

Monitoring Multichannel Television Broadcast Audio with TSL Products

Multichannel audio is more than just 5.1

In recent years, multichannel audio has become an integral component of the modern broadcaster's workflow. If you mention the word 'multichannel' to most TV professionals they will generally associate it with surround sound audio.

The reality however is often something much broader and more complicated than just 5.1. This Application Note examines the challenges associated with multichannel audio monitoring.

Precision Audio Monitor Series (PAM)



A Balancing Act

Where a TV show or project generally comprises of a single video signal, the associated audio channels may contain stereo and surround programme, separate effects mixes, audio description (AD), alternative languages and Dolby encoded tracks.

Monitoring the audio within such diverse content requires specialist equipment and since the technician, engineer or production team member listening to the audio wants the task to be simple and intuitive, the monitoring unit in question must carefully balance a high level of sophistication with ease of use.

TSL Products PAM Series of audio monitors gives operators the flexibility and functionality they need to handle even the most complex multichannel audio infrastructure. With virtually all features and options available within a single button press, complicated multi-level menu structures are consigned to the past.

Monitoring multi-programme embedded audio within an SDI stream

Embedding audio within an SDI video signal is one of the most efficient and effective means of transporting multiple audio channels across television broadcast infrastructures. 16 audio signals can be multiplexed within a single HDSDI video circuit and broadcasters have subsequently developed many different programme configuration 'standards' which use up to the full compliment of 16 channels.

Since there is no common standard for audio track allocation within HDSDI there are many variations in use around the world. Many versions represent a 'standard' for a specific broadcaster whilst some may be defined as a fixed format used for interchange of media between national or regional broadcast cooperatives.

Example 1 - Audio Track Number

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Stereo Mix		5.1 Surround Sound Mix						Stereo Effects		5.1 Surround Effects					

This table shows a track allocation table used by Sky Sports in the UK to transport simultaneous stereo and 5.1 programme mixes along with effects only versions for international distribution.

Example 2 - Audio Track Number

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5.1 Surround Sound Language 1						AD Language 1		5.1 Surround Sound Language 2						AD Language 2	

This example, used by France TV, delivers dual language surround sound with audio description

Example 3 - Audio Track Number

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Stereo Language 1		Dolby E (5.1) Language 1		Stereo Language 2		Dolby E (5.1) Language 2		Stereo Language 3		Dolby E (5.1) Language 3		Unallocated			

The final example uses only 12 tracks from a possible 16 but includes both stereo PCM and Dolby E encoded surround sound for three languages. This version is used by a European broadcaster who's international and national audience requires multiple language delivery.

*A few examples: (please see reference <http://tech.ebu.ch/docs/r/r123.pdf>)

The last track allocation table represents the most complex use of multichannel audio of the three examples shown, however a TSL Products PAM2 MK2 equipped with the Dolby decoding card option would provide an operator a one-touch solution to monitoring all six embedded programmes.

This image shows how example 3 would appear on a PAM2 MK2 bargraph display.

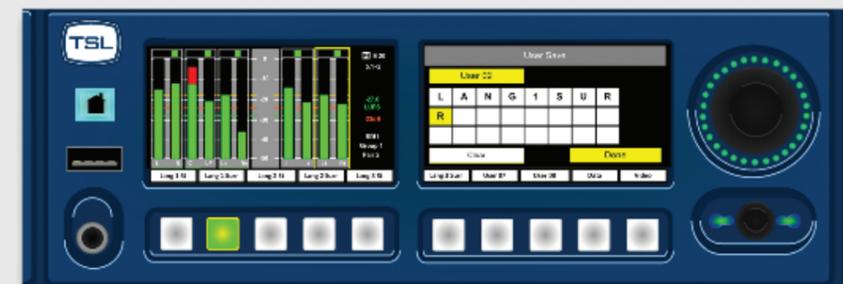


By simply assigning six user presets, one to each of the six embedded programmes, the operator can check each of the stereo and surround language tracks instantaneously with a button press.



This image shows a PAM2 MK2 with presets one to six programmed to recall each language channel.

Saving a user preset is as easy as saving a favourite radio station on your car stereo. Press and hold the preset button associated with the preset that you want to assign the settings to, follow the prompt to name the preset (if you wish) and select 'done' to finish.



Monitoring non-standard channel orders and alternative commentary tracks using 'Assign Matrix'

When a major sport, political or entertainment event is broadcast to an international audience it is often the practise of a host broadcaster to create and deliver an effects mix (without speech) which may be accompanied by mono commentary tracks in several languages. Audio monitoring devices capable of downmixing surround sound channels are usually restricted in their ability to adapt to audio that isn't formatted using the L/R/C/LFE/LS/RS standard. TSL Products PAM is not restricted in this way due to the inclusion of a unique feature called 'Assign Matrix' which allows the user to route the incoming audio signals in any order to the monitoring section of device.

Assign Matrix is a 16 into 6 audio router where up to 6 of 16 audio inputs may be routed to the monitoring channels labelled L/R/C/LFE/LS/RS in any order.

Audio Track Number

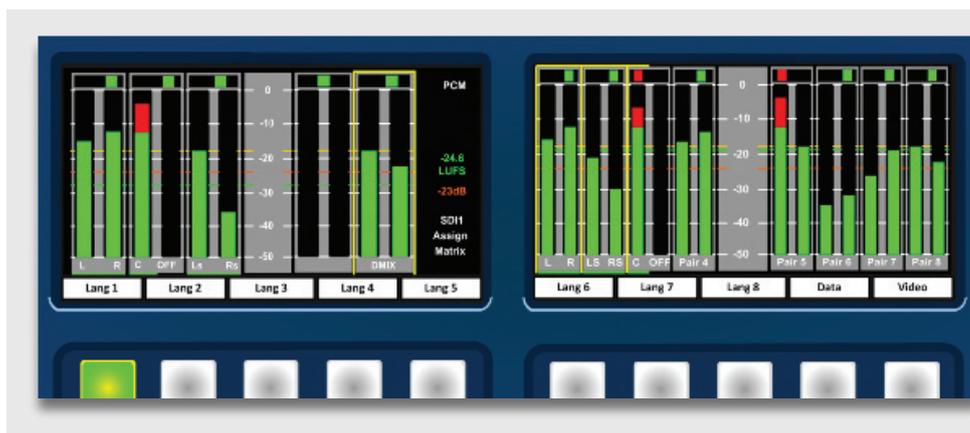
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Left and Right Front Effects		Left and Right Rear Effects		Lang. 1	Lang. 2	Lang. 3	Lang. 4	Lang. 5	Lang. 6	Lang. 7	Lang. 8	Lang. 9	Lang. 10	Lang. 11	Lang. 12

The track allocation table below shows an extreme example of an SDI signal with 16 embedded audio tracks comprising a 4.0 effects mix and 12 individual language commentaries. This is the kind of delivery that might be output from an International Broadcast Centre at a major sports tournament.



A PAM audio monitoring unit would be used to check the output of each individual language as it is transported around the broadcast centre and ultimately, by the international clients receiving the transmission. To monitor Language 1 the Assign Matrix would be configured as shown.

With all 12 languages fully configured as User Presets on a PAM2 MK2, the unit would appear as per the example below with the left hand bargraph screen displaying the monitored channels selected within the Assign Matrix and the right screen showing the input sources.



User Preset 1 is currently selected and a downmix monitoring mode automatically activated to check stereo compliance.

TSL Products PAM series – a few other helpful features explained

Dolby Decoding – TSL Products PAM series can be fitted with a Dolby card capable of decoding Dolby E, Dolby Digital and Dolby Digital Plus audio. When a Dolby encoded signal is selected the PAM automatically decodes the signal, uses the programme metadata to identify the individual channels and create a downmix (Lt Rt or Lo Ro) so that an operator can immediately identify any coding problems and audibly check the content.

Downmixing – Using a dedicated button, the PAM user can select six contiguous 5.1 audio channels and automatically create a downmix to check stereo compliance and compatibility. For non-contiguous 5.1 audio, use Assign Matrix, described earlier in this document.

Loudness Measurement – PAM features onboard loudness measurement as standard. Users can configure their monitor to measure loudness to all common international regulations and recommendations from any mono, stereo, surround or Dolby encoded signal type. PAM2 MK2 units equipped with the Dolby CAT1100 card can even measure two instances of loudness from within a PCM and a Dolby encoded signal simultaneously.

User Presets – All PAM series products are equipped with 24 onboard user presets each of which provides a snapshot of the entire system configuration enabling the user to tailor setups for different signal formats, bespoke track orders, encoding types or for specific shows and productions. Presets can be backed up or loaded via a USB storage device.

External Speakers – Almost all TSL Product audio monitors are designed to connect to external stereo speaker systems if the application requires it. Unique to TSL, you can also use any model in the PAM series as the controller at the heart of a 5.1 loudspeaker system. A clever onboard facility enables users to switch between internal and external speakers for flexible nearfield and main monitoring.

Aux Input Mixer – Another feature unique to the PAM series is the Aux Mixer. A customer who was using PAM2 in an OB Truck wanted to be able to wear headphones plugged into the audio monitor but realised he wouldn't be able to hear Talkback. The solution was the Aux Mixer, enabling the user to monitor their programme audio whilst being able to listen to an analogue or AES input at the same time.

Audio Delay – Modern video monitoring systems often suffer from latency issues, particularly those with processing engines such as Multiviewers and Virtual Set Graphics generators. In order for the associated audio monitoring to remain in-sync with the picture, PAM is equipped with an audio delay of up to 250ms configurable in 1ms steps. Since the delay can be set at different values for any of the 24 User Presets you can assign a different delay setting for varied sources (HD and SD, 'live' and processed) and bypass delay for those that don't require it such as analogue and AES inputs without associated video.



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