

REPORT 1219

SYNCHRONIZING SIGNALS FOR THE COMPONENT DIGITAL STUDIO

(Question 25/11 and Study Programme 25N/11)

(1990)

1 Introduction

Close synchronisation of signal sources and of signal processing is required in a television studio of any kind and this is particularly true in the digital studio or in studios operating in a mixed analogue and digital manner. Synchronisation is required at various levels: for the sample clock (13.5 MHz in the case of Recommendation 601), and the scanning line, field and frame, to a high degree of accuracy and stability so as to allow the freedom of mixing, effects and processing demanded in television programme production. Synchronisation is thus a basic function and its accuracy and stability are fundamental to successful television broadcasting.

Two requirements for synchronisation can be identified:-

- (a) Input Synchronisation the synchronisation of the internal clocking of a process with the input signal. This is generally achieved by locking the clock generator to the input signal directly through a phase-locked loop, thus minimising jitter and drift.
- (b) Output Synchronisation the synchronisation of two or more signals with each other, by locking their respective generators to a common reference signal, as is generally done with cameras and telecines.

2 Possible Synchronising Signals

For the case of input synchronisation of an equipment processing a component digital signal, it is clear that the reference can only usefully be the digital signal itself as defined in Recommendations 601 and 656. For the case of output synchronisation a wider choice is possible including:

- A digital black signal;
- A digital picture signal;
- An analogue black signal;
- An analogue picture signal;

- A special signal in analogue or digital form.

Here the digital signals would conform to Recommendations 601 and 656, and the analogue signals to Recommendation 470 and Report 624.

The essential requirement is that the signal should carry picture synchronisation information (line, field and frame) and that the sample clock can be derived in a simple and precise manner. It is further desirable that the signal be usable with analogue equipment in component and possibly composite form, and in both 525-line and 625-line standards.

Studies by broadcasters in both 525-line and 625-line standards have concluded that, to cater for a mixed analogue/digital environment, satisfactory performance, flexibility and commonality are achieved by the use of the analogue black signal modified slightly in respect of the tolerances on rise-time and jitter. [EBU, 1988] [SMPTE, 1989].

It is also appropriate to provide for the fully-digital environment by allowing for the use of a digital signal conforming to Recommendation 656 as a synchronizing reference.

3 Signal Decoding

The synchronising elements of the digital video signal described in Recommendation 656 can be derived from the synchronising signal either directly, or by means of the phase-locking of a generator of higher accuracy and stability, if an improved level of performance is required. The equivalent of a studio-level synchronising pulse generator (SPG) may be required. Derivation is as follows:

Sample Clock - 858 times the line frequency (525-line systems) or 864 times the line frequency (625-line systems).

EAV and SAV Timing References - directly or indirectly from line synchronising clocked by the sample clock.

V and F Flags - directly or indirectly from vertical synchronising, clocked by the sample clock.

Digital Blanking - as EAV/SAV and V, F flags.

4. Alternative signals

The use of a composite video signal in place of the specified analogue signal has been studied but is not recommended, as variations in average picture level (APL) can cause timing drift and jitter following synchronizing separation.

Further studies are invited on alternative methods of studio synchronization which make full use of new digital techniques.

REFERENCES

EBU [1988]. Technical Standard N14: Specification of a reference signal for the synchronisation of 625-line component digital equipment.

SMPTE [1988]. Recommended Practice RP 154-1988: Reference signal for the synchronisation of 525-line component digital video equipment.

BIBLIOGRAPHY

CCIR Documents

[1986-90]: 11/497 (IWP 11/7), 11/516 (EBU), 11/574 (OIRT).

REPORT 1211

USER REQUIREMENTS FOR DIGITAL TELEVISION TRANSMISSION

1. Introduction (1990)

In the Study Period 1982-1986, IWP 11/7 of CCIR Study Group 11 assembled data on bit-rate reduction techniques, for the most part those which could be used to reduce the net bit-rate of signals originally conforming to CCIR Rec. 601. This information represents a reference work on bit-rate reduction techniques and is contained in Report 1089.