JOHN LEESON

COMPOSITE OR NON-COMPOSITE OPERATION

It is intended that from time to time in these pages we shall include philosophical articles on some technical aspect of sound and television working. In this article, the first of the series, the author discusses the relative virtues of composite and non-composite working in the television chain, with particular reference to vision mixing.

THE OUTPUT SIGNAL from any studio, O.B unit, videotape machine or, for that matter, transmitter is composite. Why then has there been a tendency in the past years to keep the synchronizing signal away from the video component for as long as possible? What is the economic advantage or disadvantage of working in a composite manner? Are there any technical disadvantages of operating compositely?

Current production techniques demand more and more flexible mixing equipments with almost unlimited modes of transfer from one source to any other source. These transfers, when made, must be aesthetically pleasing to the eye and must not infringe in any way upon the artistic sense of the viewer.

This means that all changes of signal must be made with no variation of black level unless specifically required for an effect. Where cuts are made, they must be "clean", and where mixing, wiping or fading is used, the transfer must be smooth and free from any picture shift or other disturbance.

At first sight, operating all possible equipment in a non-composite fashion would seem to have an economic advantage in that less complicated and relatively inexpensive equipment may be used. If all signals are synchronous, this in fact may be so. Certainly the mixer or switcher within a studio need only be a fairly simple device. The fading or mixing of signals can be done in simple fading stages and the sync (and set-up or pedestal if used) can be added in a later stage. Thus, the level of sync (and set-up) is always constant irrespective of what is happening to the video component of the signal. All monitors would of course require to be fed with internal synchronizing pulses, but this merely means adding into the system extra cable carrying this information.

Unfortunately, it is the introduction of non-synchronous signals that complicates this simple arrangement. Being non-synchronous, these signals must carry their own sync pulses and are thus composite.

In a "non-composite mixer" it is therefore necessary to have a separate switching system to bring in these non-synchronous signals after the "effect" and "sync adding circuits". Further circuitry is also required if fading of these non-synchronous circuits is desired. Also it is not possible to cross-mix or perform effects between the composite and non-composite sections of the mixer. This may well be a production requirement at certain times. An additional complication arises if one monitor is used as a preview monitor for both non-synchronous and synchronous signals. It is then necessary to provide some information to switch the monitor from non-composite to composite operation or provide a sync adder for the non-composite source. Where several preview monitors are utilized, these facilities will of course become quite complex and of course expensive.

It therefore appears logical to have each signal in a composite form. All these signals can then be treated in a like fashion and monitoring does not require the extra cabling carrying sync information or means of switching composite/non-composite. The circuitry complexities arise in the mixer electronics (the circuitry after the switching matrix and mixing stages that process the signal). This cannot now have a simple sync adder after the fading stages.

Two requirements must be met. First, if two signals are superimposed in anything but a 50–50 relationship, then the synchronizing pulses will be of incorrect amplitude. (A white clipper will take care of any overmodulation of the vision part of the signal.) Secondly, fading to black must be achieved by having some method of using the sync information either by (a) mixing from the composite signal to sync, or (b) stripping off the sync information, fading and then re-adding synchronizing pulses at a later stage.

Common to both composite and non-composite mixers is the problem of producing a sync or "black" output even if there is no input. In a composite mixer, the difficulty can be solved by feeding an external local sync into the mixer electronics and adding to local signals (as in the non-composite switcher), but that a change-over to a separate sync source derived from the remote signal shall take place if a non-synchronous signal is taken.

Each of the objections to composite mixing outlined above can now be overcome by the use of modern circuit techniques.

If simple mixer electronics are all that is necessary, the problem of the excess amplitude of sync can be overcome by sync stretch circuits and clippers. The stretching of sync is included in case it so happens that the syncs decrease in amplitude. This, however, is most unlikely when carrying out a superimposition. Fading to black is accomplished by mixing the composite signal to its own sync.

When it is necessary to feed a synchronizing signal out regardless of whether there is an input signal or not, then local sync pulses are employed and switching between these and separated sync takes place as required. The use of sync comparators to determine whether a signal is synchronous or not makes this operation completely automatic.

The sync comparator circuits can also provide a valuable service in the composite mixer when used to indicate that the next source selected by the operator is, in fact, synchronous. If, in the case of the simple A/B Cut mixer, one of these units is placed between the A and B matrix output amplifiers, a warning lamp may be lit to indicate that a non-synchronous source has been selected on the effects banks. If full "foolproofing" is required, then the output signal of the comparator may be used to inhibit the A/B faders or wipe control.

Ideally, of course, no set-up (pedestal) should be added to the input signal of a composite mixer. As with syncs, if a superimposition of anything other than 50–50 is used, an incorrect set-up signal arises. Unless some method of automatic black level circuit is used, which is undesirable, this cannot be avoided. However, this does not produce a non-standard signal (as excess sync would), and it is of no consequence. It is also becoming increasingly apparent that the use of the set-up signal is a complete waste of the available information space, and with more linear circuitry, the discontinuing of using a number of amplifiers in cascade containing black clippers, together with the use of fly-back suppression on monitors and receivers, the requirement for the inclusion of this component within the signal is removed. Many broadcasting organizations have in fact already ceased to transmit a pedestal.

Thus it can be seen that there is no technical difficulty in accepting all inputs to a video mixer or switcher in the composite form. Additionally, it may also be argued that the mixer operator can now treat all sources, whether local or remote, in a like manner. He (or she) thus avoids those difficult transfers "across the board" when going between remote sources or from local to remote signals. Thus a much easier mode of operation is established and the possibility of operator error is reduced.

The advent of colour also points to the use of composite mixers, as it is unwise, to say the least, to remove the burst frequency from the signal. A fade to black therefore must be accomplished by cross mixing a composite coded signal to sync and burst. As in the foreseeable future it is unlikely that a complete colour service will become available in any country, we can expect to have, for a period of time certainly, the condition where switchers and mixers are handling either colour or monochrome, depending upon the day-to-day or even hour-to-hour requirements of a station. To operate in this manner will, of course, present little difficulty with the modern design of composite equipment.