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STANDARDS CONVERSION

by

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Colour must of course increase the difficulty of international programme exchange, but, inspite of this, the extra vitality and realism that it will give will undoubtedly increase the demand, particularly when it is seen how much colour enhances actualities, ceremonials and sporting events. The past few years have seen an enormous growth in the number of international programme exchanges in black-and-white, and a few have already taken place in colour, but we have to be prepared to handle a much greater number in colour in the future and to make them available between almost every quarter of the globe.

Unfortunately, inspite of repeated efforts to achieve uniformity, the world is divided in the technical standards used for television. The first, and most serious, division is between those areas of the world which use a system giving 60 pictures per second, ^{usually} called 60 fields - that is, almost all of the Americas, Japan and some other parts of the world - and the remainder of the world, including the whole of Europe, which uses 50 fields per second. But whereas the 60 field-per-second areas use only the single form of colour television - that is, the NTSC system - the committed countries in the 50 field area are divided between SECAM and PAL; and the non-committed countries will most probably choose one of these two systems but some could choose NTSC. The problem is therefore to exchange between the three systems - NTSC, SECAM and PAL - and between two standards - 50 fields per second and 60 fields per second. There are also differences in the number of lines in each field but these differences are less important. The conversion between systems is not difficult. The systems basically are the same, and the difference is only the way in

which the colour component of the complete signal is coded. To convert from one to another, the coding of the colour signal is broken down from the one system into the basic colour signals, which are the same on all systems, and then these are recoded on the other system. This involves some complexity in equipment and of course must involve some loss in the quality of the picture. The actual amount of loss depends on which way the conversion is being done. Conversion out of PAL into other systems is rather better than from the other systems into PAL. The difference is however not of very great significance and is not a decisive factor.

The more serious problem is the conversion between the 50 field and the 60 field picture. A television picture can be considered as made up of a succession of some 200,000 dots, each of which represents the brightness and the colour of a particular part of the picture, and the complete train of these dots is transmitted in either a fiftieth or a sixtieth of a second, as the case may be. If the conversion is being made from American to European standards, then the time of transmission of each set of these dots - that is, a complete field - has to be lengthened so that in a second only 50 pictures derived from the 60 pictures of the American system have to be transmitted. The surplus pictures must be disposed of gradually in such a way that the smoothness of the action is maintained. Conversely, when converting from European standards to the American standards the time taken for individual pictures must be shortened and each second ten additional pictures must be derived, again in such a way that smooth action is maintained. This involves picture storage. For some years, the storage of the picture has been done optically in that the picture on the incoming standard has been displayed on a normal picture tube. A camera working on the outgoing standard then looks at the picture displayed. The persistence of the glow on the face of

the display tube gives the necessary storage, although some electrical circuits are also used to smooth out the flicker which arises from the ten pictures per second difference between the two standards. This system has worked well in black-and-white, and all interchanges to and from America until very recently have used this system. It is, however, almost impossible to use such a system for adequate colour picture quality, and thought has been given all over the world to carrying out this process by purely electronic means. This requires that the picture signals must be stored in an electrical store at the incoming picture repetition rate, say, 60 fields per second, and then re-examined as the signals issue from the electrical store at the new rate, say, 50 fields per second. The store can be a glass or quartz delay line. From the various values obtained in this new sampling, the picture on the new standard is reconstituted. The first stage therefore gives us the conversion of the picture at the field rate, or the number of pictures per second, but leaves the number of lines in the picture still unchanged. So that from a 525-line/60 field picture, we obtain one on 525-lines/50 fields. We have, therefore, to do a second conversion to change the line rate from, say, 525 to 625 lines. This is done by the electronic line-storage converter which was developed in the BBC laboratories some four years ago, and is now in regular use. This was the first, and so far the only, electronic means of line-frequency conversion anywhere in the world. Field-store conversion, which is the much more difficult problem, has also been solved in the same laboratories, and regular colour transmission now takes place using this equipment. The device will be used for a number of programmes and has already been booked for the transmission of colour signals from the Olympic Games both in Grenoble and Mexico City in 1968.

These devices are for the immediate use of instantaneous programme exchange but they have a very wide application in the preparation of programmes for distribution in recorded form. Users of recorded programmes like to receive them in a form in which they are available for immediate use, and organisations such as the BBC, which have a considerable export of recorded programmes, are therefore obliged to carry out the conversion of the programme to the customer's own standard before it is put on tape for delivery. These electronic storage converters will be used to this end.

Not all customers however have video tape machines and will need film recordings of good performance at a reasonable price. Work is in hand on ways of doing this so that a film, once made, can be played back on any television standard and used on any system of colour television. The probability is that such recordings will use video tape recordings as an intermediate stage.

Work is also being done in several locations using systems which are a combination of photographic and electronic methods. A photographic camera loaded with colour film has mounted on it an electronic camera and an electronic viewfinder. The electronic means are used for the control of the camera so that the advantages of television methods can be realised while resulting in a colour film which is ideal of programme exchange.

FCNoL/MKPR
20.7.67

Due to be published on
17th November - copy to
be in by 1st November.

CVG
16.10.67