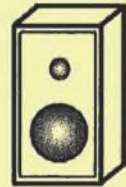


A Manual of

Television Stereo



Sound Operations

Ray Angel

ABOUT THE AUTHOR:

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Since he engineered the sound for "The Forsyte Saga", he has worked on innumerable Drama Serials, Series and Plays, including several of the BBC's complete Shakespeare series.

Among the many music productions over the years, he won an "Emmy" for his work on "Profile in Music: Beverly Sills" (1975); a British Academy of Film and Television Arts craft award for Verdi's "MacBeth" (1977); BAFTA again for "Sounds Magnificent" (1984) and gained a BAFTA nomination for "Cosi Fan Tutte" (1986). In 1982 he recorded the music for the Italia Prize-winning ballet "The Cruel Garden".

"MacBeth" was the first major production recorded in stereo at the BBC's Television Centre and was Ray's first breakthrough into what had been for long before then a mission upon which he had set himself, that was to bring stereo sound into Television for all types of production. He has been the leading proponent of stereo for TV, presenting a paper on the subject at IBC 80 and has engaged in continuous operational development work to this end. He has been the organiser of the experimental transmissions since their commencement in 1986 up to his retirement from the BBC this year.

A MANUAL OF
**TELEVISION STEREOGRAPHIC
SOUND OPERATIONS**

RAY ANGEL

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Published Privately

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*with diagrams drawn by
Paul Ostwind*

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PREFACE

The advantage of Stereo over mono is its ability to give width to sound. By thus allowing the ears to receive information more closely to the way they function in real life, it considerably increases the sense of involvement and therefore the pleasure of the Television viewer. If the sound does not have width, the benefits of stereo are absent; it is mono. Some of the ingredients of a diverse Television service may not lend themselves to significant enhancement from width; such as speech directly addressed to the viewer. In many cases, however, such speech may be part of a Production where stereo width does have effective use for other elements of the programme. In which case, the integration of such mono speech in an overall stereo sound presentation may be desirable. Ultimately though, if a programme is to be fully stereo, it must have width and good stereo must have a free, fluent and consistent deployment of it. The harbouring of pessimistic views of how the public appreciate or misuse our product by inadequate reproduction apparatus, should not deter us from balancing and transmitting our sound to the highest possible quality and for optimum monitoring arrangements. If our viewers deny themselves the benefit of our product by the use of inadequate receiving equipment, let them never be able to retort that our product does not warrant anything better.

Stereo for Television has been very hard won and long overdue. The problems now are, as after all battles, how we live with and administer the territory gained. The main part of this Manual is intended to assist in the establishment of the new order and assumes conversance with the old or mono practices.

A resumé of the campaign may help us to guard our new frontiers and continue to promote our cause with due enthusiasm.

In September 1987, NICAM 728, a digital transmission system for stereo Television which had been developed by BBC Research Engineers in conjunction with the IBA, became the approved system for terrestrial transmission in the UK. It had been on trial at the BBC transmitter at Crystal Palace since the Spring of 1986. By the beginning of 1989, although over 1000 programmes had been transmitted, they were still only regarded as experimental test transmissions. The IBA had announced a stereo service to start later that year. The BBC were giving cause for optimism but their technical staff were exasperated after years of effort to promote a stereo service. The electrical trade, particularly firms that had been producing NICAM-decoding domestic equipment since late 1987, were not amused either.

The struggle for stereo TV went back many years before NICAM made it technically feasible both in terms of transmission and distribution circuits. In 1979, although occasional simulcasts with Radio had been taking place since the early seventies, only a very small number of sound engineers had been trying to promote stereo for Television. From most quarters in Broadcasting, disinterest, hostility and even derision were the reactions that were provoked. A paper was issued by the Department which was eventually to design the transmission system, which, being based upon the paucity of experience and unenthusiastic views which had been espoused up to that time, largely concluded that stereo was both undesirable and unworkable. That challenge was met by a range of programmes being made in stereo so that the proof could be demonstrated in the hearing. It also helped that another country the other side of the world whose name there is no need to mention, were already transmitting stereo TV for music and sport programmes (mainly Sumo, of course). Stereo just had to

win through. After all, it would have been more astute and indeed easier to prove that it is Mono sound that does not work!

The advent of NICAM transmissions by no means left the field open to the advocates of stereo. Opposition shifted from theoretical subjective grounds to the more seriously alarming areas of cash, resources, commercial interests and the needs for staff to acquire new knowledge and operational skills. An era of financial rigour also descended upon TV broadcasting. Although, where there had been a degree of foresightedness, many sound control rooms and dubbing suites in Television services were stereo capable, the major problem area was Videotape who weren't and had no great desire to be. Routeing circuits, C format machine sound head alignments, stereo monitoring, staff knowledge and experience, and an understandable reticence to become involved with stereo recording and editing before official acceptance of stereo and the resource provisions that would then accrue, meant that stereo programme-making, which was necessary to convince Television production organisations of its desirability and to foster interest from the viewing public, had to be achieved with very restricted cooperation from that technical area which handled the vast majority of programmes both in the origination and transmission processes. This meant that most of the NICAM transmissions that were possible in the "experimental" years were perforce "live" programmes or "live" parts of programmes. Not least of the worries during that critical period, was what at times, seemed like a fifth column among TV sound practitioners themselves. There were both those who harboured a defeatist attitude by suggesting that mono sound was quite difficult enough and stereo would not be appreciated anyway either by their employers or the viewers and those who, with similar underlying Luddite instincts, adopted a holier than thou attitude by suggesting that those programmes that were made or could be made stereo would be some kind of prostitution of the art of audio because of the methods needed to be

used. Poor Blumlein was frequently conscripted to the latter cause in arguments that by logical extension would claim that mono sound wasn't "real" mono unless it all came from a fixed omnidirectional microphone. "Real" or "true" stereo, of course, was an attempt to project TV stereo into a unattainable Nirvana far away from the mundane everyday workplace!

Happily, most TV sound enthusiasts now welcome stereo as a new and exciting challenge whereby a new area of creativity is opened up for their craft in programme-making.

There is, however, an area of some dispute, on both subjective and practical grounds, which centres upon the desirability of the stereo presentation of the speech content of programmes. The immediate point is why, if we intend to make stereo programmes, should anyone then propose to make what is in many programmes a major content, mono? The reasons are not perhaps due to a reappraisal of our craft on account of the new challenge, but are, rather, a reticence to revise our practical methods of speech pick-up. For those who lack conviction that a worthwhile improvement by stereo speech presentation is achievable, this is a daunting prospect, particularly so if it is viewed in an historical context as would older members of our profession.

Even by 1964, when Radio were already embarking upon stereo, sound operations in Television were, by today's standards, crude and still largely based on Radio equipment and operational experience. Many shows were set up so that the artists not only worked to cameras but worked to the microphones too. The exception was in Drama and other programmes where the presence of microphones were considered to destroy the illusions of the little black and white picture. To accommodate this problem, a type of microphone, then, and yet still despised by audio purists which is a cross between an omni pressure and a ribbon pressure gradient, was worked to the artists whilst hopefully keeping out of camera shot and also al-

lowing high levels of light to get at them without projecting its profile into the picture. Operated by a breed of masochists who considered their art as being the most challenging in the studio and, I might add, with considerable justification, these cardioid mics manipulated around the studio sets in sound booms exemplified the basic differences in Television sound to other audio mediums. Although used and having origins in the Film world, the non-stop operation of booms in live programmes, often of similar duration to feature films, epitomised TV audio. It seemed a crazy exercise and frequently led to devastating cock-ups which later became legendary hilarious reminiscences among the practitioners.

Since those times, because of the great changes in programming, the advent of Videotape recording, editing and sound post production, the use of personal mics and camera shooting more akin to filming techniques, sound pick-up by these means has not only diminished in the ubiquity of its practice but become a more considered and a rather less frenetic business. It does, however, still represent a very significant problem area and one that is inevitably to the fore of TV sound persons' minds when stereo is discussed and a major dampener of enthusiasm for the concept of stereo speech pick-up. Indeed, stereo mics in booms and operations of booms to produce a viable stereo image, seems as crazy in the present time as the original moving microphone in the early days of Television seemed to those Radio engineers whose background to Drama productions was actors working to a ribbon mic on a stand in the middle of the studio. There was no alternative then. Techniques just had to be evolved and were. A real problem today, is that because there is no such compulsion to solving the problems but many facile arguments in support of mono-in-the-middle dialogue which can readily be accepted by broadcasting persons outside the sound confraternity, insufficient effort is being given in developing the required expertise both with stereo sound pick-up and in balancing and imaging the results for the enhance-

ment of Television drama sound. There is an inertia which those who are wholly committed to stereo are finding difficult to overcome and so lead their profession to the best standards of stereo programme-making which the present opportunities are offering. The sections on Drama and stereo boom operation are hoped to be a useful basic guide for those who are not prepared to accept defeat or at least come to conclusions based upon their own practical experience and judgment. The message then, is to get stuck in. Many of the imaginary problems of stereo which are harboured by TV Sound Supervisors are quickly diminished to their correct perspective when some practical experience of stereo balancing has been gained. Likewise our consumers are swiftly converted to an appreciation of stereo by simply just getting used to listening that way. Stereo opens up new areas of creativity for Television sound. We must continually seek to exploit this new ability of our craft to make our programmes more enjoyable for our viewers. That is the basic criterion which must determine how we make stereo sound for Television.

The following Manual attempts to describe the functions of stereo equipment, gives suggestions based upon collective experience for the stereo imaging of typical types of Television productions and attempts to be an instruction in the basic techniques and craft of stereo balancing. The application of these techniques, to be used in conjunction with those practiced in mono sound, are expounded mostly in fairly general terms rather than related to specific equipment due to both its present diversity and what may be conjectured that we shall be using in the future.

RMA.

I

STEREOPHONY IN BROADCASTING.

What is Stereo?

Stereophony is a two-channel system by which sound is given width. Level, and possibly phase differences between the two channels give rise to times of arrival differences at the listener's ears when the sound is reproduced on two spaced loudspeakers. The optimum stereo effect is obtained by listening at an equal distance from the loudspeakers as they are themselves apart, i.e. an equilateral triangle.

See Figures 1 to 5.

Satisfactory aural ability to locate sounds in the stereo stage declines if the listener is closer or the loudspeakers are more widely spaced. If the listener is further away or the loudspeakers more closely spaced, the stereo sound image is simply narrower.

Definition of Basic Terms.

The left channel is, in Broadcasting usually denoted as the "A" channel and the right as the "B" channel. "L" and "R" are used more commonly in the Film and the independent sound recording world. "M" is used to denote the "sum", that is the product of adding both channels together. "S" is used to denote the "difference", that is the subtraction of the right or B channel from the left or A channel. M derives from the German

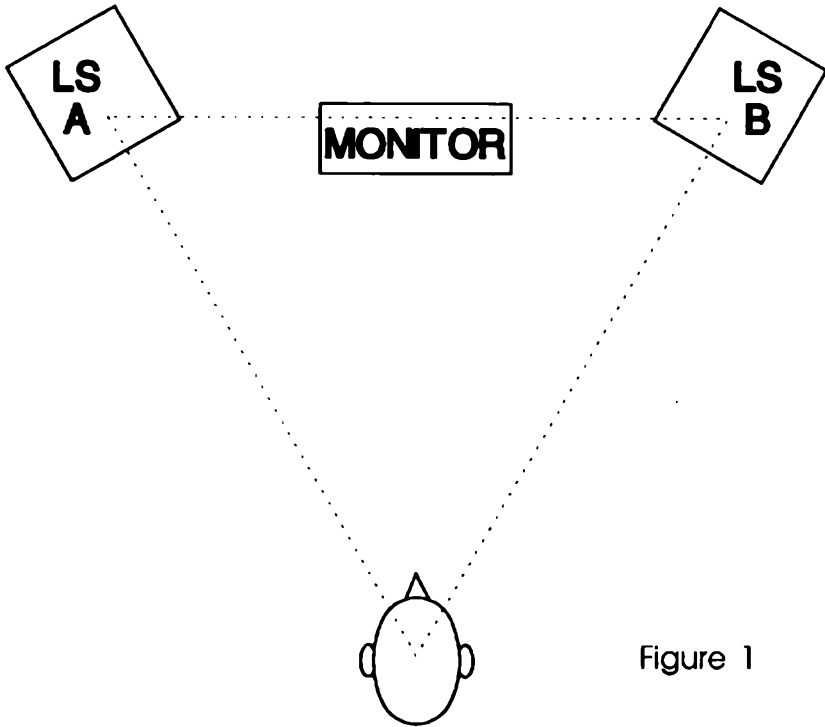


Figure 1

OPTIMUM MONITORING ARRANGEMENT
is an equilateral triangle with the television monitor placed centrally between the loudspeakers.

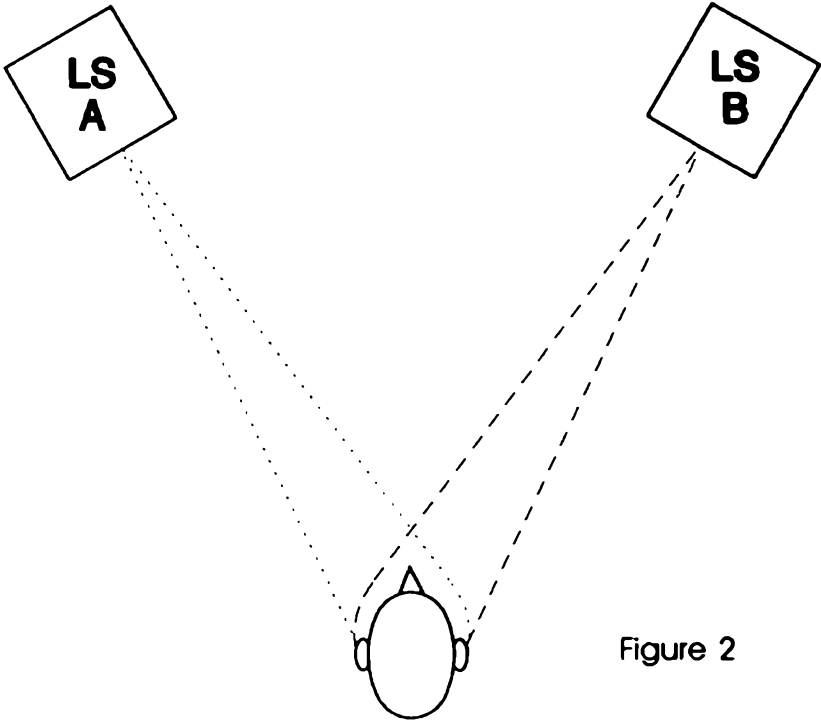


Figure 2

TIME-OF-ARRIVAL DIFFERENCE

between the ears, from both loudspeakers. Note how the signal from loudspeaker A has a longer path to the right ear and that from loudspeaker B has a longer path to the left ear.



Figure 3

A sound of equal level on each loudspeaker is perceived at the centre of the sound-stage. There is no timing difference between the sound waves arriving at each ear.



Figure 4

A sound that is of higher level on the left loudspeaker than on the right loudspeaker is heard sooner by the left ear than the right ear, and is perceived as originating from the left of the sound-stage. See diagram opposite.

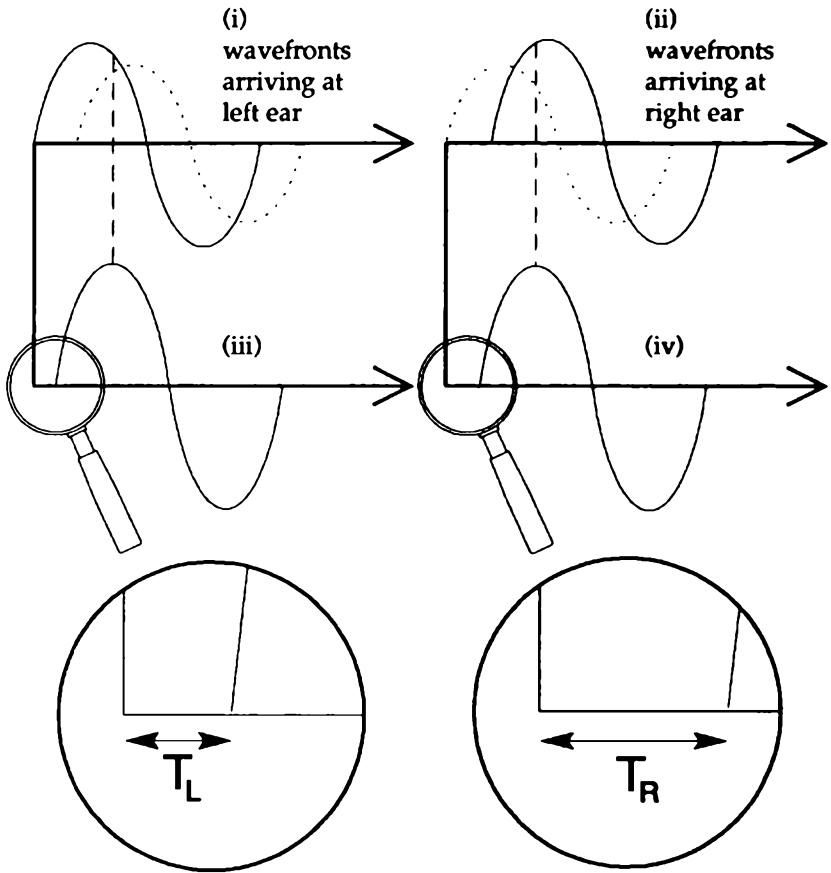


Figure 5

TIME-OF-ARRIVAL DIFFERENCE

and how it is affected by the relative *level* of the signal from each of the loudspeakers. In (i) and (ii), the dotted sinewave represents the signal from the right loudspeaker, and the solid sinewave represents the signal from the left loudspeaker, as each arrives at the left and right ears respectively. The sum of each of these signals is shown at (iii) and (iv), and as $T_L < T_R$ the listener detects the sound as originating from the left.

“Mitte”. S derives from “Seite”. Although there would be no Middle sound if M was absent and no Side sounds if S was absent, it is more accurate and convenient to logical thought to stick with “M” meaning the Sum or the derived Mono and “S” meaning the Difference, *not the Stereo*. “Leg” is the term used to denote one channel (i.e. an A or B channel) of the stereo system.

The System.

The stereo system used for television is basically the same as used for CDs, Gramophone records, cassettes and Videos.* It is specifically (apart from the actual TX system) the same as used in radio. In the BBC, compatibility of transmitted level as between mono programmes and the derived mono from stereo programmes, is achieved by:-

$$M = (A + B) - 3\text{dB}$$

which is built in to all stereo monitoring PPMs and their associated monitoring loudspeakers. Levels in the A and B legs, and in the M output are not allowed to exceed the peak of +8dB (i.e. PPM 6). +8dB is the peak level for which all audio equipment, circuits, tape machines etc. in broadcasting are engineered to accommodate without overload but with appropriate “headroom”.

There are other arrangements that are and can be used for the derivation of mono from stereo.

$$M = A + B$$
$$\text{and } M = (A + B) - 6\text{dB}$$

are the two main alternatives. The advantages and disadvantages of those systems follow. It is assumed that the level from the programme source is that which is intended to arrive at the

transmitter without intermediate control in Network areas etc. and the input for the mono FM is a fixed factor.

$$M = A + B.$$

Coherent signals, that is mono on both channels or sounds in the centre of the stereo sound stage will be 6dB higher in the M output than the maximum modulation of the A or B channels. If the A and B levels are restricted so as to keep the M output to its usual peak (+8dB), they would need to be undermodulated by up to 6dB unless in one channel only, thus being extremely wide in the stereo sound-stage. Mono programmes or sources coming from one track of a VT machine or a one-channel mono source such as a mono studio, would be up to 6dB quieter than signals from a stereo source. Test signals (tone) would be 6dB higher in the derived mono than in the stereo legs.

$$M = (A + B) - 6dB.$$

This conveniently makes test signals the same level on both the mono and stereo legs. It also means that coherent programme material will be of equal volume given similar modulation on stereo legs as one normally gives at a mono source. The problem, though, is that when a signal is not fully coherent, that is once any width is employed which is the purpose of a stereophonic sound presentation, the level in the derived mono declines up to a maximum of 6dB when the signal is placed at an extreme of the stereo sound-stage. Any stereo programme will therefore be quieter unless balanced so narrow that it is in fact mono. It is sometimes argued, usually by engineers, that this is the best way to get maximum signal to noise and optimum transmission deviation in a stereo system. They also like the prospect of test signals hitting the same mark on both stereo

and mono outputs. On the first point, stereo-leg channels can only be as consistently high in modulation as a mono channel if all the programme sounds are fully put into them rather than shared out between the two legs - which is in fact what stereo is all about. Whilst this means that each stereo leg can appear to be undermodulated for much of the time, the balancer needs the ability to put loud sounds where he wishes, either on the extremes, in the middle or somewhere between. A maximum peak in one stereo leg with this system will only give a peak of +2dB in the derived mono. If the biggest crescendo in your music is capped with a belt on the bass drum which could well be on one side of the orchestra, the whole piece would have to be held back in level to accommodate this dynamic range and therefore the overall modulation in the M output would be down compared to a mono balance and there would be no change in the average modulation of the stereo-leg channels. Where does the argument about signal to noise ratio stand then? Nothing is gained and the whole programme will be quieter in the derived mono if it has width in the stereo output.

$$M = (A + B) - 3dB.$$

This is the compromise between the disadvantages of both the above. One can balance wide without too much disadvantage and the M level can be kept to the same modulation range as normal for mono balancing. The modulation levels of the A and B legs will be reasonable although, of course, they will not be anything like as consistently high as could be a mono output. That is the nature of stereo. The signal to noise penalty is not twice as bad because noise is not coherent in the two channels. Being random, some of the noise adds up but some of it does not and it is reduced by the 3dB as well. This is the best system for maintaining consistent sound levels both in the derived mono and the stereo outputs of a broadcasting service which is a mix of mono and stereo programmes and also di-

verse in its styles of programming. The section on monitoring is based upon this system.

Another way of deriving the mono which has been recently discussed, is to insert a 90° all frequency phase shift in one leg before summing. This reduces the level rise in coherent signals relative to non-coherent in the derived mono balance and the resulting mono level is similar to $(A + B) - 3\text{dB}$. The theory looks good but there are several disadvantages. The phase shift signal processing would need to be installed at all points that a mono signal was required including all monitoring in studio control rooms, video tape suites, sound post production areas etc. There would be a need also to retain normal $A + B$ monitoring as well to enable the carrying out of tests, checks and alignments relating to unwanted or unintentional phase or timing errors. Neither would this system be a panacea to dismiss all compatibility problems. Many of the causes of poor mono compatibility stem from sound balances in which the stereo is thought to be acceptable but the mono has suffered neglect. It can still be neglected. Sounds that can be clearly heard in a stereo balance can be quite submerged in the derived mono for no other reason than that louder sounds are coming out of the same point-source slot on top of them. Although fully out-of-phase signals, should they exist due to error, would then make some modest appearance in the mono output, intentional out-of-phase signals which are used deliberately and are part of the balancer's repertoire in making good stereo would then produce unwanted signals in the derived mono. See chapters that deal with processors, spreaders, reverberation and sound FX.

The balancer's ability to, for instance, make his background music and FX good and wide so as to maintain a desirable level in his stereo but without obscuring the speech in his mono, is a common example of how the perceived "problem" of compatibility by $A + B$ derivation, can be, in other practical aspects,

an advantage. The broadcasting of programmes and films not made with such an in-house mono derivation system in mind would lead to further complexities both technical and organisational.

The whole proposal appears a rather drastic solution to an overstated problem. I am led to wonder whether the advocates of it are aware that Sound Engineers have brains and ears. They are capable of doing very nicely, thank you, if they have appropriate equipment at their disposal - even if not the remuneration as they see it!

Some video products, however, are originated in "Dolby Stereo" which is a surround-sound system and when reproduced on a stereo set-up, although largely compatible, gives an effect of mono-in-the-middle with wide FX and music. The impression of depth tends to be lacking as this is created by the absent rear surround loudspeakers used in that system. Stereo reproduced on a Dolby three loudspeaker plus surround system, causes sounds near to the centre to be pushed hard into the middle and any sounds with a phase difference between the A and B legs goes to the surround loudspeaker(s). When such films are transmitted, a Dolby decoder can be used in the home for feeding a surround system. It is not advisable to leave the decoder in circuit for other normal stereo programmes as they are not balanced for a surround system. Therefore the decoder could play havoc with the sound presentation of the programme originators.

The Sound Stage.

The stereo sound stage is the space between the loudspeakers. It is not usually desirable that sounds are placed completely left or right so that they appear fully in a speaker. Unless there is some subjective justification for thus placing a sound, it is best avoided because it will sound flat and mono-ish. A 16dB dif-

ference in level between the A and B legs will put a sound into the loudspeaker. A 12dB interchannel level difference more realistically prescribes the limit of the sound stage for major constituents of a stereo balance. Attempts to exceed the width bounded by the loudspeakers by the use of out-of-phase techniques should not be employed in the interests of mono compatibility.

Imaging.

Whether or how any programme is made stereo must depend on one overriding criterion which is, that by so doing, the programme is made more enjoyable to the viewer. The width and style of the stereo imaging should not be determined by any generalised or technical approach, but by the scale and scope of each particular programme. For instance, a quartet of singers accompanied by a piano should be given a generous stereo width but if singing with a symphony orchestra, they should be kept in proportion to the orchestra and therefore imaged to a different scale. In a drama with continuous background and action FX, music etc., it may be better to the internal proportion of the programme that the speech is imaged narrower than would be desirable for a play that is almost all dialogue and in which the interplay of the actors is the principal ingredient of the piece. If a show has an audience, as in a chat show or situation comedy, the speech should be kept within those limits of width which do not diminish the impression of the audience's size.

The least desirable imaging for any programme must be that which does not come about by creative determinations but simply by accident of the sound pick-up technique that is used. If inadequate means are available to control and maintain consistent imaging or the material is too complex to achieve this within the time and facilities available, a mono presentation will probably do greater justice to the production as a whole or

for some factor of the sound in the production which cannot be satisfactorily achieved with stereo pick-up.

Mono Compatibility.

The need for a fully satisfactory derived mono balance in all types of programme is not only imperative now - with the vast majority of TV viewers listening in mono, but is there for ever. Any comparisons with the progress of colour from monochrome are irrelevant. Many programmes can convey meaningful information although lacking good illustrations or even if the pictures cannot be seen at all! If some elements of a programme cannot be heard or bits of the sound are missing, the whole production can be rendered quite meaningless.

Compatibility does not by any means constitute an obstacle to good stereo balancing. It is mainly just a matter of being aware of what leads to poor compatibility; being sure that an adverse judgement of the derived mono does not simply stem from its lack of the greater aural gratification provided by the stereo; making adjustments when necessary (which may well then improve your stereo balance too); thinking clearly about your microphone placings and polar configurations; not placing important sounds on the extremes if you cannot afford to hold down more centrally placed sounds; making good use of devices such as stereo processors which are aids to compatibility; avoiding timing differences between the two legs such as bad azimuth and being constantly vigilant for out-of-phase stereo sources.

The area in which most problems arise is reverberation. Without denying that a balancer's absolute ideal for his reverberation settings for both his stereo and derived mono balance may well require some measure of compromise, there are factors which exacerbate the problem. The first is the same psychological factor that gives rise to the tendency of balancers to gradually increase reverb from their initial settings as their

rehearsal goes on and their day gets longer, causes them to make an adverse judgement when checking their mono which will sound drier. This dryness will also be exaggerated by the point source, flat mono that in itself compares ill with stereo. When making judgments of compatibility, it is a mistake to base that judgment on comparison, that is, to listen to the change in reverberant effect. It will never sound as good. The stereo should be judged as a stereo balance and the mono also for what it is. The second factor, encouraged by too easy acceptance of false doctrines of non-compatible reverb, can be due to reticence of balancers to take precautions against the problem or even do something to about it. See chapter on Reverberation.

In multi-mic music balancing, all sources being directly under the balancer's control, compatibility may require a little extra level to be given to sounds placed on the extremes. When coincident pairs are used, simple remedies to poor compatibility such as a fader adjustment may not be at hand. The matter needs to be taken into consideration when plotting microphone placement. Study of the section on coincident pairs will show that microphone polarities/placements that may obtain evenly spaced imaging tend to then have sources on the extremes which are on the verge or even outside what can be considered as the "compatibility limit angle". This may sound acceptable in stereo, but when listening to the derived mono, the sounds on the extremes will be further down and have the centre sounds on top of them in the point-source rendition. This problem may be very difficult to correct if the required forethoughts have been neglected. The same problem can be further exacerbated by the way that artificial reverb is handled by building the tone of the more centrally placed sounds to a greater extent than the extremes by mono reverb sending.

Poor mono compatibility does not stem from a systemic defect. Ultimately, because a balance is made to be as it is by the ac-

tions or lack of them by the balancer, the defect must be in his or her operations. Of course, there can be problems to satisfy very fine judgments. The ears work to quite amazingly small degrees of detection and recognition but the degrees of difference between the ideal balances that are produced by acknowledged sound engineering maestros can be so wide in comparison, one must conclude that there is a quite healthy amount of self-indulgent quibbling in balancers' talk of their wounds inflicted by the necessities of mono compatibility.

Lastly, do not accept the old wives' tale that balancing narrow is good for compatibility. If you balance so narrow that your sound is mono, one may not be able to dispute the point. But it is the falling off in level at the extremes that is the real culprit. A narrowish balance that falls away at the edges is bad compatibility and bad stereo too. A full width balance that has got good level in the sounds on the extremes will be not only a good solid wall of sound but make respectable mono also.

Monitoring.

In addition to the obvious uses of monitoring loudspeakers and their placement in relation to the balancer's sitting position, correct use of the stereo monitoring controls and the use of stereo PPMs should not be neglected. The "mono-on-both" key is used not only for initial setting of the "balance" trim pot but should be frequently to hand to check the centering of the stereo image. Loudspeaker amplifiers do tend to drift and so does a balancer's sitting position. "Mono-on-both" is also used to check for mono compatibility in common practice even though, strictly speaking, mono should be monitored on one loudspeaker only. Some consoles have a "Mono on A" key while others would need "Mono on both" and "Cut B" (or A). The "Phase Reverse B" key is not so much a monitoring control but a device to enable the checking of sources. Stereo PPMs are

not only used to indicate levels in the A and B legs, the derived M and the S so that these may be kept within correct modulation range, but also to provide further information about the stereo balance. The A/B PPM, by displaying the inter-channel difference levels, indicates the offset of elements of the balance. The M/S PPM indicates width by the proximity of the S reading to the M. It also warns us of troubles such as out-of-phase elements in the balance by abnormally high S readings which are not justified by high peaks on the extremes of the sound stage. Constant parallel peaking of the S with the M caused by a centrally placed source, particularly when noticed during sibilants, indicates a timing or azimuth problem between the A and B legs.

When working in an (A + B) - 3dB domain, for practical level monitoring, the M is the indicator to watch most constantly. This is because the loudest sounds in most balance situations tend to be placed for the greater part of the time near the centre and thus produce a higher peak in the M than in the A or B. The moments to observe the A/B PPM for possible overmodulation indications is when loud sounds appear or are placed near to or on the extremes. The S + 20dB button is used for line-up purposes such as checking the gain offset of coincident pair microphones, checking azimuth of tape reproducers etc. In (A + B) - 6dB environments, M will not exceed peak modulation unless either A or B does. To achieve a high M peak with widely placed sound, however, will mean some hard thrash on the limits of the A or B levels.

II

TECHNIQUES IN STEREO BALANCING.

Microphones.

Coincident Pairs. (Also called Stereo-microphones).

These are used when an "open" or "over-all" technique is required. Their use in Broadcasting, where mono-compatibility is at a premium, is more common than in the recording industry. They are usually A/B mics but some are M/S or switchable to give either type of output.

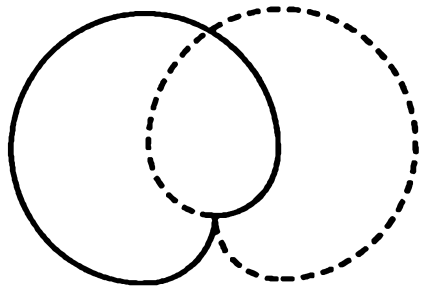
The classical procedure for lining up the outputs to be of equal gain in both legs, is to switch the polarities if that facility exists, to omnidirectional; have an assistant to speak on the mic and trim the gain on the console channels by reversing the phase of one leg and then trimming to obtain a minimum output in the derived mono. With the monitoring loudspeakers switched to mono, the optimum cancellation of output is readily heard. They are then switched back in phase, the desired polarities selected, the angle between the two capsules is set up and the mic is placed for action. Where the polarities of a stereo mic are fixed, the speech for test is given on the frontal axis of both capsules. On M/S pairs, speech on the M capsule is used to check for any offset in the console channels in similar manner and the gain of the S mic, being a different polarity (a figure of eight) can be set up more subjectively such as speech on the projected half left or right produces an image in that position when aurally monitored.

The placement of a stereo mic. and the configuration to be used can usually be deduced from where one would place a mono mic. and what its polar pattern would be for a mono balance. A coincident pair configuration is used that produces a derived M signal which is the same as the envisaged mono mic. Thus if a mono cardioid would be used; then a pair of hypers at 90° will give a similar derived mono and if it doesn't give reasonable stereo imaging, maybe you have not been using mono mics. to their best advantage! A way of predicting the imaging that will be produced by a given mic. position and polarity, is to calculate in terms of the "angle of acceptance". The lines of this angle are on the axes where sound sources will appear on the extremes of the stereo sound-stage, that is, where the inter-channel level difference (ICD) will be 12 - 14dB. Figures 6 to 13 show the A/B & M/S configurations equivalent to or derivable from each other and the anticipated image positions for basic microphone polarities. Also indicated are the points where equidistant sources would be 3dB down in level and beyond which, mono compatibility problems can be anticipated. All the parameters shown in the diagrams are approximate because apart from possible variations due to microphone characteristics, different pairs of ears, although from the same manufacturer, vary in their perception too!

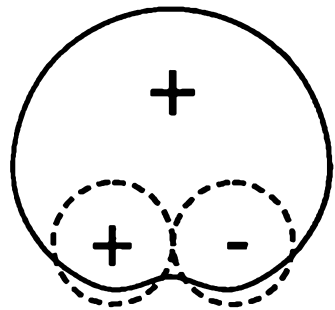
It is best to use stereo microphone configurations that sum to a recognisable M configuration. If they do not, because of the angle at which they are set etc., stretching or bunching at the centre or extremes of the image will probably result. This may be of some advantage or disadvantage depending on the practical circumstances. It may help or hinder mono compatibility.

Avoid using more than one coincident pair for sound sources which do not permit of a high degree of separation. For open mic. balancing, any additional mics. should be mono "spots" which are panned to agree with the imaging produced by the coincident pair. The spot mics. should be placed to obtain

CARDIOID
coincident pairs at 90°



A/B



M/S equivalent

$$M + S = A$$

$$M - S = B$$

Figure 6



Anticipated image positions of sources
equidistant from
CARDIOID pair at 90°

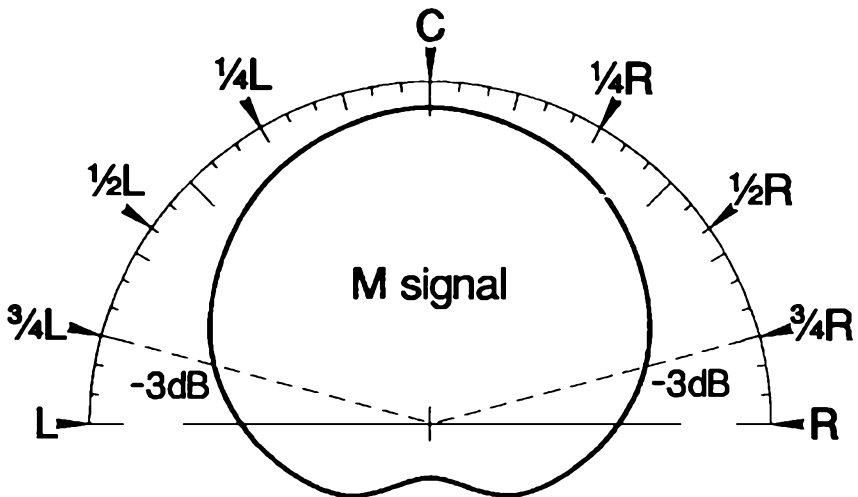
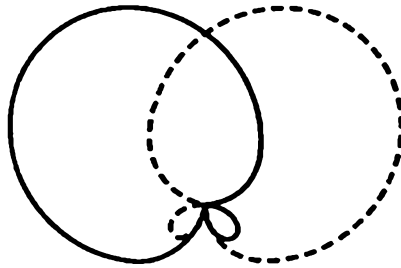


Figure 7

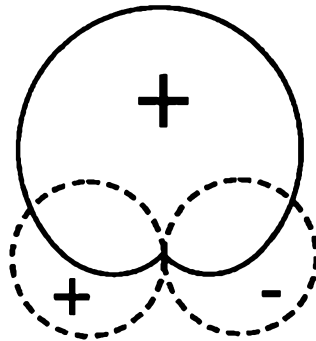
The dotted line shows where signals will be 3dB down in the M output relative to the front axis when sound sources are equidistant from the mic.

If the mic. angle is increased to 120° , the full L/R points tend to the previous $\frac{3}{4}$ L/R points. When the mic. angle is increased even more the image angles change towards that shown for back-to-back cardioids.

HYPERCARDIOID
coincident pairs at 90°



A/B



M/S Equivalent

$$M + S = A$$

$$M - S = B$$

Figure 8

Anticipated image positions of sources
equidistant from
HYPERCARDIOID pair at 90°

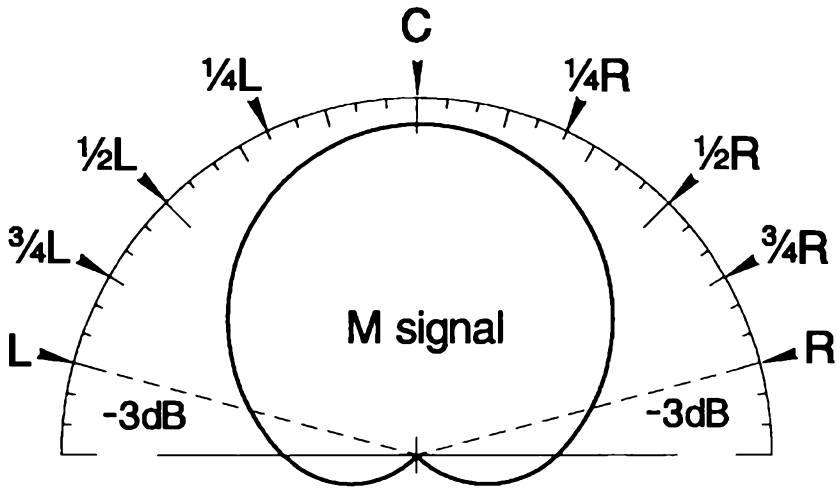
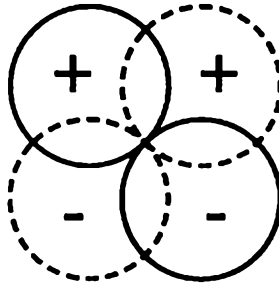


Figure 9

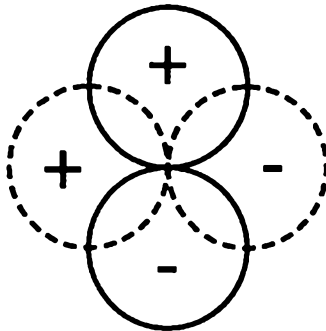
The dotted line shows where signals will be 3dB down in the M output relative to the front axis when sound sources are equidistant from the mic.

If the mic. angle is increased to 120° , the previous $\frac{3}{4}$ L/R points tend to full L/R, the overall image becomes wider and the central images less stretched.

FIGURE-EIGHT
coincident pairs at 90°



A/B



M/S Equivalent

$$M + S = A$$

$$M - S = B$$

Figure 10

Anticipated image positions of sources
equidistant from
FIGURE-EIGHT pair at 90°

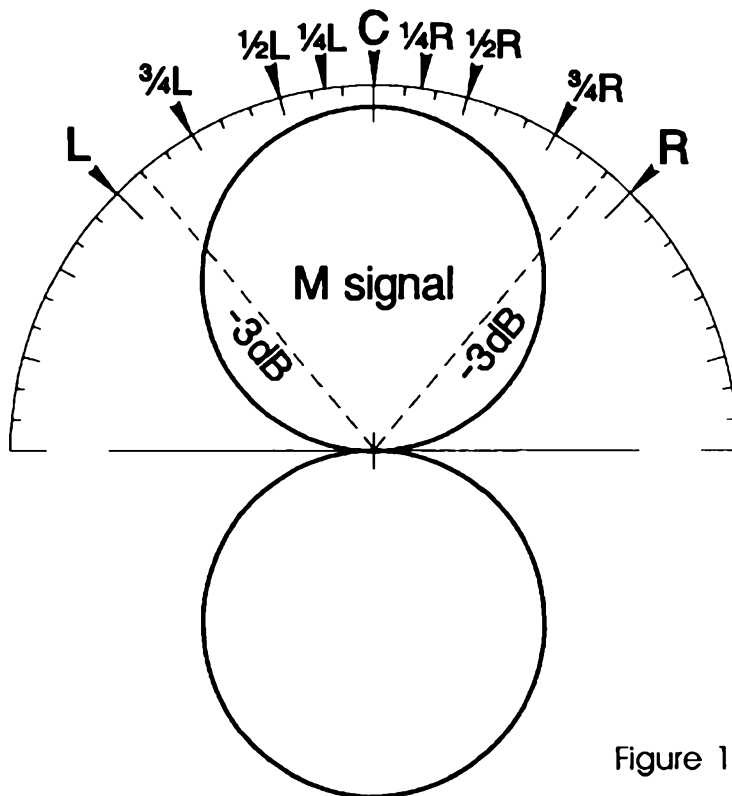
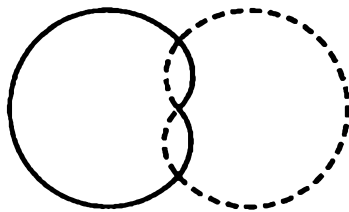


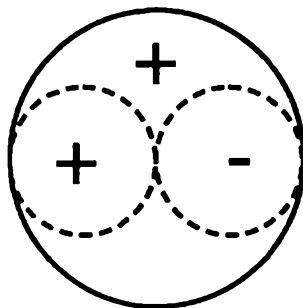
Figure 11

The dotted line shows where signals will be 3dB down in the M output relative to the front axis when sound sources are equidistant from the mic.

CARDIOID
coincident pairs at 180°
(back-to-back)



A/B



M/S Equivalent

$$M + S = A$$

$$M - S = B$$

Figure 12

Anticipated image positions of sources
equidistant from
back-to-back CARDIOIDS

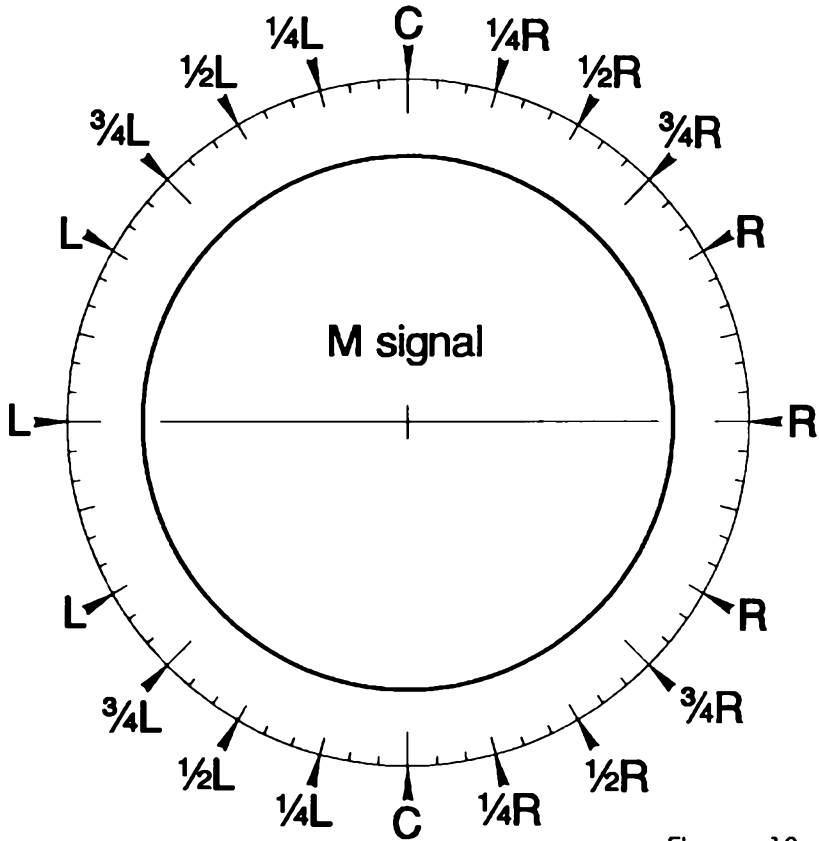


Figure 13

Equidistant sound sources of equal loudness will be of similar level in the M output.

maximum control of the source for which they are intended so that they do not interfere with the imaging of other sources.

See also Chapter IV - Music and also Drama for a discussion of M/S pairs.

Spaced Arrays.

Spaced techniques are based upon high quality omni mics. They are useful when wishing to capture rather than reject the acoustics of the studio or location. Their disadvantages in terms of mono compatibility are also more pronounced in the drier acoustics of general purpose studios. They are usually only used for Music balancing when a naturalistic sound and a wide dynamic range are required. These techniques, including dummy head set-ups, are best left to specialist Symphonic music balancers working in accustomed environments. If you would not use omni mics or spaced arrays for a mono balance, avoid using them for stereo.

Multi-mic.

When the above mic. techniques are impractical for naturalistic balances and where multi-mic. is used for artificial balances in mono operations, it is similarly used for stereo. The sources are panned on the console to the desired position in the sound-stage.

Place microphones for good separation. Spill can be troublesome and lead to unwanted movement in the sound image as levels are controlled. Use more than one mic. on any source that requires width and anticipate panning them quite hard left/right before any width is noticeable.

See also Chapter IV - Music.

Stereo Mics. on Location.

For single camera shoots, stereo short gun mics, some of which provide either an M/S or A/B output are used for speech pick-up. When the polar configuration of the M mic. is less than hypercardioid, the stereo image will be very stretched between the centre region where sounds are well "on" the M mic. and the extremes where they will only be "on" the S mic. For instance, the sound of someone walking past in the background to the principal subjects will hover on the extreme, rush to the centre, pause, and rush to the other extreme where they will walk on the spot again for a while.

When personal or Radio mics. are used for speech, an arrangement is needed to provide some width for the background FX. Either use another mic., clean of speech with which to fake an S signal by the out-of-phase to each leg technique or, where increased ambience for the speech is required as well as stereo FX, use a suitably placed coincident pair FX mic. The former can be simply recorded straight to the two tracks of a twin track recorder and mixed at the dub. The latter would, if only two tracks are available, need mixing on location.

Pairs of mono gun mics. are used for stereo FX in sports programmes and exterior events. The angle at which to set them will require some experiment with the particular mics. used. For long guns about 15° to 20° depending on their distance from source, is suggested.

Stereo Reverberation.

Stereo Reverb should always be checked and trimmed for central collapse before use. Method: cut reverb sending channel on loud peak and listen to reverb decay only; trim one leg of reverb return as necessary to get central decay. To adjust

reverb to your taste for mono/stereo compatibility, narrow the reverb to increase it in derived mono, widen it to decrease its effect in mono. If the reverb is required to increase stereo or width effect but not do anything to mono, use out-of-phase mono reverb to each leg. When mono echo sends are used, signals in the centre of a stereo source will be wettest. If the echo device has two inputs, feed them from the A & B legs of a stereo echo send or channel AUX (or from two mono ones at same level). This should give you more equal wetness from all parts of the image. If you want to be wetter at the extremes than in the middle, put a processor in the stereo echo send and widen it before it hits the echo device.

If you are handling a stereo source M/S and want to use reverb on it, send only the M. If you send the S as well, you will in fact only be sending A leg to echo ($M + S = A$). It is probably best to put your echo on after mixing the M/S source to A/B.

Some digital reverberation devices are less mono compatible than others. Also, different programmes on the devices can vary in their mono compatibility. Check out this aspect, as routine, when setting up stereo reverberation.

Pan Pots.

Pan pots are for use with mono sources to position that source in the stereo sound-stage. Pan such sources by ear and by using the A/B PPM as visual confirmation if they are predominant in the balance. The latter suggestion is not the straight-man's line to precede a joke to those who have balanced in Outside Broadcast vans or who have short arms and distant pan pots!

The law of many pan pots is log-ish in their effect. The pot position may look almost full round to one side before the source gets anywhere.

It is better practice to simply route stereo sources that are on mono channels and routed to mono groups, to the A or B group alone and not insert the pan pots. This avoids the erroneous temptation to offset the source by panning rather than trimming the gain in one channel.

Many stereo desks will have pan pots associated with stereo channels. They are only pan pots when the channels are selected to a mono function. This selector is usually adjacent to the LINE/MIC selector and preset gain. In stereo channel use, they become Offset controls.

On automated sound consoles that do not have pan pots which are under computer control, it is of course possible to set up automated panning by paralleling the source to two channels selected L/R and riding the differential gain on the faders.

Processors.

Processors are for offsetting, widening and narrowing stereo sources. The Offset control is a differential gain trim of the A and B legs. The Width control, when used for narrowing, starts adding some A to B and B to A. Thus when full control is given the output becomes mono. In the wide direction of the control, the level of M relative to S is decreased by introducing phase-changed A (i.e. -A) to B and likewise -B to A.

The "normal" position of a width control is usually labelled "STEREO". The narrowing direction is labelled "NARROW" or "MONO" and the widen direction may be "SPREAD" or "WIDEN".

The devices are sometimes found in echo return channels for adjusting central reverb collapse and adjusting width for compatibility purposes. They are also found as insert-pluggable on some consoles and are used for trimming offset and width of

any stereo source. It is handy to have them plugged in circuit on Outside line sources so that quick adjustments can be made if necessary. Remember, though, that when a source is widened, the balance may be changed because of the decrease in level of signals in the centre; so take care with music, for instance. They are particularly useful for background sound FX and for adjusting compatibility of such material.

Their use in conjunction with coincident pair mics. which are used for music balances can be a useful aid to compatibility. It may well be that the mic. configurations and source placements best suited to an even and full-width image, fall away in level too much at the extremes relative to the centre. Placements that produce a narrower image and are better in fall-off terms, can be then improved both in width and compatibility by some widening by a processor. A reverse procedure, that is setting an over-wide image on the mics. and narrowing would bode ill for compatibility.

If the sound desk has not got any processors, a width control can be arranged by routeing the two legs of the source to a second stereo channel with A routed to the B output and B routed to the A output. Fading up of the secondary channel will narrow the output. Change the phase of both legs of the secondary channel and its introduction will widen the output.

Spreaders.

Spreaders (often called Stereo Synthesisers) are for giving artificial width to mono sources. By interleaved comb filtering or frequency banding with phase differences in either leg, they produce a stereo-like or psycho-acoustic width effect. They should, in their derived mono output, sound the same as their input. If the stereo output is required to be "positioned" in the sound stage, it is done by offsetting the output in conjunction

with the width (or separation) selected on the device. Panning one channel (of a pair of mono channels) will simply cause a collapse of the spread image. Offsetting may alter the sound of the FX in the derived mono. If devices used to “spread” sound involve time differences between the A and B legs, do not expect a mono-compatible result.

Attempts to spread mono sources by using filters such as Graphic Equalisers with phase changes etc. to create an artificial difference signal are extremely time consuming. It can be done, but the mono compatibility aspect will almost certainly lead to defeat. A more simple way of spreading a mono source is to create an artificial difference signal by sending an AUX feed of the channel to a Delay Line, inserting 1 mS delay, paralleling the delay output to both legs of a stereo channel with a phase change in one leg and additively mixing this with the original mono. Providing the stereo channel is of precisely equal gain in both legs, the faked “S” signal will cancel out in the derived mono balance but will provide width for the stereo balance depending upon the level that is used. This technique works well with FX, including Sport FX when they are available clean of commentary, but speech and music is better spread by a dedicated spreader.

M/S A/B Matrixing.

When there is an operational requirement for mixing M/S and also perhaps locally recording the sources in that form, a way of setting up the desk is to plug the M/S outputs or tape returns (Monitor Line IN for multitracks) to a “monitor mix” arrangement on the console with M selected to both A and B output groups or panned centre of stereo group and the S on two (mono) channels, one selected or panned to the A output; the other to the B output with a phase change in that channel. See “Drama” and Figure 14 for an M/S to A/B arrangement on a mixing console.

Although the above sort of arrangement is convenient in a sound control room when a balance is being constructed and recorded, no fully balanced source or final recorded tape should be matrixed in such a manner in any transfer or source conversion operation. It is important, then, that the following equations:-

$$\begin{array}{ll} (A + B) - 3\text{dB} = M & (A - B) - 3\text{dB} = S \\ (M + S) - 3\text{dB} = A & (M - S) - 3\text{dB} = M \end{array}$$

(or whatever your firm uses) are precisely adhered to. This can be somewhat mind-numbing when you have to think about it, so don't think; use a purpose built matrixing network.

Dynamics.

Limiters, Compressors, Expanders and Gates, when used on stereo sources or outputs, should be side-chain linked. If not, a high peaking signal anywhere but dead centre, will cause the sound stage to twitch sideways as the dynamic is activated. It is normal to use A/B dynamics although they can also be used in M/S mode if convenient. They should be similarly side-chain linked or else the width will blink.

In an (A + B) - 3dB company, limiters set to PPM 5¼ in the A and B legs will then give a maximum peak of PPM 6 in the M output. This is usually an adequate arrangement because the majority of sound balances, for most of the time, have their high peaking sounds in or near to the centre. When loud sounds are required in the extremes, having them limit at PPM 5¼ and thus only making PPM 4½ in the M, is not so wonderful. It may be possible to alter the threshold setting at those times or limit that particular sound separately but it is more likely that the loudest sounds are required all across the sound stage simultaneously or in quick succession. An extra dB or two can

be squeezed out by setting A/B limiters to PPM 6 and then using an A/B to M/S matrixing convertor, go to another pair of limiters (linked of course) to sit on M and S at PPM 6. Then convert back to A/B before going back into the programme chain. When limiters are used as an occasional "catcher" rather than being driven frequently, setting the threshold higher on A/B limiters, even up to PPM 6 on the stereo legs, is acceptable if there is a limiter in the derived mono transmission chain. When a loud mono source is placed on or near to the extremes of the sound stage, separate mono compression/limiting and routing to output after any stereo dynamics can secure an optimised high level for that source. It had better have total or near total separation from the rest of the balance though, otherwise it will try to escape from its position in life!

In (A + B) - 6dB companies, limiters just need to be set to contain peak modulation on the A and B legs. Your moderately loud sounds on the extremes of the sound stage will hit the limiter and produce a peak in the M of 6dB below peak. Simpler but can be frustrating.

Background and Spot FX.

It is usually desirable to use a higher level of background FX in a stereo balance. Their absence is also more noticeable and it is necessary in many more circumstances to fill the sound stage with some background material. The ears detect unnatural silence that much more readily when the principal sounds such as speech are not obscuring that which should be behind. It also helps to cover those annoying little noises that one is frequently stuck with on the speech track, particularly if that track is stereo and gives directional qualities to them. It helps also to cover the varying levels and movements in the studio background produced by level control and panning. If the level for stereo is too much for the derived mono, make the FX wider. If

that doesn't satisfy, try putting some out-of-phase FX in too.

See chapter on Video Dubbing for faking from mono discs, using exterior FX on interiors etc.

Try not to move FX in the sound stage once they are established unless to make some dramatic point. If the background FX are part and parcel of a stereo speech track, they may well move about but because some part of the FX, such as the weather, may be constant, movement due to mic. operation and discontinuous shooting are not so disconcerting as sudden offsetting of artificially applied material. If what is supposed to be making the noise appears in shot from time to time in varying parts of the picture, try to find an average position to place it and make it as diffuse in its image as possible.

Spot FX are usually originated from a mono source. They can be spread if desired and offset to the required position. The use of stereo reverb associated with the location to blend them in and panning produces acceptable results in most cases.

Title and Incidental Music.

Title music is intended to set up the mood for the programme. Unless one is looking for a quaint old-fashioned effect, it must not be mono or of inadequate width. Don't let it prejudice the viewers' expectations of the quality of sound that follows it.

Incidental music creates the required atmosphere and should pervade all corners of the sound stage. If the stereo balance can stand some higher level than the derived mono, subtle use of a stereo processor will help. When such music is specially recorded for a programme, it should be recorded good and wide. The dubbing balancer, particularly when he uses it at low levels, will not then wish to widen it and thus perhaps

change the original balance by diminishing the centre-placed sounds.

Also see Video Dubbing.

Audience Reaction.

Normally multi-mic'd audience rigs which are needed for the laughs are panned to produce an even spread of reaction to fill the space between the loudspeakers. It is not a shameful state of affairs if in studio comedy the audience has a hole in the middle tendency. The audience being as it were, around the artists who are in the centre, can be quite pleasing and has a helpful by-product for mono compatibility because the audience will be a little more down in mono than can be taken in the stereo balance because of the cocktail party effect.

The problem of applause on close mics. which are there for the laughs, is more exaggerated in stereo. Where a distant mic. is used for opening up applause, a coincident pair or a couple of spaced mics. can be used. If these are separately controlled by limiters set at a higher threshold than the close mics., together with some smart fader work, the audience may go their contrary ways without sounding like cans of dried peas during the clapping.

Where smart mixing cannot be assisted, is in the problem of audience pick-up on the speech mics when they go up loudly on the set or stage, thus making their image collapse i.e. suddenly very narrow when it were better they stayed big and wide. "Letting the audience in" on speech mics as is sometimes handy in mono practice does not work. Enough level on the audience mics relative to the speech mics during loud reaction is the only way of maintaining width.

Line-up of Outside Sources.

A stereo line source should either be faded up on the stereo channel, put on a stereo PFL (pre-fade listen = channel solo) or deselected from O/P and faded up on stereo AFL (after-fade listen). In the case of recording directly from a line source, a stereo PPM is put across the line inputs. If the tone levels are received at or very close to the expected levels, fine trim the gain of each leg or adjust the OFFSET as appropriate to the particular console. On a record machine, trim the input gains. The most accurate way to do this is to tweak for minimum S by using the "S + 20dB" button on the PPM. If that minimum S is not very low level in relation to its frequency, for instance over 20dB down at 1kHz, the phase accuracy of the source may be in question and a query initiated to the next-back-up-the-line handler of the source. The difference level may not be caused by phase, of course; it could be a distortion on one leg. In any case, a large difference level indicates something wrong with at least one leg of the circuit or source.

The above assumes that local ends have all been tested before backward referral. If tone levels are received looking different to that which is anticipated, query the source's send level. If a source is of an external origin, the level of line-up tones should be established with the source in terms of dB below peak and set up at that level below PPM 6 on the A/B readings.

If a circuit arrives fully out of phase, try to get the matter put right where it has gone wrong before inserting your own phase change in one leg. The danger is that somewhere up the line, it may be eventually noticed to be out of phase and will be put right - which then to you - will be wrong. If you have to put in a phase change because of time pressure, inform back up the line that you have done so and no corrections now please.

Most stereo PPMs are switchable AB/MS. When Red/Green

III

TAPE.

When used for analogue recording, tape is the prime destroyer of audio. Being a complex subject in itself, suffice it here to mention those factors beyond mono applications which cause additional menace to stereo. There is the necessity to keep both tracks coming off the tape in the same phase relationship at all audio frequencies as they were when going on to the tape. There is also some problem with editing. Tape does not like to be cut square. That is why, to avoid a click, we cut tape at an angle for mono.

The ultimate answer to all problems is not to use tape for analogue but for digital recording. Because digits dismiss the signal to noise problem, copy editing, as opposed to physical splicing, has no drawback and therefore edits can be made electronically. That solves all editing problems apart from, in some applications, the time factor introduced by copying. In that case a solid state digital sound editor is the answer.

Noise reduction systems such as the latest generation which are intended to prolong the life of analogue machines, whilst excellent for signal to noise ratio, operate dynamically and have analogue filtering. Identical phase relationships at all frequencies cannot therefore be maintained across the record/replay process. Although fine for multitrack work and in overall terms far better with than without for stereo $\frac{1}{4}$ " tape, noise reduction is not an absolute panacea.

Analogue Recording and Replay.

Before using a tape machine for recording stereo, an azimuth check needs to be made in addition to the other line-up checks to ensure phase integrity of the tracks. When they are summed for mono derivation, there must be no losses in the audio frequency spectrum due to timing errors introduced either when recording or reproducing.

Check the replay head azimuth by playing a line-up tape and with both tracks set to exactly the same gain, observe the level of the difference relative to the sum on a stereo PPM. The S should be at least 20dB below the M at 1kHz and at least 12dB likewise at 10kHz. Use the S + 20dB button where necessary to get a reading. Then record some tones on the front of the tape to be used for recording and check that they replay as good as the line-up tape. If the first check fails, the replay head is below par and should be adjusted. If the second check fails, the record head needs adjustment. White noise is a good alternative for azimuth checking and can be quicker to use than sine wave sweeps.

Equally, when any prerecorded tape is reproduced, an azimuth check should be made on its line-up tones and the machine caused to reproduce them accurately. If the machine azimuth setting is not correct relative to the tape, unless electronic means are available to make correction, the replay head must be adjusted to reproduce the tape adequately.

Try not to be misled in the above checks by the difference signal being produced by some other factor such as distortion on one leg or level mismatch. Whenever in doubt, use a dual-beam oscilloscope to look at and assess the tones.

Obviously, equal level is given to both legs when tapes are played. It is not uncommon, however, for tapes to be recorded

a little offset from their line-up tones so listen to them for possible offset, use the stereo PPM for confirmation and make any necessary adjustment to the relative level of the legs.

Poor azimuth can be recognised on tapes that have been received without line-up material on them in various ways. Centre imaged material may be noticed to cause parallel peaking of the M and S needles particularly during sibilants on speech or vocals; there may be a noticeable loss of top when monitoring is switched to the derived mono. If the azimuth is tweaked in such a case, it is sometimes possible to do it while listening to the high frequency content of the background noise. It is not recommended, however, unless one can definitely hear some defect in the derived mono output.

Tape boxes should not only be clearly labelled as stereo but give an indication as to the level of line-up material, e.g. "Tones at zero level" or "Tones at stereo level". On tapes destined for outside one's own organisation, it is helpful to state the level in dB below peak, i.e. "8dB" or "11dB below peak" as the case may be.

Editing.

Electronic.

Edits must be made simultaneously on both tracks. All mixes, fades, level adjustments to smooth edits etc., should be controlled equally and simultaneously on both channels. If there is a need to offset either the outgoing or incoming material to avoid an image shift and make an edit work, a small increase or reduction in the level of one leg may help. It would be better though to attempt to establish the origin of the discrepancy and if possible put that right. Offsetting does affect the derived mono balance and the results may well be more noticeable than when listening in stereo.

When mono material is inserted into a stereo tape, the level must be reduced by 3dB. The reading on the M PPM will then be the same as a mono reading of the level on that mono tape. The level will read 3dB lower on the A/B PPM on each leg. When mono insert material has been recorded out of context for perhaps a stereo-recorded music programme, it may be necessary to reduce the level still further for subjective contextual reasons. This tends to arise when introductions and voice-overs are recorded separately from the main programme.

The above is applicable where mono derivation is governed by $(A + B) - 3dB$. It may well be necessary to make the 3dB reduction in the $(A + B) - 6dB$ context too because a derived mono from a stereo recording will probably be quieter than a mono originated recording.

Physical.

Use a 60° degree cut for $\frac{1}{4}$ " tape. This represents about one-hundredth of a second at 15 ips so if that isn't good enough, do it on a solid state digital recording/editing device.

Do not edit mono-recorded tapes into stereo tapes or packages. Even if it is not then all full left, the level will not be correct if it has been twin track recorded. (Unless mono derivation is $(A + B) - 6dB$, but see the above paragraph about this).

IV

STEREO OPERATIONS and IMAGING IN PROGRAMMES

Drama.

Speech in Stereo.

A very wide range of programmes come under this generalised heading and therefore the specific treatment and style required for the sound presentation must be determined by the dramatic content of each particular production. Stereo, in itself, must not be allowed to assume mystiques of its own that deny the basic priorities of good drama sound. "Stereo" must never be allowed to become another euphemism for not hearing the dialogue clearly as has been the case of "perspective" when sound pick-up has been inadequate. Neither should what happens in unavoidable studio background noise cause the abandonment of the priority of keeping a healthy level in the speech track.

The sound image should be appropriate to or "match" the "established" viewing angle that appertains at any given time. This can stay constant for long periods, may change rapidly or may change gradually with a developing shot. The width of the speech imaging should be controlled and not left to the random vagaries of mic. distance to source or whether the artists are by virtue of any particular, practical mic. placement, more or less wide in the mic's. acceptance angle than is consistent with previous or ensuing imaging. Close-up sequences require a narrower imaging than shots that display action or the physical location of artists one to another. This is because when an

actor's face is seen out of the spatial context provided by the in-shot presence of other artists, the dichotomy of the differing direction of the sound and picture images is then most prone to causing a disconcerted reaction by the viewer. During such close-ups, the boom-mic distance to sound source will normally be closer and therefore without any reduction in pick-up width will produce wider, not narrower imaging. Because of these necessities to have operational access to width control, regardless of the type of originating mic-pair, an operational control, most conveniently a fader which controls the gain of the difference (or S) is used alongside the fader which controls the gain of the sum (or M). This arrangement also caters for the desirability of being able to use the M output only when that mic-boom is used in a "spot-mic" role during "split" pick-up situations. See figure 14 for a suggested layout of a sound console for control of M/S mic. sources. When the viewing angle makes a sudden change or is orientated from a different area of the set, where in mono sound a boom swing may cope, it is usually wiser to cross-fade to another pre-positioned mic-boom thus avoiding unstable and uncontrollable image movement. When the pick-up has to be "split", either one or more of the mics are used as "spot" sources, or the mic-pairs need to be "milked" to avoid polluting each others pick-up or, where good enough separation exists, may be left faded up to the extent that it is desired to hear their output if of any significance. A frequently arising situation that needs care to avoid inconsistent imaging, is the deep shot. The sound image of the foreground artist should be similarly positioned as though the background artist were not there or perhaps immediately beside them (as they may well have been before moving upstage to make the deep shot). This means that the foreground mic. cannot partially follow upstage in an attempt to contain the pick-up of the rear artist in the way that may well be adequate for mono. This is because the foreground artist will then be placed wider and more on the side of the mic-pair. If the mic goes more over and above the foreground artist, the pick-up

will become over-wide and small movements such as head turns will produce exaggerated image instability. When the distance between the foreground and deep artists is too great for the boom to maintain a foreground position and still achieve adequate pick-up of the rear artist, the pick-up should be split bearing in mind the above points.

Requirements of Drama sound pick-up range from relatively simple situations such as static two-handed conversations shot in conventional fashion to complex action with several artists shot from all directions and with the inevitable mic. shadow problems, obstructions from design features et al. It may be necessary to have perhaps three mic-booms and other auxiliary mics requiring complex mixing. This may all have to be recorded on the run with many points about mic. coverage unclear, having through time pressure to be left to inspiration and good luck. Considerations of stereo imaging can be far away when sound operations are stretched to those degrees just to find a way of hearing the dialogue at all!

If the required operations to produce a satisfactory balance "straight down" are not feasible, the vision operations are uncertain or the action and shooting pose imaging problems that are not solvable within the shooting schedule, multitrack recording becomes necessary so that such material can be re-balanced in post-production. When such facility is available, all separate mic. sources should be recorded, ideally both before and after the mixing control applied in the studio, so that all elements exist on the multitrack when the remix is performed. When such facilities are not available but necessary to provide reasonable chances of producing a viable stereo speech track, account of this should be taken in the planning of the production and a mono speech track or completely mono production should be proposed. Stereo operations should not be undertaken that will lead to expansion of shooting schedules unless by specific understanding and agreement of the Producer.

Neither should stereo operations be undertaken that are likely to produce at the end of the day, a worse product for the viewer than if stereo had not been attempted.

Imaging of Speech.

Here are some guidelines which if followed will provide a framework for consistency in approach. It is inconsistency that leads to disconcertion by the viewer because the unexpected draws attention to itself. If I hear you say that stereo speech is itself "unexpected" then the retort is who would have expected "stereo" films or TV programmes to be mono in a major respect. It is just a matter of getting used to what is served up. I impugn neither way but know what is to be preferred.

The guidelines:-

1. The viewing/listening angle, which is the direction from which one is caused to have or retain an overall picture of the action, is determined by the currently established shooting "line". This is usually, therefore, the last shot that showed the relationship of the actors one to another or to their environment. It is changed by a cut to another establishing shot or by a development shot. The sound is imaged as from this viewing/listening angle.
2. "In shot" speech should be within half of the sound stage width. For example, actors on the left and right of a wide or full length shot should be no farther than half left/right (about 6dB interchannel difference).
3. Close two-shots and inter-cut close-ups should be more narrowly imaged to a maximum of 3 to 4dB interchannel difference.
4. Big dramatic close-ups or singles where one actor becomes

the sole focus of attention should be imaged centre.

5. Deep shots should be imaged so that foreground artists are narrower than background artist(s). Thus the former should be consistent with point 3 above and the latter with point 2 above. The antithesis of this, easily caused by inadequate mic. coverage such as one boom "working" the shot and being too side-on to the foreground artist is a common cause of inconsistent imaging.

6. Group shots and shots intended to show more of the action should be given good width. However, in very wide shots intended to get back from the artists and show more of their environment, the speech should be allowed to be narrower (which will occur through the then greater mic distance to source). Width in such shots is best maintained by an increase in stereo acoustic or environmental FX.

7. Out-of-shot speech can be imaged as far out as effective. Care must, however be exercised that the result is also satisfactory in the derived mono. If it only occurs as the result of a reaction shot to another artist, however, or is in an inter-cut sequence, imaging should remain in the same positions determined by 1 to 6 above.

8. Panning and moving shots sometimes develop the viewing angle and sometimes do not. If they do, which is the more usual, the listening angle goes with them. If the shot simply watches someone going past, going away from or coming into the established shooting line, then their sound image should be allowed to or caused to move appropriately.

9. Crowds, choruses etc should be imaged full width whether their chattering, singing etc. is in or out of shot (unless the point made in 6 above applies).

10. Take all opportunities within the above constraints to exploit width. If you do not, your speech track, in overall terms, will be very near to being just mono. If the width of the coincident pair boom mic. is fixed to give imaging which is narrow enough for close shooting with close mic. positions, there will be no noticeable width in the rest of it. Remember that it is easier to make over-wide images narrower in post production than to try to increase the gain of a difference which is practically non-existent.

See Chapter on Stereo Boom Operation.

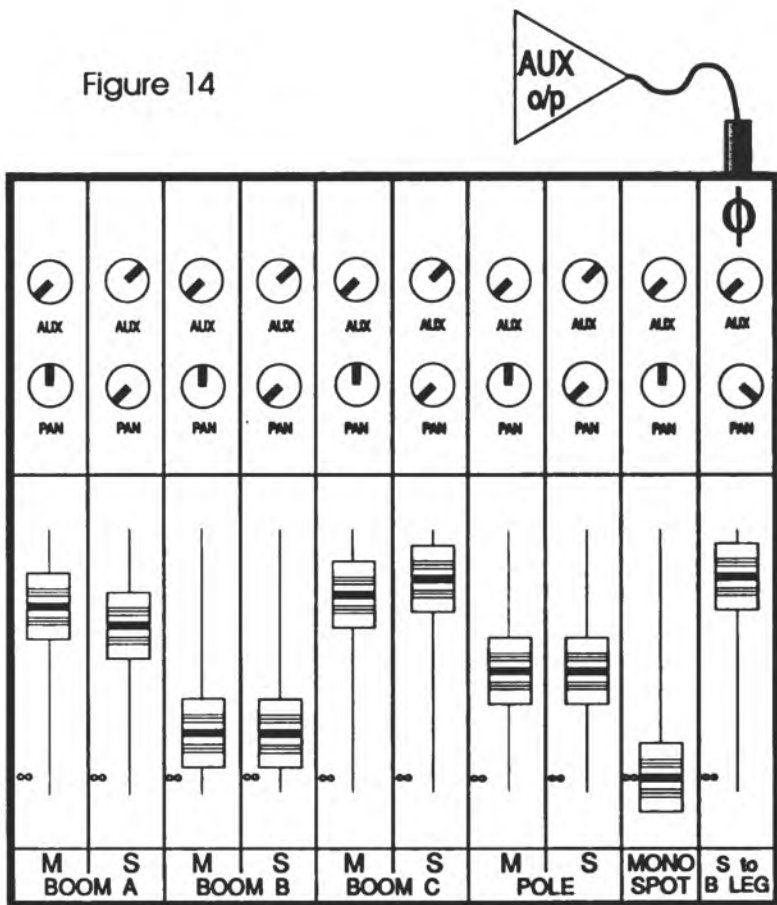
Setting-up the Desk

When a test signal is plugged to "S" channels, the setting of the AUX. (post) send control and the desired fixed setting of the "S to B leg" channel, should produce equal A/B PPM readings, no M reading and an S reading that is 3dB higher than the A/B. (Or the same as the A/B if $(A+B) - 6dB = M$).

To make pre-fader feeds for multitrack recording, parallel all of the mics. to another block of channels which, of course are not selected to O/P, but are left faded up and their levels set and minded by the tape assistant so that adequate levels are recorded without them getting too hot.

Mix the M/S mics with the faders manually ganged by grasping them together or, if you prefer to make width adjustments later in post production, use a fader clip or VCA the pairs to control in harness. The latter not only gives a ganged control on one handle but also allows freedom to ride the S level. To make the speech wider or narrower (that is further from or nearer the centre), increase or decrease the level of the S fader in relation to the M. If the whole image is not centred, the pick-up can be offset by panning the M channel. Any such panning

Figure 14



Suggested Layout of Sound Desk for controlling M/S Mics. for Drama Stereo Speech pick-up using mono channels selected to a stereo group.

to make compensation for a compromised mic position etc., will have greater effect when smaller relative gain is used from the S mic and conversely less effect when the S gain is higher. It is recommended that the width is gripped first and resorting to offsetting is the secondary control option. Occasional offsetting, if left to Post Production should not be a particularly time consuming operation. It may take rather longer however if, by trying to do it straight down, you are stuck with unwanted image shifts in the speech. Mono spot mics need to be pre-panned to the required position if you are going for straight down results.

Live sound FX which have to unavoidably be picked up on the speech mics can be problematical. If they are all-round sounds they may be easier to live with but a sound with a specific source and of long duration, can move about disconcertingly or inhibit the boom operations for optimum speech pick-up. Firstly try to avoid the situation. Secondly, mic. up the source of sound to get some control of it. Use the speech mics with no more width than you really need to keep consistency to the style of speech presentation. If you are multi-tracking to back up the balancing of the speech track, run such FX mics onto the multitrack as well. You will then be better able to tidy up such situations in the post production dub.

Speech - Mono-in-the-Middle

When it is elected to originate a mono speech track for a stereo production, that is, one in which the FX and Music will be of stereo origin, it is advisable to make additional stereo recordings of action sequences on, for instance, $\frac{1}{4}$ " centre-track time-code tape for post production dubbing. Also any wildtracks of FX or backgrounds should be recorded stereo, of course. A mono speech track is one thing but when some FX are stereo and then some are not, what can pass as an acceptable presen-

tational style becomes an incongruous patchwork. The least acceptable results from this form of stereo presentation that can occur unless adequate techniques are employed in post production to integrate the mono speech track, stem from recordings made in a live acoustic and thereby having mono reverberation in the middle as well. This also occurs when the speech track is recorded before an audience and has a mono ambience on it from a reinforcement or public address system. See chapter on Video Dubbing for stereo reverberation techniques to help with these problems.

If sequences of synch FX can only be recorded mono on the speech track and no stereo provision has or can be made for action sequences, use a spreader so as to get away from the incongruity of point-source FX mixed with stereo FX.

Music

Multi-mic balancing

Place the instruments in the sound-stage so that there is an equilibrium in both weight and tonal colour in similar positions on either side. If an element of the balance cannot be counter-balanced by another sound, it is probably best to put it in the middle. It is likely that it is a solo or a very strong rhythmic component or the only bass register instrument. Other higher pitched percussion sounds are customarily placed quite wide and are best so placed when there is another rhythm sound answering on the opposite side. Avoid in-the-speaker sounds which will give that instrument a mono-ish effect. Sections of similar or the same instruments should be mic'd in such a way that they can be given width. Mono blobs should be avoided. This also applies to such as Tom-Toms, Pianos and other tuned percussion instruments that have a long register. Avoid putting any instrument or sound that does not qualify for reasons

given above, in dead centre. This is for a similar reason as one would not put an eye or the nose dead centre of a portrait - unless it was supposed to be the centre of attraction of course. Sounds that are placed towards the extremes of the sound-stage may well require an extra couple of dB to help mono compatibility and the doing of that may also give a nice solid wall of sound in the stereo balance.

The above may be acceptable advice for out-of-vision bands or for pre-recorded music but what about in-vision bands where the layout does not obey the rules? Firstly, where one's planning influence can prevail, get a physical layout that suits your balancing intentions but not, of course, one that spoils more fundamental considerations such as adequate separation. When a band just has to play that way and layout is not up for much negotiation, don't be too pedantic about "matching" the stereo layout to the physical layout. Avoid blatant contradiction, but if the show is about the music, a good sound is more important to the show than naïve geometrics. It may be that a heavily featured instrument is on one side of the band. It is likely that it will be a predominant feature in the camera shooting and so its placement nearer the centre of the stereo balance will be less awkward for the presentation as a whole.

Remember that, unless there is a solo or vocal giving high M peaks, a musical ensemble should give peaks in the S within 3 to 5dB of the M. If it doesn't, your balance is probably too narrow.

Open-mic balancing

Spaced mics, involving high quality omnidirectional mics, are quite commonly used in both radio and the recording industry. Three (and sometimes four or five) mics are slung centre, left and right across the front of the orchestra. Additional "spot" mics. are used where necessary. This technique, which is only

recommended for use where the acoustic is favourable and will be the dominant source of reverberation, produces a comparatively diffuse and cohesive ensemble effect. Theoretically, spaced mics are not good for mono compatibility because of phase and time of arrival differences of the same sounds at more than one mic. Practice is another thing of course. In other ways, such as the falling off at the edges and reverb problems associated with coincident pair technique, spaced mics may have some advantages for mono compatibility.

For small ensembles such as quartets etc. and pianos, two spaced mics would typically be used.

The coincident pair technique is used where sharp imaging is required. It is also usable in dead or less friendly acoustics such as Television studios. The pair is placed similarly to a mono main mic. If in that position you would use a cardioid for mono, then a pair of hypercardioids at 90° are its stereo equivalent and is probably the set-up to use.

Likewise, if a sub-cardioid (a so-called wide cardioid) would be used for mono, then cardioids at 90° are equivalent. Quite a lot of forethought needs to be given on the choice of stereo mic. configurations and placement relative to sources so as to achieve the required presence relative to room acoustic, a full width with evenly spaced imaging and a pick-up that does not fall off at the edges so as to give poor mono compatibility and a hump-in-the-middle stereo. "Stereophony" comes from the Greek words for "solid sound". That does not mean solid in the middle but soggy either side!

Spot mics used with coincident pairs, which can be delayed by delay-line by the equivalent path length of the spotted instrument to the main mic-pair, will avoid bringing the sound out front. They are panned to the same position in the sound-stage as that sound appears (or would appear if you could hear it!) in the output of the main pair.

A spaced pair on the extremes of the orchestra can also be used to counter any fall-off in level on the coincident pair which does tend to occur in those regions when the main pair is placed as close as a poor acoustic tends to demand. Take care of what that may do to the tonal reproduction of elements of the orchestra in the derived mono, though.

It is not advisable to use coincident pair mics as spot mics for sections of the orchestra or for choruses. A smooth and better coverage is achieved with arrays of mono mics which can better be placed for separation and will not present out-of-phase zones to any other areas of the orchestra.

Remember that, when tutti, your orchestra should show those peaks on the M/S PPM that indicate good width. Also, never take the phasing of mics for granted - check all of them. It may seem simple, but it is the commonest joker in the pack.

What about the pictures? Do they influence the way the orchestra is balanced? Take into your considerations that the visual presentation will play a major part in telling the viewer where a musical event is taking place. Audio/visual compatibility is most at risk when close shooting of instrumentalists is accompanied by a time-lagged sound as from the upper circle! Create a sound balance that has sufficient presence to withstand the pictures. This may well entail some work with spot mics to ensure that presence. But this should in no way prejudice the priorities of a music balance which are to make the music sound right for what it is and make the orchestra sound like an orchestra. Beyond those points, it really is up to the picture director to make it look like an orchestra too! And to do it in a way that does not decrease the viewers' enjoyment of the music - which is actually your sound.

Opera

For studio opera, the chapters on drama and music have application. I only refer to "live" opera or singing. The photography and sound balance may well be marvellous in mimed productions. This can be great kudos for the cameraman, sound engineer, designer, director - and keep the accountant smiling but it is no great shakes for opera which is performance art.

For both Opera house recordings or studio, keep the principal singers within half the stage width but give full width to choruses and, of course, the orchestra. Spill from foldback systems which are required when the orchestra is in a separate studio from the vocalists, calls for careful loudspeaker positioning and control. Foldback of the orchestra needs to be placed centrally behind the stereo mic pick-up to avoid lop-sided spill. Individually controllable loudspeakers are required behind the firing lines of all the stereo vocal mics. Likewise, any spill of the vocals on the orchestra mics. should not produce double imaging or a non-central reverb collapse. The two-way foldback system which is used, avoids feedback or howl-round problems by using a close multi-mic balance which is kept free of vocal foldback pick-up to feed the foldback of the orchestra to the vocalists. A separate orchestra balance, which can be an "open" balance, is used for the programme output sound.

Ballet

Ballet is usually shot in a succession of wide, full length and developing shots which all prescribe the viewing angle. Stereo coverage of stage effects and pitter-patters requires a coincident pair mic at every shooting axis, positioned between the camera and the action for correct perspective. In studios the most practical arrangement is the use of mic-booms. The music foldback should be positioned so that spill on the FX mics is not lop-sided and thus harm the music balance. Where practi-

calities do not permit stereo FX pick-up, a mono FX track, although perhaps not as subtle, is quite adequate to humanise and give life to a dance performance, but it should be diffused with a spreader otherwise the mono point-sourceish quality draws attention to the sounds which are to be noticed by their absence rather than their presence. The problem of avoiding music spill with directional properties is also then avoided.

Music playback for video Ballet shooting must be from a time-coded medium which is locked to video synchronisation pulses. If this is not done, the sound track will not be resynchronisable in audio post production after the video edit. This is because, apart from speed variations of play-in machines, the music will have a variable relationship to the video pulses which determined the possible precise edit points that can be taken in video editing. Every shot change can then lose or gain a frame at random. Video dubbing mixers are not then amused.

Light Entertainment Variety and Comedy

Light Ent. Variety is, as its title suggests, a variety of most operations that are mentioned under all the other headings - which see!

Situation Comedy can be handled similarly to Drama but because they are usually recorded "as live" in front of an audience and are afforded little or no audio post production, there is a necessity for a straight down mix. If the speech track is kept quite narrow apart from the obvious moments such as off-stage lines etc., this objective will be facilitated. Unlike Drama, the artists tend to play out front and there is less subtlety in their interrelationships in the acting. The whole situation is not of reality or dramatic atmosphere. First and last, it is all about laughs. This is where, (hopefully!), the more obviously stereo things should happen.

Where mono speech pick-up is used, keep up a stereo ambience from the Public Address system by maintaining some spill on the stereo audience reaction rig. If this produces an undesirable quality, the addition of artificial ambience with out-of-phase mono reverb to each leg could avoid a breach of the Trade Descriptions Act! That could be applied without time loss in post production.

See also: Drama, Audiences, Foldback and PA, Music etc.

Game Shows

The primary object is to communicate the speech clearly and free from disturbing factors. It makes better stereo if all the voices do not come up the same mono slot. This will entail devising a suitable way for any particular show to achieve this without getting any voice, during close-up shooting, to be more than about 4dB interchannel difference. The compere, who will usually frequently address the viewer direct to camera, should be imaged centre - at least when he does so, if not for the whole show. In general, speech imaging needs neither to be too literal (related to set or stage positions) nor too slavish to every camera shot. Aim at establishing a style of image presentation that will be smooth and predictable.

The audience and general atmosphere should be good and wide, giving a sense of excitement and participation.

Bells, buzzers and sound FX should be given as fanciful a presentation in the stereo imaging as suits the fun of the show. Music which is used to give the show pace and excitement can be presented in like manner.

Sport - Linking Studios

Title and backing music should obviously be stereo. Where no stereo version of a signature tune exists, it should be spread and perhaps some mono reverb, out-of-phase to each leg, added to help give it width.

Linkmen, because they directly address the viewer should be imaged centre. The fact that at times they may not be in the middle of the picture because of logos, inlaid or projected stills or moving action, should not be taken as a cue to offcentre them. They are the overriding source of information and should be kept as the central focus of the sound without any distraction from being moved about in the sound image. If there are two or more linkmen working together, relating to each other and directly addressing the camera, they should be either imaged centre or at least very narrowly, say, only 1dB interchannel difference. Any FX of studio action or FX from inlaid sport action should be stereo or diffused mono if appropriate and is better not to be offset.

Out-of-vision commentaries to sport montages may be effectively panned off centre when accompanied by FX or music but not if the commentator keeps appearing in and then out of vision. It would cause a distraction if he was not centre for the in-vision or, if he was panned to and fro, would be very disturbing for the viewer. Race betting can be effective if off-centred when captions are superimposed over a shot of the event and the commentators are similarly off-centre (but perhaps on the other side). About 4dB interchannel difference seems to be comfortable for OOV voices. Long sequences of results readings, such as soccer results, where there is no other sound than the reader's, are better to be placed centre. They are, so to speak, then directly addressing the viewer rather than watching an event with and alongside the viewer.

See section on checking the line-up of Line Sources. Particularly as Outside Sources frequently do not become available until the linking studio is on air, constant vigilance is required that these come up in phase and facilities for remedial action should be immediately available if phase or offset problems occur. All local sources and local ends should be checked for phase and gain equality in both legs before the start of the day. All prerecorded tapes should also be checked, particularly for having been recorded in phase, before they are reproduced into the programme.

When a separate commentary track or source is being mixed with a mono FX source, it can add some value to the event to diffuse the FX with a Spreader. In cases where a mono mixed commentary and FX source is accompanied by another circuit from the event by a clean FX feed, this can be used to create an artificial difference signal by inserting a Delay Line with a very short delay (1mS is about right), and adding this on both legs of a stereo channel with one leg phase-changed. The results can be amazing! It is not advisable to put a complete mix of commentary and FX through a spreader or, indeed, the latter type of aural deception. The voice will blow the gaff on you before the FX take on the disguise. Unless the Spreader has a feature designed to deal with the problem, the setting of the spreader to have any worthwhile effect on the FX, will be unsuitable; in fact sound silly, on the voice.

Sport - Origination

Sound FX

When making decisions on the mic placing and stereo imaging for sound FX in sport, some analysis should be given to functions and relative importance of the various components of the FX particular to the sport in question. The way each aspect of

the FX are handled can be determined by a consideration of how stereo can best enhance and give the fullest expression appropriate to the sport and thus provide for the viewers' maximum enjoyment of the event.

Sport FX are a combination of action FX, spectator reaction and environmental FX. Whatever precedence any of these ingredients are given, however they are combined by relative balance or however each element is imaged, the total result should, for all sports, be of full stereo width. If this is not so, something is being wasted that could make it more fun for the viewer.

In the case of most stadium or arena sports such as Football, Boxing, Rugby etc. spectator reaction should be presented as a solid wall of sound, drawing the viewer to a sense of involvement with the crowd's excitement. In events such as Cricket, Horse Racing and other "open air" type sports, the environmental sounds can be given more priority in the creation of width and depth, thus conveying a sense of "being there" to the viewer. Action FX in the above can be imaged either central or relatively narrowly so that a sense of scale is maintained in addition to a compatibility with close camera shooting. In thrilling action sport such as Motor Racing, movement and depth in the FX optimises a major factor of the event's excitement. Microphone techniques should be chosen by considerations such as those. All-out spectator involvement may be best served by multi-mic arrays to acquire a sufficient and continuous presence. Where beautiful environment sounds are required or moving action within specific areas, good clean imaging and depth will be best achieved by high quality coincident pair mics. Action FX contained in specific areas of the venue, to be mixed with the spectator/environment sounds, such as ball kicks, whacks, hits, grunts, starting gates etc. can be handled similarly to mono operations, by spot mics either fixed or hand-held. If they present an over-thin or mono-specific sound, they could be diffused by use of a spreader.

Care needs to be taken in some circumstances when mono spots are used in conjunction with stereo arrays that they do not collapse the spectator FX. Either smart mixing to duck the spot mic levels during heavy reaction or setting of separate control dynamics to prevent this may need to be employed. A further problem can be timing differences between spots and overall FX arrays giving double hits etc.

It is not necessary to be too literal or purist in the sourcing of FX for sport. The use of "clean" environment FX from other regions of a venue (or even taped FX of course) to fill in for the lack of such FX due to practical circumstances should not be eschewed.

Commentaries

When more than one commentator is used, it is not good stereo if they are imaged in the same position in the sound stage. Some space between the voices gives a more pleasing effect. This should be done in a way that gives an equilibrium to the balance. If there are two commentators, for instance, one either side of centre (about 4dB interchannel difference is suggested) is far enough to put them alongside rather than in front of the event and will usually give good mono compatibility. In the case of Tennis, the main commentator is best placed on the opposite side of the sound stage to the umpire. Placing commentators too wide can diminish the scale of the event as portrayed in the sound FX and also give compatibility problems.

When only one commentator is used for long durations, it may be better to image him centre if there are no positively central or counterbalancing sound FX that help to prevent a lopsided feeling to the presentation.

When a commentator does in-vision pieces (perhaps introductions, payoffs, half-time features), he should be imaged centre

unless he is related to other interviewees or summarisers, as should any single speaker who directly addresses the viewer. If the additional summarisers and interviewees also directly relate to or address the camera, any speech width is best kept quite narrow, that is only sufficient to get them off the same point-source. A 2dB ICD, giving 4dB of spatial separation between voices is sufficient.

Religious Programmes

Congregational singing and responses should be imaged full width regardless of camera shots. Some small degree of offsetting of the organ, choir or other musical instruments if involved can be effective if the visual presentation suggests this to be appropriate. A stereo balance that is aimed at bringing the viewer to feel part of the service rather than a removed spectator is not well served by overplaying the visual orienteering game. The avoidance of blatant contradictions will be enough to contend with anyway. The clergy and those taking the service are effectively imaged in appropriate directional relationships to one another but when they address the congregation and the viewer directly as in sermons or readings, it is better for them to be placed centre.

Chat Shows and Magazine Programmes

Introductions and speech direct to the viewer should be imaged centre. During interviews and where speakers relate to each other, they can be appropriately imaged either by stereo mic. pick-up or by panning individual multi or personal mics. About 4dB interchannel difference is enough to be pleasing to the ear without creating an awkwardness with close-up camera shots. However, in Chat programmes, where both the host and interviewees tend to directly address the viewer as well as each

other, an even narrower imaging may be called for. If the number of interviewees increase ("stay with us"), do not allow the overall speech width to increase by virtue of the wider spread of speakers or by the boom mic then being more side-on to the extreme speakers. Reduce the S content of the pick-up if necessary.

Where two or more presenters work to camera as well as relate to each other, keep the imaging very narrow or even all in the centre if the nature of the show precludes realistic chances of maintaining consistent imaging of the speech content. Do not be over-persistent with stereo mic. coverage of speakers if this leads to a conflict with the overriding priorities of getting sufficiently audible speech and an adequate PA level. Clarity of speech should not be sacrificed to any attempt to maintain stereo boom pick-up.

If presenters demonstrate artefacts which make sound that needs width, a stereo source of pick-up should be arranged for the FX. If there are problems with an overabundance of the FX sound on the presenter's mic., a possibility is to use a mono FX mic., as clean as possible of any voice pick-up, which is fed to both output legs out of phase; thus creating a faked "S" which will not contribute more level to the mono-derived balance.

When stuck for some way of getting away from sounds all coming up the same centre-mono slot, whether speech or FX, judicious use of a spreader can help. If used on speech, only spread to the degree that it removes the thin, point-source-ish quality; avoid the yard-wide mouth effect that over spreading can give.

For other aspects of these types of programme, see chapters on Music, Audiences etc.

Nature and Travel Programmes

Full width imaging should obviously be exploited in these programmes for all general FX and music. Specific FX which illustrate close-ups should be imaged centre. When out-of-vision commentary is frequently intercut and segué with the same presenter in vision, it may give better flow to the programme to image the speech centrally throughout rather than put the OOV off-centre. If there are two speakers, it makes better stereo for them not to emanate from the same mono slot in the sound stage.

V

STUDIO FLOOR and LOCATION OPERATIONS.

Stereo Boom Operation.

The Microphones.

A coincident pair mic. in the sound boom is used for stereo pick-up of speech and sync FX. It makes no difference to the way this moveable mic. is operated whether it be an M/S pair or an A/B pair. If, as corresponds to established mono practice in Studios, the derived mono polar configuration is to be cardioid, then the mic-pair will be a cardioid and figure-of-eight for an M/S pair or two hypercardioids at 90° for an A/B pair. Both mics should match in quality. When two separate mics are used in a closely spaced mounting, the figure-eight should be of the same manufacturer's range of mics as the cardioid.

When mounting an M/S pair in the boom, put the figure-eight above the cardioid. The end of the cardioid capsule should be directly below the centre of the figure-eight capsule. This gets the mics. as coincident as possible and the figure-eight does not tend to shadow the cardioid as it will do if placed below. The side of the figure-eight that faces camera left is the side which should be in phase with the cardioid. Some capsules have a spot on the neck of the casing to indicate the in-phase side. Bear in mind when testing the mics. that the windshield position is not a certain indicator of the capsules attitude; the works can become twisted round inside the casing. A perplexing fault

condition which can occur in a figure-eight capacitor mic. capsule is that, although the mic. apparently works, it has turned itself into a side-facing cardioid by shedding its connections to part of the capsule which is, in fact, two back-to-back out-of-phase cardioids.

When these mics. are mounted on poles, they may be used either over or under the camera shots. The most straightforward way to turn the image round if the mic-pair is inverted, is for the balancer to insert a phase change in the S channel rather than to twist the mic around. Obviously, the operator must keep the balancer informed of his operational mode.

Stereo short gun mics are useful for one or two camera units on location. They are M/S mics. but will sometimes be switchable to an A/B output if required. They produce a stretched imaging of sounds not on the axis of the M component of the mic. If more evenly spaced imaging is required which will, for instance, contain pick-up coverage of typical drama action or give better location FX imaging, a wider M polar pattern nearer to Hypercardioid is recommended. It is necessary to use coincident pairs which are integrally built stereo mics. for exterior work so that they can be conveniently wind-gagged.

M/S pairs are more sensitive to handling and air movement noise in their S component. Because the principal sounds are kept "on" on the M and the S is only used to provide directional information, the bass end of the S can be rolled off harder than one would wish to roll off the M. The bass contributes less than the middle and higher frequencies to the information that is recognised by the ear as directional information. Equivalent A/B pairs will also be equivalent with respect to handling and air noise: it may not be so convenient to EQ the S component. Some integral coincident pair mics. which are M/S in their fundamental operation may have bass roll-off built into the S output.

Operation of Mics - A System.

In the positioning and "sighting" of stereo boom mics. by the operator, there are some basic rules and considerations. Keep the M configuration in mind at all times. The sounds to be picked up must always be within the acceptance angle of that configuration, that is, for normal studio mics., "on" mic as for a cardioid. The fact that the source is being "looked at" by a figure-of-eight or looks reasonably on the side of a hypercardioid A/B pair may mean that something is heard on an extreme of the stereo image but it will be as inaudible in the mono output as its degree of off-mic-ishness on the M configuration of the pair.

The mic. must not be tweaked or panned in any way that does not contribute to the required stereo image. Desirable image instability and movement due to artist action must not be spoilt or confused by instability of mic. operation. If adequate coverage from a level or distance point of view cannot be contained by one stereo mic. boom with the above constraints, then the pick-up coverage must be "split"; that is, a second mic. (boom, pole or fixed mic.) must be deployed.

In considering a basic situation of two artists fairly close together being camera-shot by a frontal two shot and intercut cross close-ups, the mic. is placed so that both are well "on" mic on M; the mic-pair is centred on a point equidistant between the two artists; the mic is not necessarily above the centre-line of the two-shot if some "favouring" of one artist is required or because the mic. is on the edge of a lighting shadow. The mic-pair stays, while that situation appertains, pointing at the same spot between the artists. They will be equally left/right in the stereo image and to the degree chosen by the balancer by his level of difference (S) output.

The above basic set-up can be developed and projected to all situations where one mic. boom is capable of solo coverage. After stripping away those operational ploys that work with mono but are denied us in stereo such as panning, swinging and racking to and fro between artists and swinging from one location of speech to another when the cameras suddenly look at something different, we are left with the question of where exactly to point the mic. in any given situation that will produce a suitable image that will be compatible with the visual presentation of the action. If we call this point the "Image Orientation Point" (IOP) and think of it as something which is there, the whole time, on the set somewhere with the artists, patterns and a way of thinking about boom mic. placement begin to emerge.

There are four different ways in which, for drama style speech pick-up, microphones can be used. The boom mics, as well as pole or fixed mics., may be used alone covering all the speech and action of interest. Let us call that **Stereo Mic. working.** Two booms may work simultaneously with the balancer using the stereo outputs of both, either by "milking" the particular speech that each covers or because there is sufficient separation for him to leave them faded up together: **Split Stereo working.** The first of two ways in which the mics. may be used as mono sources is when a Stereo Mic. alone is inadequate for obtaining sufficient level of certain speech because of distance and its inability to swing or rack to an artist for particular lines of dialogue: **Mono Spot working.** The second, is by using two or more mics. purely as mobile multi-mics, picking up the speech line by line from varying regions of the set and leaving the stereo imaging to a panning exercise by the balancer: **Multi Mic working.**

Stereo Mic Working.

All aspects of the pick-up are taken into account; the level; the perspective; the stereo image. The mic. must be close enough to hear the speech distinctly with some compensation for quieter and louder dialogue where necessary; the distance from the action and the difference in distance between sources within the action; the mic. all the while pointing at the IOP, this being at times still and fixed; at other times moving and developing to a new position as it is carried along by the action.

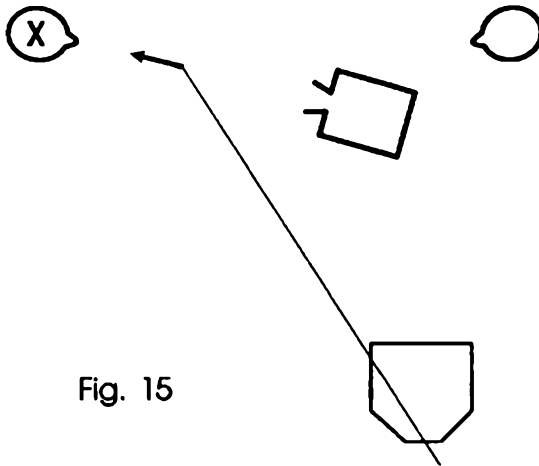


Fig. 15

To illustrate a simple sequence: artist enters set *single panning shot* - IOP is same point as his head, walks across set mic. racks/swings with him maintaining central IOP, (figure 15), he comes to another artist the shot becomes a two shot and some intercut close-ups follow - the IOP goes smoothly to a point between the two artists as the two shot is developed, it stays there during the close-ups,

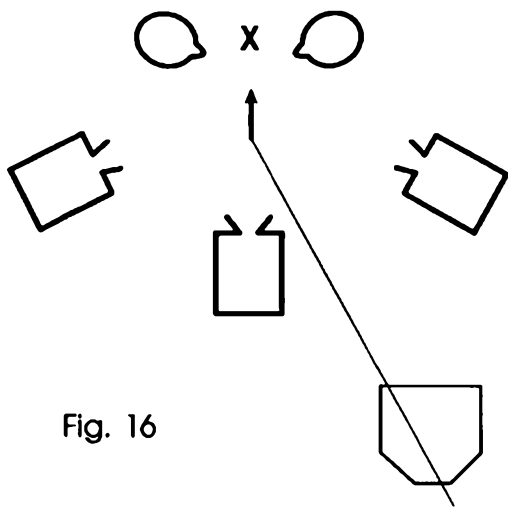


Fig. 16

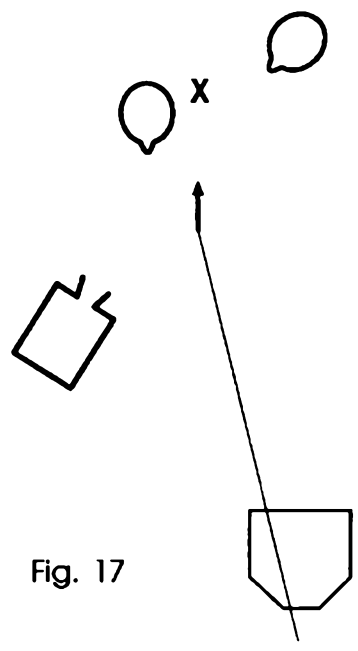


Fig. 17

(figure 16), one artist takes a couple of steps towards camera in the two shot, the camera tracks back a little and holds him one side of frame and the other in the background - the mic. is racked back with him, the IOP stays between them but comes a little closer to the foreground artist so that he is nearer the centre of the stereo image than the background artist, (figure 17). He turns to face upstage, camera shot becomes an over-the-

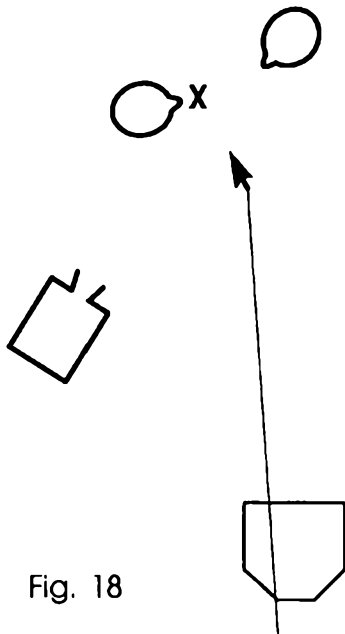


Fig. 18

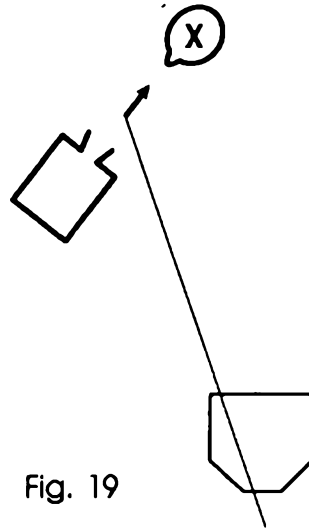


Fig. 19

shoulder two shot - IOP stays the same as before but the mic. goes up, in and over but still looking down to the same IOP, (figure 18). He moves away during the last couple of words of his speech and exits, the rear artist makes a final reply, camera lets foreground man go, tracks in to close-up of man who was background - IOP is held steady as he goes off, then centred on the other as the camera goes in, (figure 19).

Split Stereo Working.

Here, the IOP has another less immediately recognisable factor to take in account. The point of aim is between artist or artists covered and the imaginary position where the other artist(s) would be if all the distance was taken away so that the one mic-pair could cover them all. The Split Stereo working is, after all, only necessary to overcome the problem of distance. The balancer controls the amount of spatial separation of the artists by his control of the level of the S mic. outputs when he wishes to vary the width presented by the operational position of the mic-pairs.

To expand our example to include some working in this manner, after the two shot, one artist goes away from the other by about five paces while speaking and turns back to face him, *the camera pans off with him and crabs to an eye-line position as from the other artist, another camera takes similar cross-shots of the stationary*

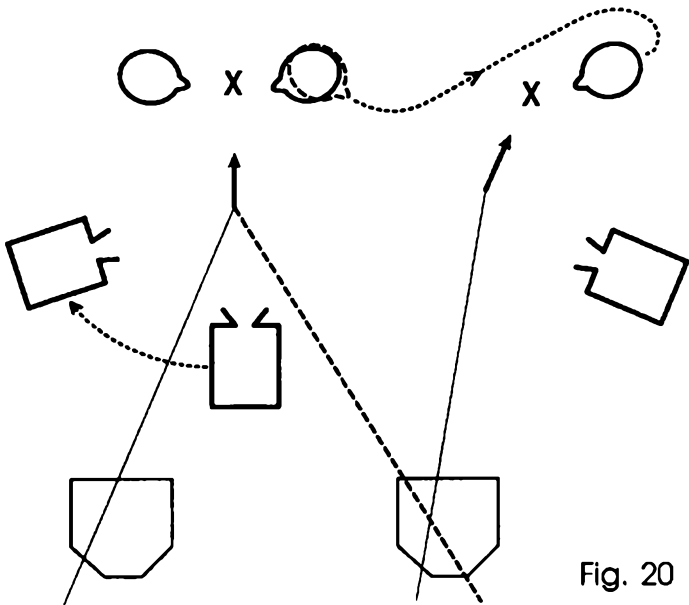


Fig. 20

man - the IOP goes off with the walk as though the other man followed, another boom takes up a mirrored position on the stationary man which is in fact the same position as vacated by the boom that followed the walker, (figure 20). These positions are held for some exchange of dialogue and then the walker circles round behind stationary man, pauses for a speech and comes forward to join him again. Camera pans him round, brings in the then foreground man by developing to a deep shot - the boom goes with the walker, keeping the IOP at the same distance to the side of him; loosens the perspective distance as he goes. By the time he stops in background, the IOP is still similar but can have increased slightly because the added perspective distance will cause his image to be somewhat narrower. The other boom holds his IOP on the now foreground artist, (figure 21). The walker then comes downstage to join the other again. Camera lets walker come down into two shot as before

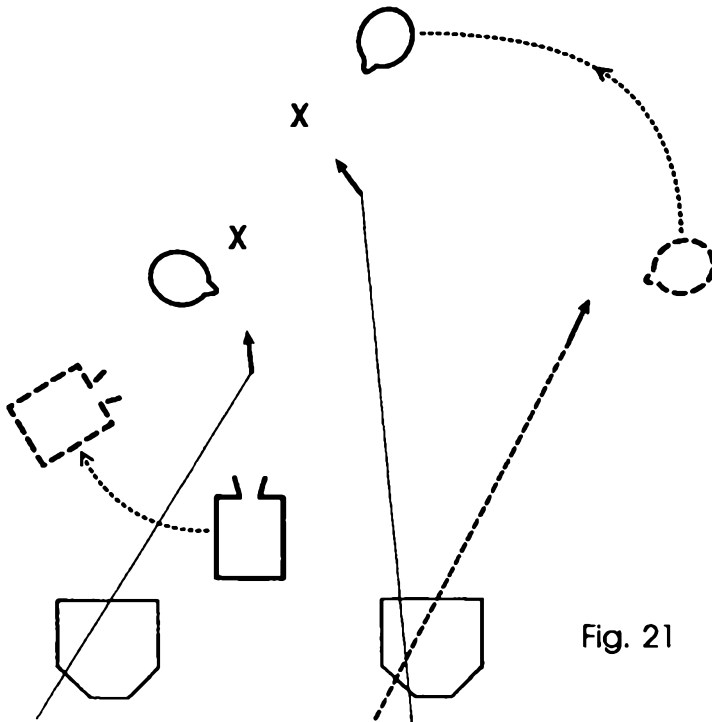


Fig. 21

he went walkies - boom brings him downstage, the IOP and perspective distance smoothly returning to where it started and the other boom quits, (figure 22).

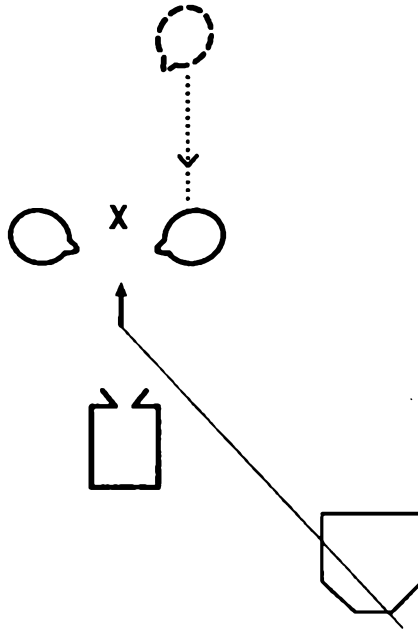


Fig. 22

Mono Spot Working.

When a mic-pair is used for this purpose, the M mic alone is faded in with the main stereo mic. to pull in a line. The balancer will need to pan it to the required image position.

Revise our story again. A third person enters and takes position upstage of the two protagonists, they turn their heads up and there is an exchange of dialogue. *Camera sees third artist between other two in deep three shot - the second boom goes for the upstage line as tight as shot allows, (figure 23).*

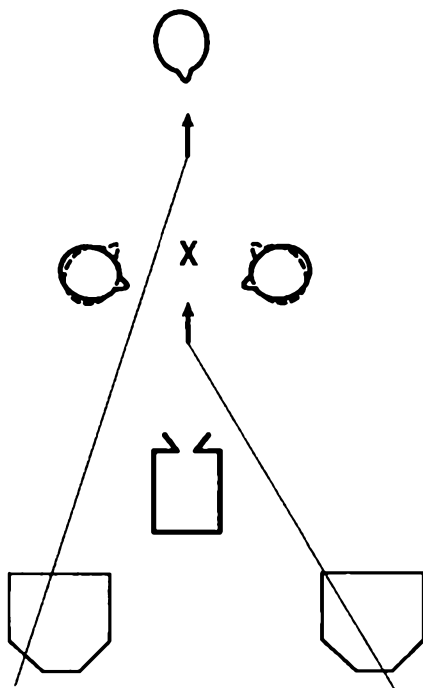


Fig. 23

Third man comes downstage to others talking the while. Camera lets three shot materialise - background boom has to come downstage with the third man and take up a similar position as other boom had to abandon - at some moment the foreground boom had to be faded out and at the same time the difference (S) of the second boom has to be faded up, (figure 24).

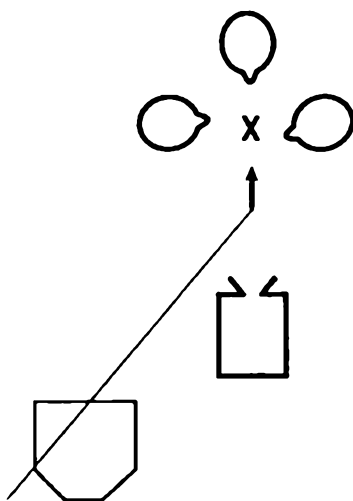


Fig. 24

After some business, third artist goes way off towards set exit, turns and addresses a line back to the other two.

As he goes the camera shot is a wide cross shot with exiting artist on the downstage side and the other two on the upstage side of the shot, the then stereo mic. develops to a new IOP as the two main artists reposition to set up the cross-shot and the third man leaves group, a mono mic. by the exit door which is pre-panned to place the line further out than the main artists in the sound image, (figure 25).

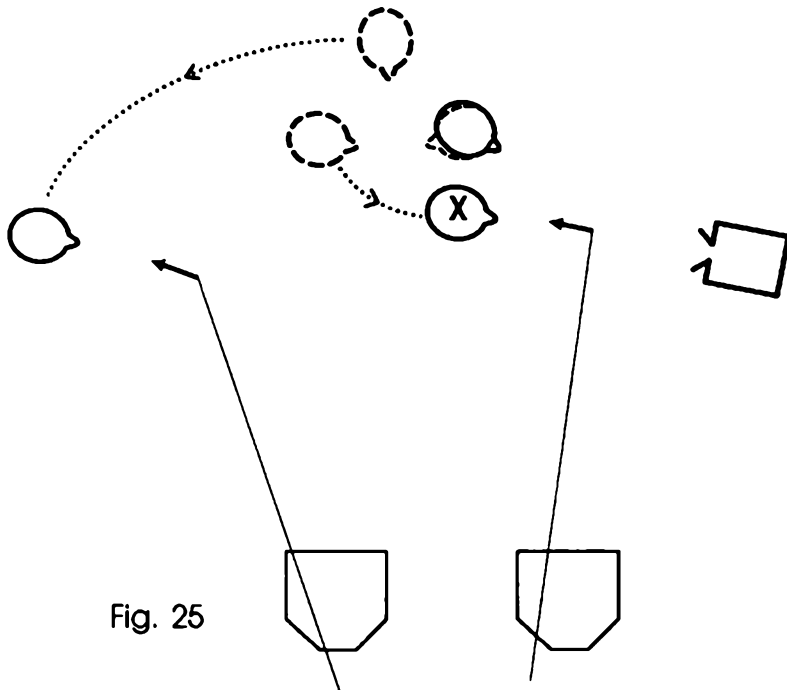


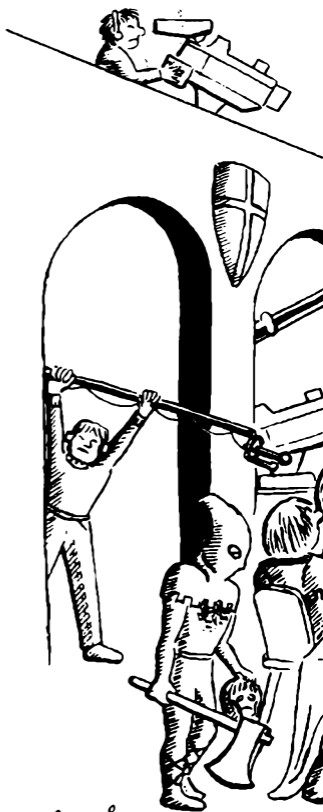
Fig. 25

The above may be very simple sequences but they are given as a basis from which to develop a way of visualising and communicating between operators a system for stereo mic. positioning which can be projected to any action. For notes on Drama speech imaging, see Chapter IV - Drama.

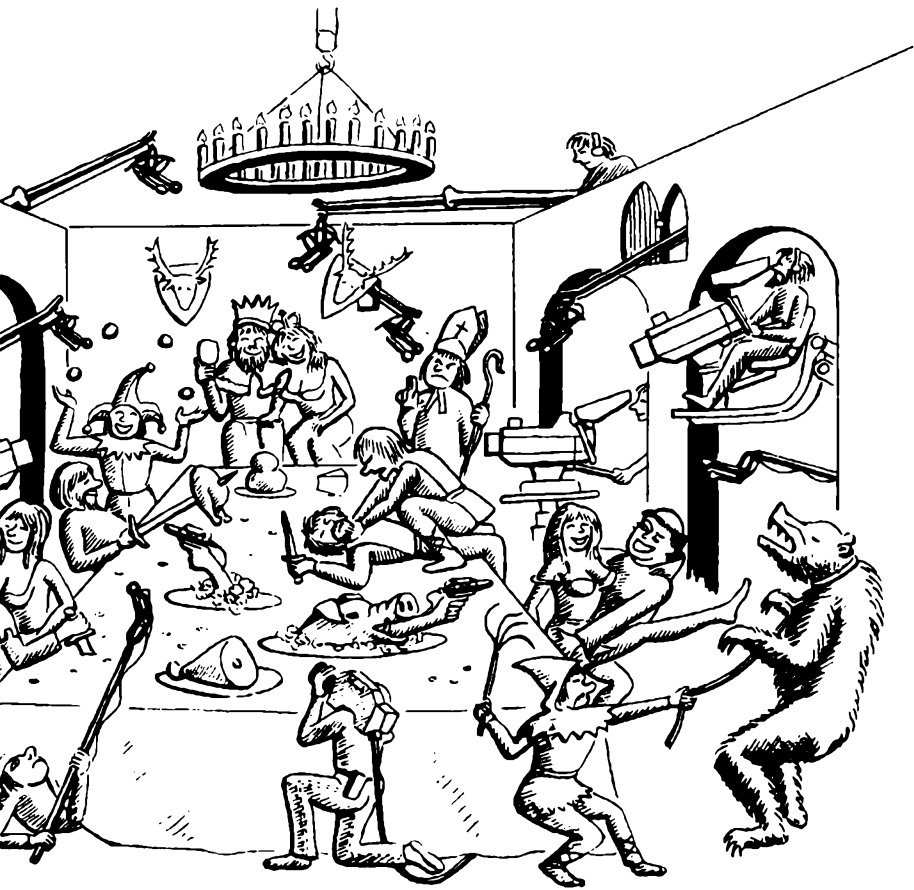
Multi-Mic Working.

This technique has to be used when there are many artists, all over the set, camera shot like a football match, then perhaps shot a second time with a different wall of the set out and the sound operators are hard put to cover the dialogue at all. Perhaps no decisions about the eventual imaging can be taken at the time of shooting. It may be necessary for the balancer to concentrate on getting a good multitrack recording for a post production remix.

Our example plot thickens. Six more artists enter, after brief introductions, all eight sit around a huge table and the dialogue goes all over the place. *It is shot at first on a big wide shot all the way through. Then the cameras get all around them (and where they cannot avoid shooting each other, the shots are left out to be taken as inserts later); they just pick off the speakers from wherever they get good eyelines - the stereo boom lived with the big wide shot but three booms are wheeled in to snatch lines in the most practical way they can with lots of unavoidable swinging, racking and shadow avoidance work.* In situations where the artists are in a spread out but stably positioned setting and are multi-mic'd in various practical ways, the mics. can be panned to create the desired image for the establishing shot. During close-ups etc., this overall image can be narrowed down by the balancer (a processor is a handy tool for that). An overall coincident pair may be useful in such a situation to provide some ambience and to disguise individual mic. milking. Some of that balancing operation, such as the width adjustment of the multi-mics. and, given



Roger Bunn



enough recording tracks, the degree of use of the ambience mic. could be left to post production.

Foldback and Public Address.

Foldback loudspeakers should be positioned to give minimum pick-up on mics. and so that spill will be central on coincident pair mics. That is, directly to the rear rather than on one side.

Deliberate acoustic pick-up of sound FX from studio floor loudspeakers is not recommended. This is because the spill, likely to be in out-of-phase zones on coincident pair mics., will give greater compatibility problems than if they are substantially played into the balance direct and appropriately panned. Although certain "on-set" FX may sound right when played via a loudspeaker on the set, such as perhaps to represent a radio, the procedure may inhibit boom operations from their primary task of speech coverage and may lead to one being stuck with unwanted movements in the FX image on the speech track.

Backing track foldback to vocalists etc. can be handled similarly to mono operations except when the mic. arrangements may produce lopsided spill as mentioned above.

All PA systems, where the audience is also mic.-rigged for reaction are provided in the normal mono fashion. The loudspeakers should be arranged to avoid lopsided spill on audience or stage mics.

VI

VIDEO DUBBING.

Multitrack Systems.

Line-Up: Record zero level sweep frequency tones on all the tracks which are to be recorded upon. A period of white noise can also be useful for azimuth checking. On the final mix tracks, put tone on the programme countdown clock/leader at stereo level (or the level which is meant to indicate the programme level). Write up the tape box to be sure that the line-up is interpreted correctly by subsequent users. Indicate the position on the tape of test material by giving appropriate time-codes.

When checking the sweep frequency line-up of the Dubbing tape(s), check the replay azimuth of the tones which have been recorded on all "Mix" and "Tracklay" tracks. Look at each pair of tracks (in replay) on the M/S PPM with tones reading zero level on the A/B PPM. There should be no S reading at 1kHz and the S reading at 10kHz should average -12dB or better at 7½ ips. but may not be very steady due to tape weave. Performance at 15 ips should be substantially better; the S reading being below that which will register on a PPM unless the S + 20dB button is operated. If the replay head is found to be disagreeing with the record head, the replay head should be lined up using an azimuth test tape. Coherent sweep tones or white noise is selected to the tape track inputs and whilst recording on blank tape and still looking at the replay head outputs on an M/S PPM or on a double beam oscilloscope, the record head is adjusted to obtain a minimum reading at all

frequencies. This is usually a job for a specialist engineer in most organisations. If there are stereo VT tracks already transferred onto the tape, the tones on those tracks should similarly be checked. In the event of the VT tracks not agreeing azimuth-wise with the dubbing suite machine, either an electronic delay line type azimuth adjuster, sometimes called a phase chaser, or a physical adjustment will be needed. If the former device is not available, it may be more efficient to have the VT tracks re-transferred at correct azimuth. Physical head adjustment will produce a final tape which is itself incorrect. This, of course, leads to problems when the tape is dubbed-back to VT. When any secondary multitrack is used for tracklaying or for playing in material from another source such as from the studio or location, similar azimuth checks should be made as appropriate. $\frac{1}{4}$ " prerecorded tapes such as Title and Incidental music, should also be checked for good azimuth and care should be taken in reproduction that equal level is given to both legs.

When a dub is not completed in a continuous session and returned to after other use of the dubbing suite, checks should be made that the azimuth parameters of the tape machines still agree with the original line-up.

Organisation of Hardware.

Make sure that there are enough tracks available for the dub e.g. a 24-track machine and a time-code striped tape. If in a Drama dub some sections are to be re-mixed from studio 24-track audio recordings by initially tracklaying them, there will be only three tracks available if an 8-track machine is used for mastering. Another pair of tracks, if it is desired to make an A/B roll for a dialogue pre-mix, could simply be a pre-striped $\frac{1}{4}$ " centre-track tape locked to the dubbing master. The 24-track can then be used for tracklaying of music, FX, etc. when it is no longer required for resynching the studio recordings.

Although a matter which does not arise due to stereo itself, the resynching of multitrack material in dubbing systems where track-laid material on the dub master tape is read from the replay head, requires some prior thought to be given to the way that hardware and track deployment is organised. In such a dubbing system, when mixing down, an offset is produced between the final dub master and the videotape. The actual offset, which is needed to be inserted when reviewing and transferring the tracks back to Videotape, is determined by the head spacing of the particular multitrack that is used as the dub master machine. Acquaintance with the value of that offset in relation to the tape speeds used becomes more imperative in the complex operations required for stereo dubbing. It is surprisingly easy to confound oneself and the customer by neglecting to ensure that the timecode track is being read by the correct head and thus laying material which proves to be out of sync at the final mix. A similar mistake of listening to a track for sync reference when re-synching original studio multitracks on a second machine is positively avoided by using the sound track from the video machine as a guide to sync reference at all times.

The above sync problems are, of course, all avoided in a dubbing system which works with zero offset and reads all tracks from the sync heads throughout. It is not the best practice, however, in terms of maintaining optimum quality, particularly if a tape speed of $7\frac{1}{2}$ ips is used.

Some dubs, particularly those for music productions, may involve the remixing of multitrack material which originates from the production studio and also material which has been assembled on the Videotape tracks. By using the tape which would normally be the mastering tape as a play-in tape on another machine, the programme can be dubbed to a new timecode striped master. This way there will be enough tracks for track-laying all the sync material in A/B roll fashion and there

will be no hang-ups from offset problems if making a zero offset tape whilst also requiring replay of tracklaid material from the replay heads for the final mixdown. This further complication arises if the dub master tape is required, not only for transfer back to Videotape, but as a Transmission master to be time-code locked to the video source. There is still no need to dub on sync heads. The appropriate offset normally used to replay the tape sync to picture, which might, for example, have a negative sign, is inserted as an offset of the opposite sign in the timecode output of the dub master multitrack machine. The dub can then proceed in normal fashion and the removal of the then positive offset for eventual replay will be akin to the insertion of a negative offset of the same figure. The tape will finally be of zero offset, as required, to the picture source.

Stereo Speech Tracks - Tracklaying and Mixing.

If there is to be any more than a small degree of modification or remixing of stereo speech tracks, it is better to work through the whole show setting up the imaging and getting that out of the way before commencement of work on sound FX and music etc. It is easier to get consistent results in the speech imaging if one concentrates on this aspect alone before getting into further tracklaying or mixing. Set up the console so that there is control - automated control if this is available, of both width and offset of the edited VT tracks and similar arrangements for any studio multitracks to which one may need to have recourse. If studio recordings have been made in M/S format, this is the time to convert them to A/B by a similar arrangement to that shown in Figure 14. For suggestions as to the width to employ on drama speech refer to Figure 26. Try to get to those limits but if one attempts to balance wider than these, the problems of unwanted image movement make it very difficult to create a consistent, smooth and convincing track. Stereo speech tracks cry out for stereo reverb to provide

a convincing acoustic. A Room Simulator type of reverberation unit gives the best results with the minimum of hassle to set up or bring back to the same setting when required.

The more acoustic that can be applied, the smoother will the speech quality be and the balance and image-changing operations on the console will be less detectable in the final result.

Mono Speech Tracks.

Use as much stereo reverb as the location will stand. Pan any obvious "off" lines. Do not tolerate any action FX sequences to get to the final mix sounding mono. If there is no stereo track to cover such sequences, diffuse them with a spreader. If the track has been recorded in a reverberant location or a sound reinforcement situation, set up a similar sounding mono reverb and add this, out-of-phase, to each leg. Balanced accurately, the faked reverb. "S" will not contribute to the derived mono but give some badly needed width to the stereo output.

Electronic Edits and Drop-ins.

Staggered erase heads, which feature on some multitrack machines, together with the consequent timing of the record head switching can cause difficulties when dropping into record on new material. Picking up on the same material is fine as sometimes are edits in similar material (e.g. a different take of the same thing) but dropping in on new background effects will give a fast audio wipe. A way to avoid this is to track-lay alternate scenes or takes and then use time-code triggered variable-rate cross-fade devices to make the transition. These can be inserted prefader in the track-return channels so that they bring up and take out the sources as selected on time-code cues. The outgoing and incoming levels are under full control; the transitions can be taken manually when desired and any

type of overlap is available. The record drop-ins can then always be made in identical or similar material. Scene-change cuts are sometimes better as fast cross-fades than hard chops and the above mentioned type of cross fade devices allow for more finesse in that respect than record drop-ins even if the multitrack has simultaneous record switching. If the FX are being played direct into the final mix, the time-code triggered faders can be plugged across the tape/grams outputs for accurately timed changes in backgrounds.

FX and Music.

Stereo music and stereo FX can be widened or narrowed by use of processors. Remember that this is the principal way of adjusting the mono compatibility of such material. Take care on music that the widening by processors does not harm the balance in the derived mono by over-diminishing the level of sounds in the centre of the image.

Mono music is best given some width appropriate to its purposes for the programme, by employing a Spreader. Additional stereo reverb will also help. If there is enough reverb on the mono version, play the "out-of-phase mono reverb to each leg" trick.

Sound FX.

Keep some kind of stereo background there continuously. It is very noticeable when there are dead gaps in the sound stage. Keep the FX wide. Apart from this benefiting the stereo output, there will then be a more moderate level in the derived mono where they can easily be a distracting factor when fighting for space in the same mono hole as the dialogue.

Faking stereo from mono background discs can be achieved by using two copies of the same disc. Route one disc to a channel that is mono and panned centre. Route the other to a stereo channel or two mono channels with them panned fully left/right and put a phase change in one leg. This will put width into the effect depending on the level of the faked "S" channel. If the mono centre channel is fed through a spreader also, one has a good variety of possibilities in the use of the effect. When dealing with exterior sounds and effects as heard within interiors, don't make them too wide or have precise directional imaging. They are best if simply diffuse and don't move about unless the established viewing angle is radically changed and are placed in the area of the sound stage from the general direction of their supposed entry to the interior. Use the FX source (whether a mono or a stereo one) in mono via a spreader. To place the sound anywhere other than centre, if that is required, offset the spreader output. When the action goes out to an exterior, cross-fade to pukka stereo from the same disc or put in the out-of-phase component if faking from a mono disc.

Another way of producing exterior FX as heard from an interior is to play the effect on a foldback LS into the dubbing studio, bounce it around with acoustic screens and pick it up on a stereo mic. so that no direct sound from the LS comes to the mic. Additional EQ and stereo reverb may help too.

Spot FX can also be spread but will usually be satisfactory if panned appropriately and blended into the scene with stereo reverb. If placed widely in the sound-stage, take care that there is sufficient level for the mono balance where they must be heard through other sounds which may obscure them.

0 dB	Central Image Artist in shot & addressing viewer Voice Over stills Trail Voice Drama B.C.U.s Game-show Compere
2dB	Quarter L/R More than one presenter, addressing each other and viewer
3dB	Interviews when not addressing viewer Drama C.U.s in intercut sequences
4dB	Game-show panelists Sitcom in-shot speech
5dB	Out-of-vision commentator
7dB	Half L/R Drama in-shot speech
10dB	Three-quarters L/R
12dB	Drama OOV speech / crowds
14dB	Fully L/R Comedy OOV
16dB	In the loudspeaker

**Figure 26. Imaging of Speech
Suggested Limits of Inter-Channel Difference**

VII

EPILOGUE.

With Television now poised to catch up with the rest of the audio world after twenty-five years of dragging its feet with obsolete mono sound, one would expect that by now there would be some further change or advance in sound reproduction standards appearing on the horizon to put us back where I fancy many of our purely audio orientated colleagues think we belong anyway, that is, at the bottom of the heap yet again. What major innovations will the future bring for sound - and then doubtless, another quarter of a century later, be forced into a kicking and screaming Television industry?

Only the certainty of all things becoming obsolete in our consumerist society and the inevitability of fashions in entertainment changing, make me feel that there should be an answer but it defies me to offer an inspired suggestion. Nothing appears on the horizon to dent my confidence that stereo has a long way to go before new dimensions in audio supercede it. Quadrophony was a mirage; fun while it lasted, but never became part of the real world. Binaural does not claim much attention even from those who apparently feel so naked or exposed to life's realities that they like to enclose their ears with headphones.

Stereo has plenty going for it after all. It is also quite a recommendation for it that notwithstanding the great advances brought to recording and reproduction by digital techniques, in particular by Compact Disc, there has been little suggestion that the system that finally delivers these products from elec-

tronic equipment to the customers' ears, should be fundamentally changed. Stereo has been accepted as fully adequate for sound reproduction in the home. By suspending the audio image across the sound stage between two loudspeakers, the ears are gratified by width and depth but by being an "in front" medium it is not totally enveloping of the listener and can be treated with similar degrees of involvement or detachment that is chosen for any given programme as is the way of most home viewers.

There is a commercial thrust for a surround system for the home similar to that commonly used for feature films in the cinema. Unfortunately, the premise which is fundamental to its *raison d'être*, is that dialogue and speech must be in the centre of the sound presentation. And to make sure of it, a centre loudspeaker fed from a matrix-derived centre channel gives not just mono-in-the-middle but an in-the-speaker quality to it also. A plethora of trade names and buzz-word expressions are built up to describe the intricacies and sophistications of the system. Whilst I do not deny that for cinema sound presentation it can be wonderfully effective and its proprietors have led a revolution in cinema audio, I find little to recommend it for the home unless used specifically for decoding feature film sound that has been balanced for that system. On a stereo set-up and without surround or rear loudspeakers, the dialogue sounds mono and the music and FX, being balanced very wide tend to give two blobs either side. This effect can be minimised for productions made specifically for Television or Video, but the hardware needed in the home is not congruous with that used for Radio and CD listening. Neither does it necessarily achieve the dogmatically proclaimed essential of central speech which is purported to obviate any divergence of the sound and picture image unless a small TV set is actually placed there. If stereo is the preferred way to listen to sound then why should it be degraded to a mono element because of the presence of a picture which gives you a look at what you are hearing. Stereo

sound brings the little picture to life; mono sound emphasises the confines of the little box and a system that would have it be a virtue is surely regressive. It is dialogue and action sounds in stereo that make drama-style productions spring to life. Any future system must be progressive in its dimensions for that aspect of Television audio as well as being a standard that offers greater expression and fidelity for music reproduction.

Obviously the above is a polemic based upon subjective judgment. The more objective problems for the surround system would appear to be in persuading the Television industry to fall in with patented systems and products, perhaps also employ "audio consultants", display logos, pay royalties and so on when they can get "simple" stereo for nothing - well, OK, very little!

At the time of writing, an encouragement to the mono-speak advocates and a threat to the general adoption of an honest stereo TV system is looming. This is the proposal for EBU standards for international sound distribution to be a stereo circuit for music and effects (or the "Multilateral" sound) and a mono circuit for speech (or the "Unilateral"). Whilst for Sport or News exchanges which just involve commentary no great harm to stereo ideals may occur. If this procedure is used for the exchange of more creatively based programmes, it represents a regressive approach to the exploitation of a two channel sound system for Television.

There is a debate afoot concerning a suitable sound system that may be introduced with High Definition Television. Why it is that a new shape, size or quality of the picture presentation should cause a rethink about sound provokes me to a rather cynical reaction. Whilst I approve of a review at a time when new standards are being formalised, I smell Philistine engineers with their spurious notions about audio making all the running yet again. I have not yet noticed any great degree of public dis-

satisfaction with the highest quality audio products at present on the market because they were only stereo. If there are no reasons which stem from quality sound reproduction itself for using a more complex system, I feel confident of stereo's adequacy for any type of home video display.

Let all of us in the sound balancing business get the new era for Television off to a good start and not allow ourselves to be compromised before we have been able to establish the best standards. By this we will serve our productions best, give ourselves new vistas for creativity and find a new stature in our profession.

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Stereophonic Sound is now here for Television!

The Manual is written to assist sound engineers and balancers in the TV industry in the updating of their skills and learning of the new techniques required for stereo programme-making.

All the basic knowledge including monitoring, stereo/mono compatibility, stereo microphones, AB/MS formats, stereo balancing equipment, stereo imaging for programmes, stereo sound boom operation, stereo video dubbing and all the tricks of the trade are described and discussed.

Written primarily for those already engaged in Television audio, those with aspirations or simply interest in the subject will find the Manual instructive and it is intended to prime their creative skills and enthusiasm for the challenge offered by stereo.