shape-shift" our business plans to stay alive. Becoming a specialist and targeting a small segment of the market has been one route of survival for many, while others see being a "generalist" as the key ingredient to success. To accommodate the diverse clientele that the industry offers, our equipment selection, orientation and functional control room/studio ergonomic environment must also be able to change. Often we do not know where the business is going, which makes it extremely difficult to allocate our resources in one given direction with complete confidence. This is illustrated by the extreme changes in studio methodology that MIDI has brought about. We therefore must be as flexible as possible, not only in our business plans but also in our equipment choices and room design and construction.

Our company, New York Technical Support, provides efficient working environments, designing around the above-mentioned problem scenarios by anticipating the demands of the clientele. Over the course of designing and installing the last eight to ten studio/control rooms we did, we have included:

A. A 25-conductor cable to outboard equipment locations. This cabling is intended for use with synchronization equipment.

B. "Synthesizer stations" in the rear of the control room with audio and MIDI capability.

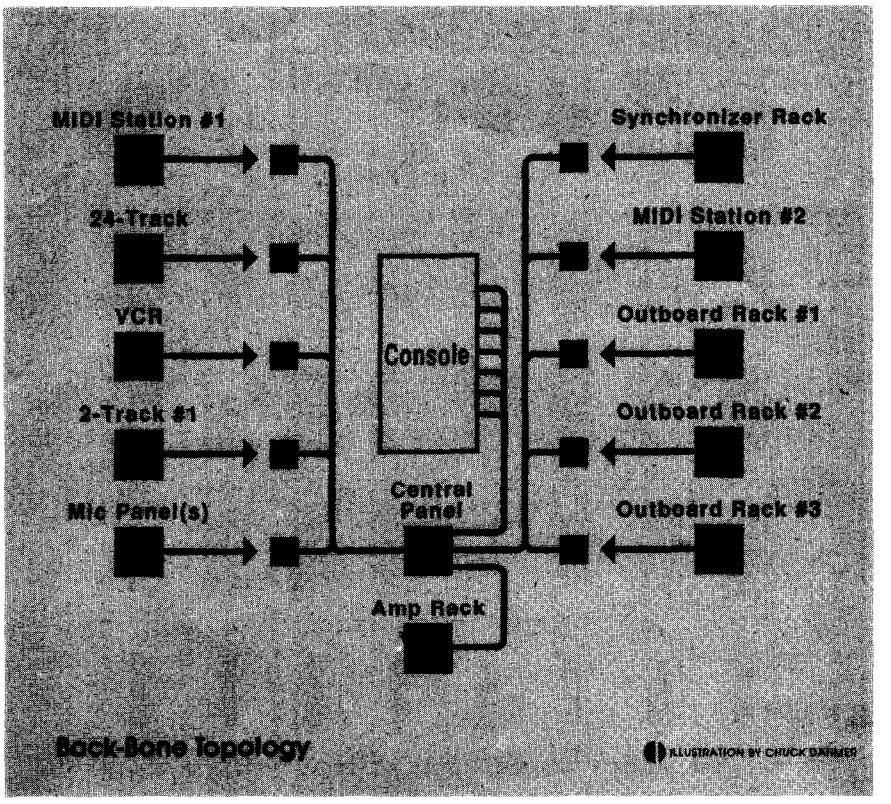


C. MIDI jacks on connector panels on the top and rear of outboard equipment racks for external synthesizers and processing gear. These jacks terminate in a wiring location that is perceived as central to the operation of MIDI-based equipment, such as at a MIDI patch bay

D. High-level cable to the outboard racks, console and synthesizer locations.

When a new installation is complete, everything works fine. As long as the room's function is not required to change, the solutions originally offered by the installation prove highly successful. When the business climate requires a radical re-direction of a studio's equipment use, in some cases we found the above remedies to be insufficient. For instance, when we provide one data line, the needed equipment rearrangement requires two. When we provide two data lines, we find we now need one for data and one for video. We found ourselves in that position one too many times. An established client of ours commissioned us "way back when" to assemble a little 8-track pre-production room. When we were requested to rewire the room to accommodate a second synthesist, second 24-track, a synchronizer and video system, we decided that a new approach was necessary. This article is an outcome of that decision and the resulting room.

Using traditional design methods, we allocate a piece of equipment to a location the user desires, typically in close physical proximity to other equipment of a similar type. The wiring necessary for accessing its functions is then put in place. Normally, a few flies get into the ointment along the way and these flies are what we strive to eliminate. For example, have you ever successfully integrated a PC into the console automation system, only to have the computer's fan and hard disk noise become a major annoyance? Well, the answer is to put the computer in a soundproof box, or move it out of the control room (a convenient location might be the amplifier closet or the room closest to the control room). Either way, the disk drive is now inaccessible for the person attempting to back up the hard disk, making that task even more onerous and less often performed than before. It also means we must add a second keyboard and monitor at the new computer location, *and* add



sMITE, automation data, keyboard extension and monitor extension cabling from the new computer location to the operator's position.

When contemplating any change in console location, rack location or an equipment addition, keep these cables in mind. Most wiring systems we've created allow for expansion and modification of the system design, but change sometimes requires different facilities than anticipated.

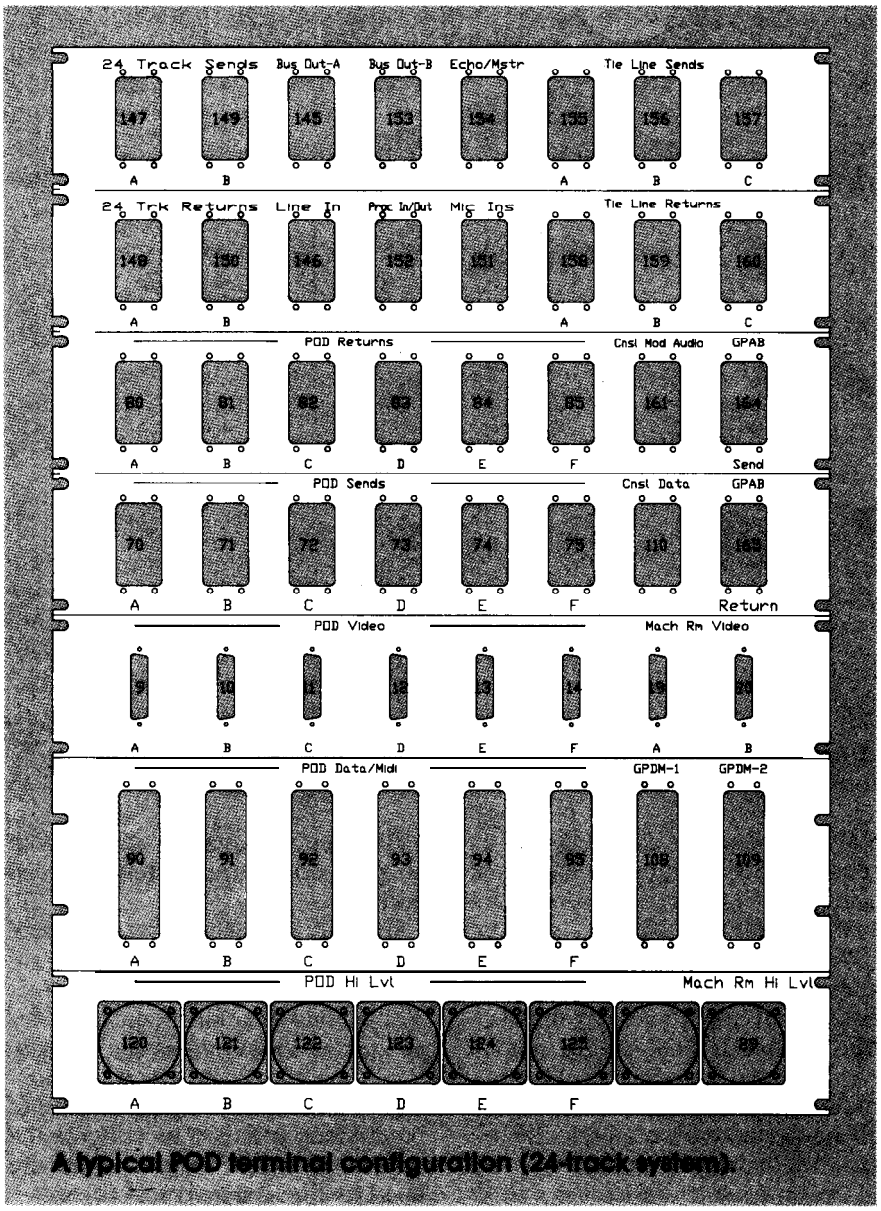
Driven by such difficulties, we set out to find an equipment installation method that could be all things to all people, over a long period of time. We wanted to provide our clients with an environment that could accommodate almost any rearrangement of the control room that their clientele might request, as well as integrate as yet undefined technological advancements in the areas of console automation, MIDI sequencing, synchronization and video post-production.

Our list of requirements included:
(1) ability to hide all MIDI cabling;
(2) ability to place the video monitor(s) or VCR where it is most convenient, not where someone laid cable for it a couple of years ago;
(3) feasible relocation of the synchronizers to a convenient operator position, with the ability to add a controller by adding a few wires and changing some jumpers;
(4) coherent signal grounding with all processing gear, including video and data;
(5) ability to easily move noise-producing equipment, such as computers, out of the control room, while maintaining their functionality; and,
(6) ability to easily change the configuration of a single piece of equipment, as well as a large grouping of equipment, and then reconfigure the system as it was before, when the need for the change ceases to exist.

We are not the first to arrive at these requirements, and many before us have accommodated these needs via the concept of a "central patch" facility, in which all wiring to and from all equipment terminates at a central location. (See "Lucasfilm's Skywalker Ranch," M&August '88.) This does not overcome the difficulties of physically relocating a piece of equipment, but makes changing its interface eas ier. A central patch is more oriented to multi-room facilities and does not address the individual control room vagaries.

A **New Alternative**

A different type of wiring topology was required to satisfy the above needs. We found a system that has been in use in other industries for years: the "backbone" interconnect system that serves telephone, data and



A typical POD terminal configuration (24-track system).

PABX networks.

The concept of a backbone system is one whereby all of the conductors necessary to accommodate any given system task appear at all equipment locations. This implies that at all equipment locations we have the ability to access a wiring system that will enable us to interconnect:

-audio, both sends and returns of mic level, line level and speaker level;
-video sends and returns;
-data: serial and parallel formats of dynamic data as well as machine tally, DC levels for things such as servo control, and static data lines for monitor and machine selection and control;
-SMPTE and MIDI;
-grounding and shielding.

In the traditional methods used by telephone companies, this simply means there are two to 34 conductors running from a central panel to each "user" location. A few minor changes are needed to make the concept fly in the modern recording environment. After all, it's difficult to get an M-49 to sound right after it has been routed around the building on a twisted pair!

To implement a backbone design in the recording environment, we must first determine the type of functional groupings we'll have, how to interconnect them and the manner of internal cohesiveness that will make the system truly flexible. In doing so, we must define several system concepts:

Central panel: The location at which all conductors forming the backbone terminate. At this location, each grouping of function will be interconnected. This is oriented to a single control room. In a multi-room facility, each control room's central panel can terminate in a "central patch" by treating the central patch as one or more "pod" locations. Such a system is hierarchical in organization but distributed in function. For cost considerations the central panel can be located under the console, although altemately it can live in a closet down the hall from the control room. The uniformity of pin-outs and the consistency of connector types are the essential elements of success in achieving system flexibility. All audio connections are made through the same type of connector. All data connections are made through the same type of connector as the audio, but in a different shell type, so as not to inadvertently cross-connect the two signal types.

Pod: A grouping of equipment that lives at any of a number of locations. The most common pod is a rack full of outboard gear. This equipment is assembled as desired within a rack, and wired to the pod termination, which is location-independent. There are many locations where this pod can be connected.

GPAB: The acronym for "general-purpose audio bus," and the name of the audio trunk line that serves as the audio "pipe" in the backbone system. In our design, this is a directionally oriented line, so it has two parts: sends and returns.

GPDM: The acronym for "general-purpose data and MIDI trunk," which provides for all the data, MIDI, SMPTE and control lines needed for a given function. We also directionally orient this trunk to provide for proper shielding and grounding with the many diverse requirements imposed upon it.

Video: A bi-directional series of lines for general-purpose, constant impedance use.

High-level: We provide two stereo cue systems and one stereo pair of bidirectional, genera-purpose, high-level lines. High-level lines are designated for use with speaker levels.

Some functional groups require a dedicated location. Their locations are mandated by many different criteria, including size, heating and cooling requirements, acoustic relationship to the monitor speakers and electrical power requirements. Considering such criteria, we can see that the console, monitor rack, computer rack and monitor speakers fall into this category.

These functional groupings are not what give us grief when we need to

. . . look at the ease with which we can change the face of the control room to match a desired function. ..

change the control room functions, but remain stable in the functional equation. We therefore find that all other functions fall within our stated definition of a pod. A pod can be a multi-track tape recorder, a Dolby system, a rack of MIDI-based synthesizers, a 2-track, a rack of cassette recorders or another complete control room! We must accommodate the console, the monitor rack and the computer rack interface at the central panel as well as provide for all the different pod locations. At each pod location, as well as at each dedicated function location, we allocate these signals: audio (mic level, line level and high level); data and MIDI signals; video; and grounds.

Next, we must decide upon the system's level of capability. This is most easily stated as, "How many different pod locations do we need?' Looking at the cable requirements (pg. 42) for each pod location, we see that with an excessive number of pod locations, our cable, connector and labor costs start to escalate drastically. At a minimum we must support all console functions, all monitor and computer rack functions and at least six pod locations.

In our first backbone installation, we decided to integrate the monitor and computer racks, supplying one GPAB, two GPDMs and two video trunks. This has proven sufficient. Expandability has been accommodated via modularization of the wiring system, which was accomplished through using a standardized connector panel and a standard definition of the pod. If we need more pod locations in the future, we simply bolt in another couple of connector panels, construct more pod trunks, drop them in the trough and we're done. The only limiting factors are rack space at the central panel location and room within the trough for the additional wires.

Use of fhe Backbone Concept

In setting up the backbone, we defined certain functions.

Console: The entire console was installed to the central panel. We performed several modifications to the console, so we put additional connectors on the console-to-central-panel interface to accommodate data, MIDI and other audio. These lines all follow the same pin-outs as the pods' and machine room GPAB and GPDM lines. We recently realized we could replace the console within an hour or two using the backbone system, assuming that we preassembled the console-to-central-panel interface.

Multi-track machines: Because we did not wish to access the audio and transport remotes of two multitrack tape recorders via the central panel, and the multi-tracks were set up right near the amp rack in a machine room, we decided to dedicate those functions rather than commit an entire pod trunk to each machine. We allocated one GPAB to each machine. All remote audio and transport functions to be accessed by other systems are interfaced through the first GPDM trunk of the machine room. We even have a remote VSO running from the console through the backbone!

Two-tracks: We have five 2-track machines in this system. Two-track #1 is a digital recorder, and lives near the multi-tracks. The feeds to and from traverse the machine room GPAB, and the transport and audio remote are via the first machine room GPDM. The other 2-tracks live in a rack with other outboard equipment. We use that rack as a pod, and the outboard, cassettes and **FI** all live happily together. In that rack we do have a remote monitor selector for the last two machines. The to and from wiring for this selector is handled through the central panel, making this selector easily moved and/or changed.

Console automation: We're using a PC-XT, disk-based automation system for the room. The computer lives in the machine room, while the keyboard and monitor reside at the console.

MIDI lnstrumentation: The MIDI-based sources in the room show up in three different pods. One is a dedicated keyboard controller, with an IBM AT monitor, mouse, printer and keyboard living in the control room. The computer itself, along with a Roland MPU-401 MIDI interface, lives in the machine room. At another location we have an additional dedicated controller, keyboard, mouse and monitor. This location uses a Mac II and again, the computer lives in the machine room. At yet another location, we have a J.L. Cooper 1620 MIDI patch bay operating in conjunction with a Jam Box. All MIDI information from each synthesizer, computer and keyboard routes through the central panel to these MIDI patching devices. Within the machine room itself, we have another pod position for other MIDI-based sources that do not require direct operator access. We can easily relocate the pod that lives at the location by changing a couple of connectors (about five minutes work!).

Outboard equipment: We have two racks dedicated to audio outboard. These racks, as well as the MIDI instrumentation groups, have our traditional panels on the top of the rack for interfacing external outboard (equipment brought in from rental or other sources). These panels now incorporate MIDI lines that show up at the MIDI patch bays.

To appreciate the benefits of this wiring approach, we have only to look at the ease with which we can change the face of the control room to match a desired function. An example of this would be, say, to build a rack of eight cassette decks for real-time duplication. Add a monitor selector and a source selector and terminate the whole sucker as a pod. You can pick up the control lines from the console through the GPDM lines, pick up the source signals through the GPAB sends and return the output of the monitor selector to the console through the GPAB returns.

Another example would be to decide to run the 24track from where the outboard equipment rack was be-

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hind the mixer, because the outside engineer doesn't feel comfortable not personally handling the machine. This is easily accomplished by plugging the machine interface into the old outboard racks pod location, and moving the central panel jumpers from the old machine location to this new one. In this manner the audio and transport remotes and synchronizer lines are transferred to this new location, and the outboard rack that was in the old location can be assigned to any other unused pod location. So, it is possible to relocate outboard, sampling keyboards or tape recorders to the ergonomic location that's best for the type of session coming in, with a minimum of fuss or downtime, be it a tracking date, overdub session or mixdown.

We came to realize some of the benefits of the system while building it. Through its flexibility, we found we could simply shift groups of cable from one location on a connector to another, and all the design work worked. The system appeared to be self-healing! By virtue of the connection scheme, pods are portable in nature. A problem that both the studio owner and our company faced was how to handle groups of equipment coming and going from the studio when the artist had to go out on tour. The solution of dual equipment setups was not acceptable because of the expense involved. With the pod concept, that equipment can be carried on tour in its pod form, or removed from the studio pod and installed in the road pod. As of this writing, we have just completed the installation of the first room of this type. We have yet to realize the full potential that this wiring topology represents. ■

Formerly chief engineer at Wally Heider Recording (LA and San Francisco), and technical director of Audiotechniques, Greg Hanks now heads New York Technical Support, which provides service, installation and consultation to the audio industry

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