

Recording Studio Consoles and Film Production

Modifying a recording studio console for film production is relatively easy-until Dolby stereo requirements come into play.

THIS ARTICLE WAS JUST going to be about how to modify a recording studio console for use in film production. But before going into how, it might be a good idea to look at why. After all, even though there are certain similarities between film and record production, there are a lot of important differences, too. Probably the most fundamental difference-from the point of view of the recording engineer-is the manner in which the "final mix" is assembled.

But even before that stage is reached, the "basic tracks" are usually recorded in an entirely different way. When making a record, there is, of course, the artist(s), the engineer and the producer-all working together at the same time, in the same recording studio. When making a film sound track, a lot more variables are involved.

So, let's begin with a little basic film production technique, which may be of specific interest to recording engineers whose previous experience is entirely based on LP record production. All you pro' film folks can skip ahead if you like.

While the film is being shot, the director works with the actors and a location sound recordist. Location sound is usually done on quarter-inch tape on a Nagra, using wireless or shotgun microphones. Sync is laid down by the Nagra on the tapes, which are called "dailies." The dailies are numbered, notated in a log, and taken to a transfer studio where they are transferred to magnetic stock.

The magnetic stock-or simply, "mag"-is a film base coated with ferric oxide-in essence, sprocketed tape. The two major categories of mag are full coat and mag stripe. Full coat is used for three-, four- and six-track recording, while mag stripe is used for mono work.

Once transferred, the mags are "sync'ed to pix," which means making the clapboard (that is, the sound) and the pix fit together. Pix are the prints taken from the film shot the day before. The synchronization process is one where pix and mag are put on a common-spool drive and wound through a projector/player with parallel sprockets. This is done to verify the proper synchronization of film and sound. The director and primary film editor now collaborate and do a "first assembly," which is actually the preliminary cutting. Once this is done, black-and-white dupes are made.

A number of transfers may be made from the sync'ed mags. These are distributed to the film editor, sound editor(s), and the music-score composer. At this point, the dialogue is refined, looped, and cut to pix. While the dialogue is worked on, the sound effects are refined and any necessary "Foleys" are recorded and cut to pix. Foleys are those sounds produced on a specially-equipped sound effects stage (a Foley Stage).

Next, the composer tries to write a score for the final cut, and record the tracks. The recorded score is then conformed to the final cut.

By this point, the sound track may be comprised of a

myriad of separate rolls of 35mm mag stock. To keep track of the overall soundtrack continuity, cue sheets are usually made up at the time.

"THE MIX" is approaching! Depending on whether this will be a mono mix or in Dolby stereo, the console will have to meet different requirements. In reality, the "mono mix" is usually a three-track mix (dialogue, music, sound effects) on a four-track recorder, with each track mixed separately. The fourth track is set aside for spare effects.

When film is being mixed, it is done using a collection of mag playback machines, each playing back one to four tracks of a given sound. These playback mags can each be considered analogous to a track on a multi-track tape recorder. Aside from editing, an advantage is that at any time in the production, any sound effect may be moved forward or back, in relative time to the track.

Each of these tracks is fed to the console, as is the music, and depending on the type of sound, sent to its corresponding bus. The recording is usually done on a four-track "pick-up" type of mag recorder, capable of inaudible punch-ins. Monitoring is done off the playback head at all times so that when the bus is monitored it is displaced in time by two frames (universally, the distance between the record and play heads).

When the sound is monitored, it is heard as a combined mono signal coming from the center of the projection screen. The monitor system is usually comprised of a bus/mag selector, a bus (track) solo system, switchable Academy equalization, and a mute and level control.

DOLBY STEREO

With Dolby stereo mixing, the personality of the console changes considerably. This may be noted in the change of bus functions.

With mono sound tracks, the buses are used for the discrete combination of music, dialogue, and effects, whereas in Dolby stereo the buses are used for relative location assignment instead. What this means in practical terms is that no longer is the film mixer afforded the luxury of building the discrete bus, which can later be changed with relative ease. Instead, the sound effects must be married to the dialogue. The music level is no longer handled with a sub-master, but is mixed pretty much as in a record production.

The four tracks used in Dolby stereo are left, center, right and surround. When recording in the Dolby format, the console is the same one that was used last week for a mono production. This means that what was last week's music bus (track 2) is this week's hard-center soundtrack. The efficiency of the change of roles is determined by the flexibility of the console and the imagination of the operator.

Before looking at the console in greater detail, perhaps it would be a good idea to review the basics of Dolby stereo. First of all, mono films are optically striped with a single track on one side of the film. The Dolby stereo optical track is different in that, like a phonograph record, each side of the optical track carries different information. Dolby has also made significant changes in the way we "see" motion picture sound. The differences are that noise reduction is used on the playback of the optical track, and one-third octave

Greg Hanks, formerly service manager at Audio-techniques, Inc., formed New York Technical Support Ltd., which specializes in studio installation and service.

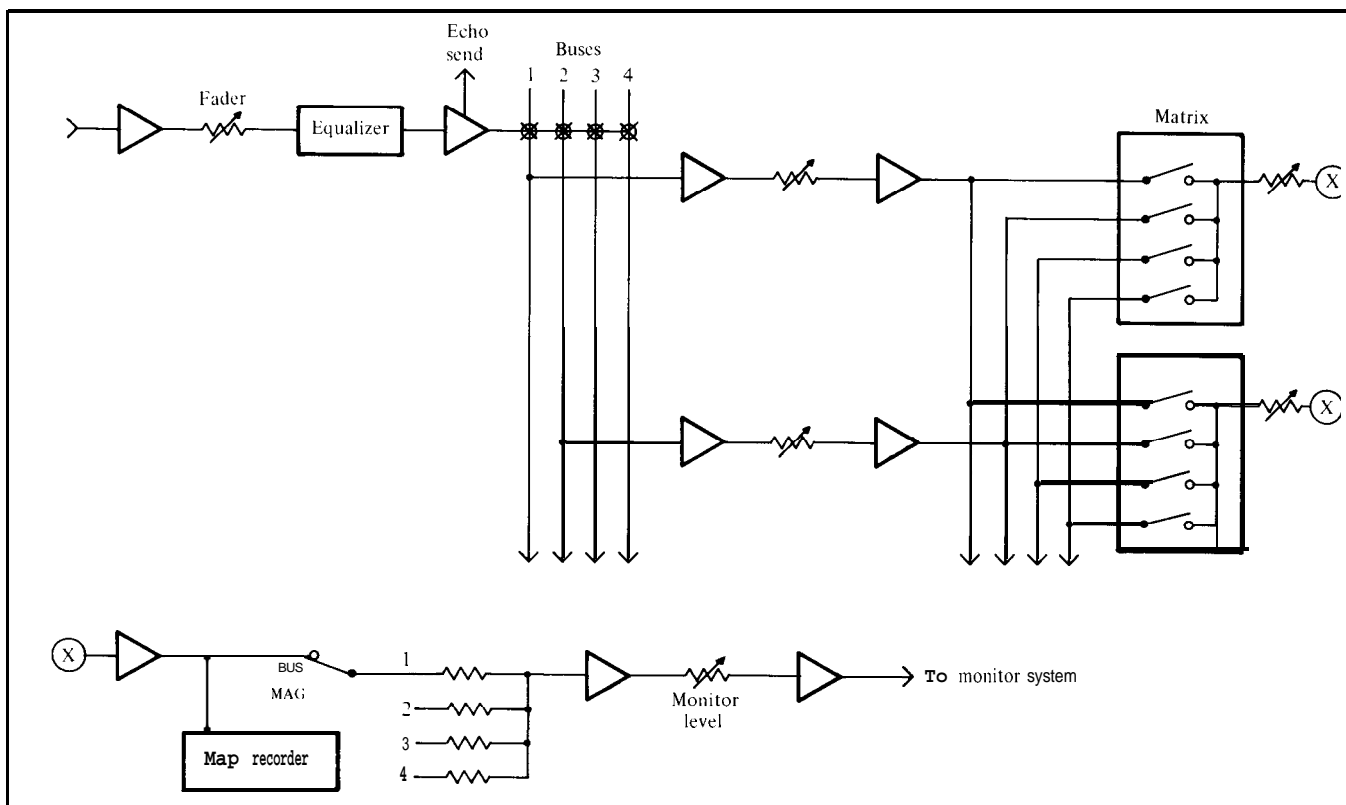


Figure 1. Console block diagram.

equalization is used in the theater playback system. The Dolby four-channel sound is encoded into two channels, using a phase-matrix system.

During playback, the signal is decoded with either a Dolby CP50 or a CP200. After decoding, the signal is sent to four one-third octave equalizers (required as part of the license agreement to show Dolby films), and then to the power amplifiers.

In the film studio, the encoding process for this four-channel system is handled by a unit called the DS-4. The Dolby DS-4 does much more than just encode four channels of information to two channels. It is a vital part of the recording studio chain during the entire mixing process. Because the matrix encoded uses phase information for directional cues, the matrix decoding is somewhat touchy when it comes to some source material. For this reason, all monitor signals are first encoded and then decoded before getting to the monitor amplifiers in the studio. The DS-4 does all this, as well as providing a mono compatibility check and additional metering inside the encode/decode chain.

The job of the classic film console is easily defined as a system that will combine many (up to and exceeding 56) sources on three or four different buses. As noted earlier, the standard configuration is dialogue, music, sound effects, extra effects.

Each input module usually provides:

- a channel fader,
- equalization (usually of the stepped type to accommodate repeatable settings),
- PFL and/or Solo, usually pre-equalization,
- discrete (usually, one to four) bus assignment. At times the send buses are ganged with the main assigns to marry the effects send to the main track.

The buses are usually sub-grouped, with the return of the married send buses returned before the sub-master. The groups are matrix-selected to the different tracks of the mag film recorder. A board master is most commonly provided.

The monitor section of the film console provides:

- mono fold-down of the four tracks,
- Academy equalization of the monitor output,

- bus/mag selection for the four tracks/buses (pre-fold-down). Generally, this selector is a master selector for all tracks,
- track solo, which is a facility to solo the individual tracks,
- monitor mute/dim. This is an overall function.

A block diagram of the standard console is shown in **FIGURE 1**. As can be seen in the figure, a standard mono film console is a relatively simple device. With a little creativity in patching, almost any recording console can fulfill film requirements. The four buses could be the first four buses of the console. The bus/mag select of the monitor could be the multi-track monitor bus/tape switch. The monitor section of the console is set up with tones for unity fold-down to mono, and most consoles have some facility for track soloing. The effects returns would be brought back to the input modules, and the sends could use the second set of four buses.

When using a recording console for film recording, the important thing to keep in mind is that the pan pots should never be in the circuit and the monitor of the four buses that feed the mag recorder should be level-matched, never touched, and combined to mono in the monitor. Console crosstalk should be very low, and the noise of the input channels should allow for multiple passes through the board without any noise contribution.

This all sounds simple enough, and it is. At least, it is a very simple thing to do mono recording on a multi-track recording console. However, Dolby stereo is quite another matter.

Let's look at Dolby stereo requirements with a function-by-function description of the console.

INPUT MODULE

The input module should be able to send the signal (after the common facilities of level, equalization, etc.) to any one of four discrete buses in the mono mode, and send the same signal through a pan pot to the same four buses in the stereo mode. The panning should be left-to-right, left (or right)-to-center, left (or right)-to-surround, and center-to-surround. One essential aspect of the pan pot is that it must be down

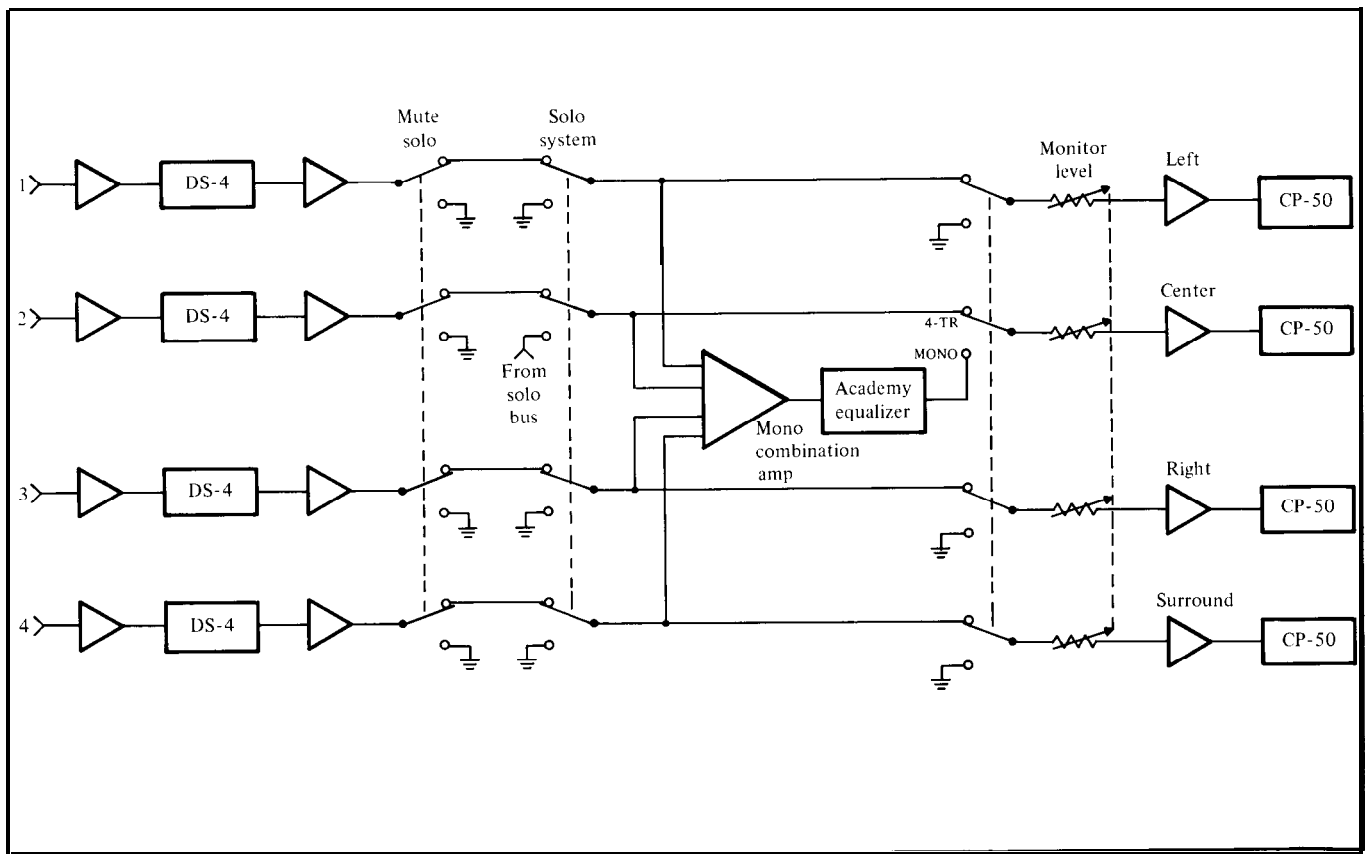


Figure 2. Monitor system detail drawing.

3 dB in the center; when the console is in the mono mode, the pan pot should be out of the circuit.

Discrete sends can be used interchangeably between mono and stereo modes. A minimum of four sends should be available. Something to note is that for 95 percent of the time the input modules are looking at line in, and a trim at this point in the signal chain is a very useful feature.

GROUP OUTPUTS

The group outputs in the mono mode should go through some form of sub-master that is accessible and easy to use. An overall board master should follow, and then the signal should go to the mag recorder (with metering and monitoring on the recorder side of the patch bay). However, for the stereo mode, the signal path must be broken between the console output(s) and the recorder input(s) to accommodate the Dolby DS-4 encoder. The outputs of the DS-4 then feed the recorder and the console bus monitor position. This function is usually accomplished within the patch bay of the console. The only real difficulty is to break off the bus monitor point within the console and make this an external function.

MONITOR

The monitor circuitry needed for Dolby stereo film (see FIGURE 2) requires a bit more than is readily available within the standard recording console. The requirements are:

- to be able to monitor the bus as an external function, as mentioned above,
- to be able during stereo recording to select bus and mag and send the selected signal at a +4 level to the FROM RECORDER inputs on the DS-4,
- to be able to return the monitor signal from the DS-4 output and insert it into the monitor chain before the individual channel mute/solo system, and before the master level control, mono check, and Academy equalization.

COMMUNICATIONS

The film post-production re-recording process is one of mixing and therefore requires very little in the way of communications. The only exception is the communication required between the projector operator, the machine-room operator(s), and the mixer. Most film studios are built with the projector directly behind the mixing theater. In a larger facility, or in one that maintains more than one mixing theater, there is usually a central room in which the dubbers and recorders are placed. In this location there is at least one person who changes patches, reels, and framing on the machines. Some form of internal phone-type intercom must be incorporated in the console system to allow for communication between all these facilities.

Sometimes the mixing theater will be used for live mixing or dialogue replacement. At these times, it is necessary for the standard talkback and cue facilities to be in place. Slate tones, and slate inject of voice on bus are also necessary for smooth operation.

MACHINE REMOTES

For any type of production facility, the requirements of machine control are directly proportional to the importance of ease of operation. With most studios this means that the direction controls of forward, stop, reverse and record, as well as individual track record on and off, are necessary. Other controls that are handy to include in the remote control package are inching, 2x (4x, etc.) speed, and shuttling. Something to note is that most mag machines do not have fast forward or rewind in their vocabularies. Inching is the capability to move forward or back one frame at a time, 2x means double speed, and shuttling is the same thing as MVC.

As can be seen, most professional recording consoles can, with a little modification, be applied to the re-recording process for Dolby stereo film production work. In the second part of this feature, the case histories of two such consoles will be described.

The following sidebar was written by Mel Zelniker of Sound One Corp. Mel is one of New York's more prominent film mixers. This is often given to clients preparatory to their coming to the mix.

Mixing Tips for Dolby Stereo

In today's world of production deadlines and squeezed budgets, the preparation and completion of a Dolby stereo mix represents a formidable task for both editor and mixer. On the East Coast, where film mixers usually work on mixing desks designed for single-seat flying, it is of paramount importance that the prep work done by the sound editorial team be organized in a most efficient manner.

For obvious anatomical reasons, the mixer is not going to handle the entire track inventory for each reel at one time. He is going to pre-mix. How these pre-mixes are organized can spell the difference between a smooth creative mix and a battle.

As in traditional stereo, a signal sent equally to left and right is perceived as mono or "phantom center." In very wide theaters the phantom center may present perceptual problems to the viewer seated very far off the center-screen axis. Keep this poor guy in mind; we will get back to him in a moment.

The first pre-mix will be for dialogue. We have found that it makes things neater if certain effects textures are added during the dialogue pre-mix. Most of the time, the dialogue is going to come from channel 2 or hard center. We have found that the production "room tones" that are used to fill editorial gaps in the dialogue track work best if they are also sent to hard center. The same applies to "production effects," i.e. those effects actually recorded while dialogue action was taking place. In traditional mono editorial technique, these are usually split off onto the effects track of the master. In stereo however, we have found that for the off-axis viewer the sound "images" more realistically when sounds made by center-screen action come from hard center, as opposed to phantom center. For this reason we lay out our dialogue pre-mix as follows:

- Track 1, dialogue,
- Track 2, alternate dialogue and/or dubbing lines,
- Track 3, production effects,
- Track 4, room tones. In the final mix these all go hard center.

In addition, we will at times also lay down the Foley tracks along with the production effects.

Now the fun begins. We begin our stereo pre-mixes. We generally approach effects first. There is no cut-and-dried rule of thumb here. Atmospheres such as sea shores or airport backgrounds work wonderfully when recorded in stereo. In addition, the editorial staff will have prepared specific sounds to be placed left, right or on the surround channel. You can surround yourself in a jungle with monkeys chattering behind you, elephants on the right and birds on the left. It's all up to the imagination, and it's what makes a stereo picture sound so alive. But treat these pre-mixes with caution. If it isn't planned right, you can get trapped.

First, always have your dialogue pre-mix up for listening purposes. We are able to monitor the pre-mix while recording the effects pre-mix. This allows us to

set an idea of the rough balances between the hard center and the stereophonic tracks.

Second, we like to break our effects pre-mixes down to at least two units so that backgrounds from one scene are not butted up against the next scene. This involves editorial preparation so that these backgrounds are "checkerboarded." Later, when all the pre-mixes are up and running at the final mix, you have the freedom to change the relationships from scene to scene without the need to do "on the frame" punch-ins.

Third, while it's possible to accommodate a certain amount of panning during these pre-mixes, you can do a better job if the big action scenes with a lot of cross-screen panning are handled as a separate pass.

And fourth, treat the surrounds with respect. We never know how the surround channel is going to be set up out there in theatreland. It is the most variable aspect of any Dolby theater. Therefore, we have had the most success in treating it as a special effects channel. Experience has shown us that it is not smart to place constant information in the back of the theater. Also, for reasons best left to a more technical discussion, too much reliance on surround can do ugly things to mono compatibility.

At this point we have at least three pre-mixes available to us: the dialogue, and effects #1 and effects #2. We may have even more. Now comes the music. "Source" music (music coming from a radio or TV seen on the film screen), is generally mono. We place it in phantom center. The score is stereo, naturally. Nowadays it has become increasingly common to have the score divided into eight or more tracks for each cue. This is done because experience has shown that the balances achieved in the recording studio do not always prove to be the same when heard against dialogue and effects. Fletcher Munson, cinema equalization, and theatre acoustics all come into play. So here we are with Music elements A through E, some involving 12 faders, and the music department is asking for six cross-dissolves in 45 seconds of screen time. We're going to have to pre-mix again.

At this point, all things being equal, you are ready for that magic moment. Everything has been done right. Dialogue is smooth, the effects pre-mixes mesh one to the next, and your music is in manageable form. With an occasional hand from the people around you, the process by which all these elements come together begins. Soon you'll have the pleasure of seeing and hearing a Dolby stereo film. Mono just isn't the same.

It should be noted that this was written from the standpoint of a one-man mix. Rules are made to be broken and nothing is boilerplate. The organizational and editorial suggestions given here have worked for us. Any other suggestions would be appreciated.

As can be seen from the preceding paragraphs, film requires editorial coordination between engineering and production well beyond that expected in the record industry. ■