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DUAL CHANNEL SOUND IN THE INDEPENDENT TELEVISION NETWORK

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Introduction

ITV companies will soon start to broadcast dual channel sound as a national service. The IBA is hoping to achieve around 75% coverage by late 1990, this will be preceded by a preliminary service next year by some of the larger contractors including Thames. The introduction of dual channel sound into the studios and its distribution from there to the transmitters has involved the setting up of a unique system, some details of which this paper will outline.

In the case of Thames TV it is proposed that the internal distribution of the dual sound signal will be made using the AES/EBU digital audio standard. This will allow the Broadcaster flexibility in the future to upgrade from 16 bits to any new developments in the digital audio field. The connection from studio to the transmitter, which is the responsibility of the IBA, is to be made using a system of sound in syncs (SIS). This system inserts a time compressed digital audio signal into the sync pulses of the video signal, so eliminating the need for extra audio cables to be laid. Finally the digital audio information will be transmitted on an extra subcarrier carried with the normal modulated Television signal.

Studio Considerations

At present most television broadcasters operate in mono for the generation and distribution of their audio material. This means that the switching and cabling used in the studios is designed only for single channel work. To replace this with stereo pairs would be very difficult and expensive, due in part to the lack of spare space in the studios' cable ducts. Similarly, the replacement of a mono matrix with a stereo one would require a doubling of rack space and the number of distribution amplifiers.

The proposed use of the AES/EBU digital audio interface would simplify this installation and provide some positive benefits over the twin wire analogue solution. These can be summarised as follows:-

1. The stereo signal can be transmitted along an existing audio cable using all of the connectors and jackfields in present use.

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2. Digital matrices can be used which will be smaller than analogue equivalents and which will not introduce distortion and noise to the signal, thereby enabling cascading of matrices without degradation
3. Signal degradation will be minimised when interfacing to digital machines such as the PCM MII recorders soon to be installed at Thames.

The existing analogue sources such as mixer outputs will, of course, require codecs but if conversions are kept to a minimum then maximum benefits can be expected. There will also be a requirement for a standards converter at the studio output. This will have to convert the 48kHz sample rate used for the AES/EBU interface to the 32kHz used in the Nicam system. As such converters are essentially digital filters, there will be some modification of the audio signal and some delay. This can be reduced to an acceptable level by use of suitable filter implementations allied with the latest digital signal processing i.c.'s such as the Texas Instruments TMS 320 family. Such converters are now under development at the Thames Laboratory and by the manufacturers of the SIS encoders which are to be used by the ITV network.

Network Considerations

At present the ITV network has to carry feeds from a company to any or all of the other companies on the network, the company's output is also fed to the local IBA transmitter. These feeds at present comprise a separate video and audio signal path. Clearly when the network is running a stereo service an extra audio path must be added. It would, of course, be possible to simply add an extra audio channel in the manner of the existing network, but in addition to the extra cost of this solution the overall sound quality of the audio would not be enhanced. As the proposed method of transmission of the stereo signal is via a digitally encoded subcarrier added to the existing UHF signal, it was decided to use the same coding for sound transmission through the network and carry it in the syncs of the video signal. This means that the existing audio channel could be dropped (so saving money) and the quality of the audio signal maximised throughout the chain. The main limitation to quality now becomes the coding method chosen, in this case a 14 bit linear signal, block compressed to 10 bits for transmission at a data rate of 32kHz. The sound in sync (SIS) coders being supplied are capable of transmitting 728kB/sec of time compressed digital audio, plus 11kB/sec of auxiliary data. This equipment will code the signal into four level symbols which are then transmitted at 6.552 M.symbols/s in the line syncs (fig. 1).

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At this point several problems emerge:-

1. ITV companies have to insert local advertisements onto a network programme and maintain synchronisation. The same situation occurs with the Channel 4 feeds.
2. Cascading of Nicam encoders means that the audio is delayed with respect to the video. This implies that decoding and encoding at remote studios for routing through presentation mixers could result in lip sync problems.

The solution proposed in the case of Channel 4 is to route the network feeds through a crosspoint switch at the remote studios, thereby avoiding the need to decode the Nicam signal. The locally produced material (mainly adverts) could then be switched to the transmitter feed via the crosspoint switch after being synchronised to the network feed (fig. 2). The main disadvantage with this system is that it would not be possible to crossfade the local source to the network feed or to provide locally generated voice-overs.

In the case of the ITV1 service it is proposed at Thames to take the incoming network feed strip out the SIS signal and transcode this to our 48kHz AES/EBU standard. These two signals will then be synchronised to local station syncs and fed to the presentation mixer prior to transmission. The audio mixer will need to be a digital one able to take the digital standard chosen for the studios. The output of this mixer is then coded back to 32kHz Nicam in the SIS encoder at the station output (fig. 3). Although this does mean some sound processing is required, it is felt that the benefits of being in control of the signal will outweigh the problems this may cause.

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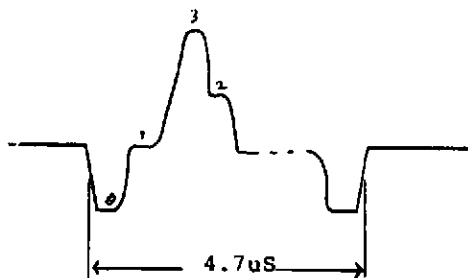


Fig. 1 Four level symbol information inserted in line sync.

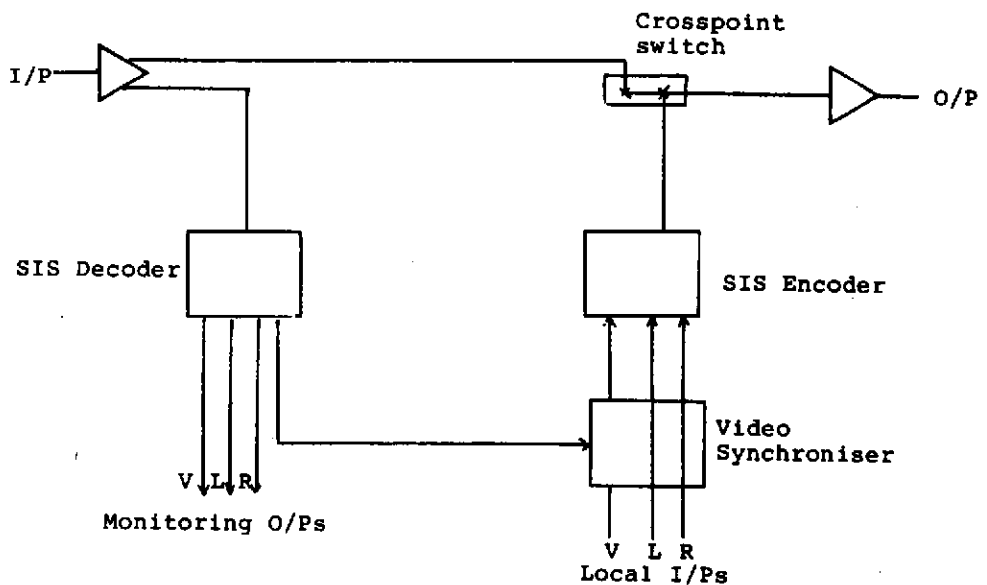


Fig. 2 Proposed Channel 4 Feed Through ITV Studios.

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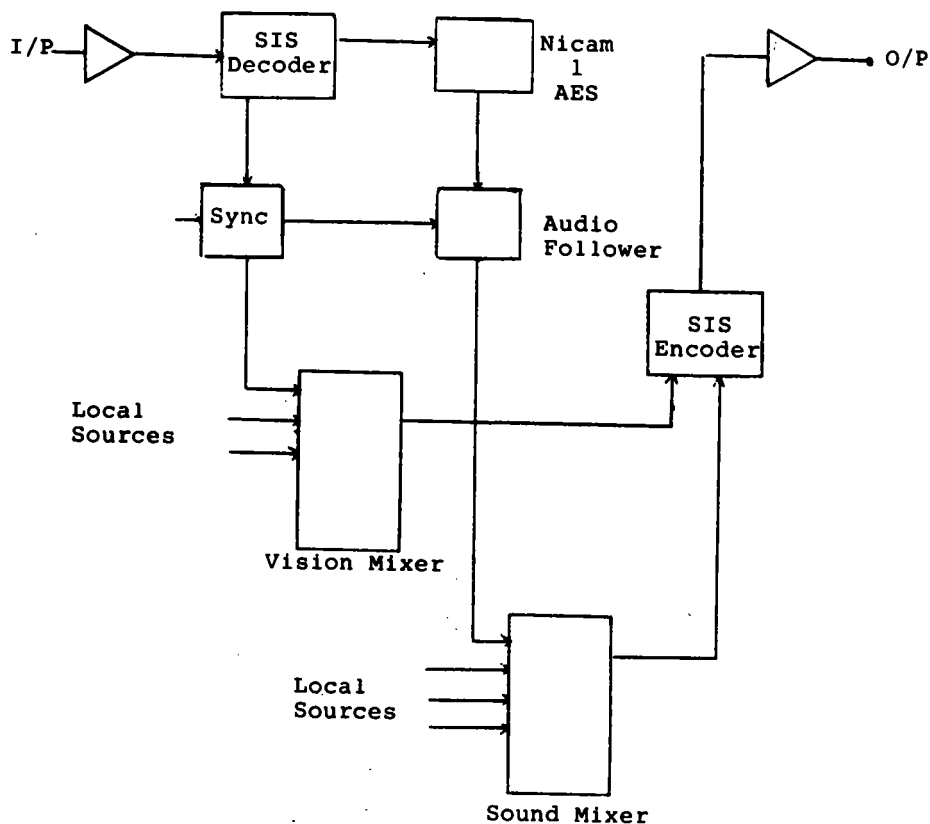


Fig. 3 Proposed ITV1 Studio arrangements

