

SECTION 11C: CONTROL, MEASUREMENT AND INTERNATIONAL EXCHANGE OF TELEVISION
PROGRAMMES

REPORT 628-4

AUTOMATIC MONITORING AND CONTROL OF TELEVISION OPERATION

(Question 15/11)

(1974-1978-1982-1986-1990)

1. Use of insertion reference signals (IRS) in the television studio complex

1.1 Purpose of insertion reference signals

Study Programme 12A/11 recognizes the possibility of using insertion signals as a reference and certification tool for adjustment of the waveform characteristics of a distorted programme signal, so that the original characteristics of the picture may be restored. Such insertion signals are called "insertion reference signals".

1.2 Insertion points

Insertion reference signals are inserted on the video signal at all certification points; that is, at all points where qualified personnel are present who can verify that the technical parameters of the programme signal are correct, and that the content of the programme picture, as seen on a picture monitor, is also correct. The insertion reference signals stay with the programme signal at all times, and may only be erased and replaced at recertification points down-stream (if any).

As an example, the outputs of film and slide scanners, television cameras or vision mixers, etc., can be certification points; at these points technical personnel check that the inserted IRS are undistorted and that the programme signal parameters are correct. In particular, they verify that the level of the programme peak white does not exceed the level of the white bar in the IRS.

1.3 Correction points

Automatic correctors that can correct most of the linear distortions of the IRS signals are available on the market. The correctors may be used for instance automatically to correct luminance level, chrominance level, burst amplitude and sync amplitude, etc.

An automatic correction by means of IRS can be effected on the output of the switcher in the continuity suites that feed the television distribution networks; in this way, all signals distributed on the networks conform to the standard and to the artistic intention of the programme director. It should be noted that in the USA particular insertion reference signals (VIR) are fed throughout the television system, down to the user's television receiver, which could incorporate an IRS correction circuit.

Manual correction with IRS may be carried out at recertification points; this occurs in the case of a studio vision mixer that corrects, switches on the output and recertifies a remote signal such as one coming from a film scanner.

IRS may also be used to advantage to make small adjustments in the alignment of television tape-machines when playing programme tapes. The output of television tape-machines can thus be considered to some extent as a correction point.

1.4 *Waveform of the national insertion reference signals*

Many countries believe that the waveforms adopted for IRS should preferably be the same as certain of the waveforms adopted for international insertion test signals (ITS) [CCIR, 1978-82a]. However, it may not be necessary to adopt all the ITS waveforms for certification purposes [CCIR, 1978-82b; Zaccarian, 1978]. Other countries prefer to use a different and much simpler waveform for the insertion reference signal. In any case, it is important to make sure that, at the input to the international distribution network, the IRS are deleted after they have been used to make the necessary corrections. This is in order to ensure that there is no possibility of confusion with ITS which may subsequently be inserted, in accordance with Recommendation 473.

The EBU has recommended [CCIR, 1978-82a] that its member organizations operating with 625-line 50 field television systems and wishing to introduce IRS should employ the signals shown in Figs. 1 and 2 (taken from Recommendation 473), preferably inserted in lines 17 and 330 respectively. If, for reasons of economy, it is desired to use only one of these signals, the signal shown in Fig. 1 should be inserted only in line 17, or alternatively, the signal shown in Fig. 2 should be inserted only in line 330.

In the United States of America the VIR signal is transmitted by all major television networks and is inserted locally by many television stations. A complete description of the VIR signal is contained in an engineering bulletin published by the Electronics Industry Association [EIA, 1982]. The waveform of the signal is depicted in Fig. 3.

2. **Use of insertion test signals (ITS) for the automatic monitoring of television systems**

2.1 Television emission stations

During recent years, it has been the custom to design transmitting stations for unattended operation. This has led to a growing demand for automatic measuring systems capable of checking transmitter performance and providing alarms and status information for control stations. This automatic equipment is generally arranged to measure important characteristics of the television signal such as the synchronizing pulses, blanking intervals and the main features of an insertion test signal located in the field-blanking period. The equipment may also check the frequency of the vision and sound carriers and, in some cases, the continuity of the sound channel may be checked by detecting the presence of a super audio pilot signal. In the case of transposers, the insertion test signal measurement results may be regarded as sufficient evidence of correct operation of the sound channel.

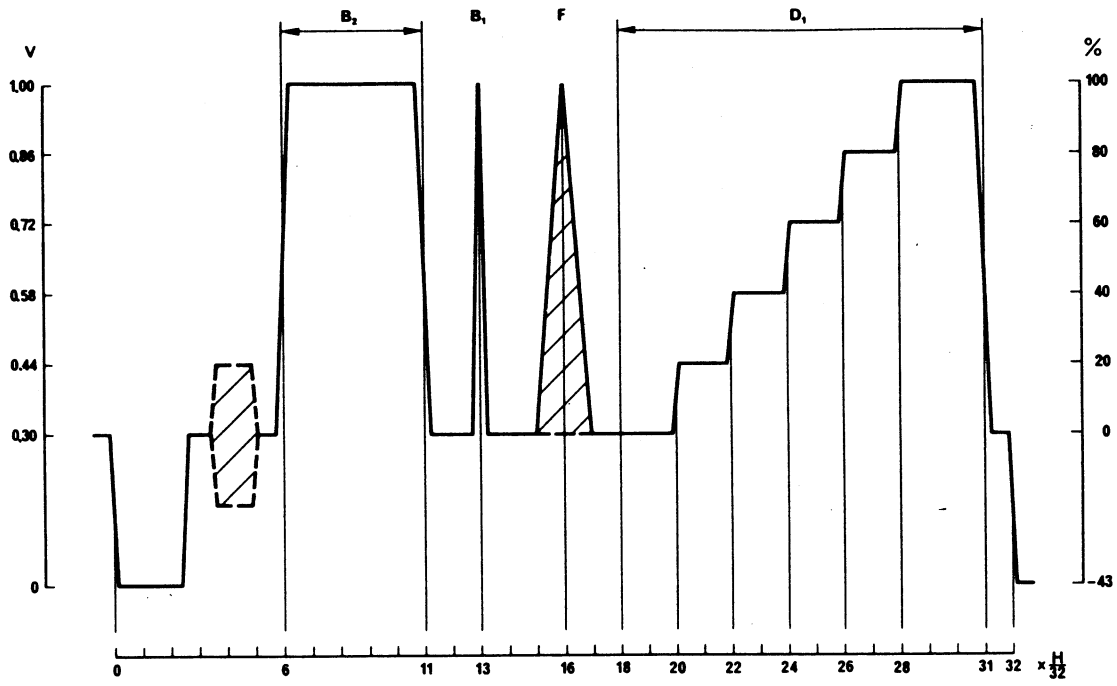


FIGURE 1 - IRS signals recommended by the EBU for insertion in line 17

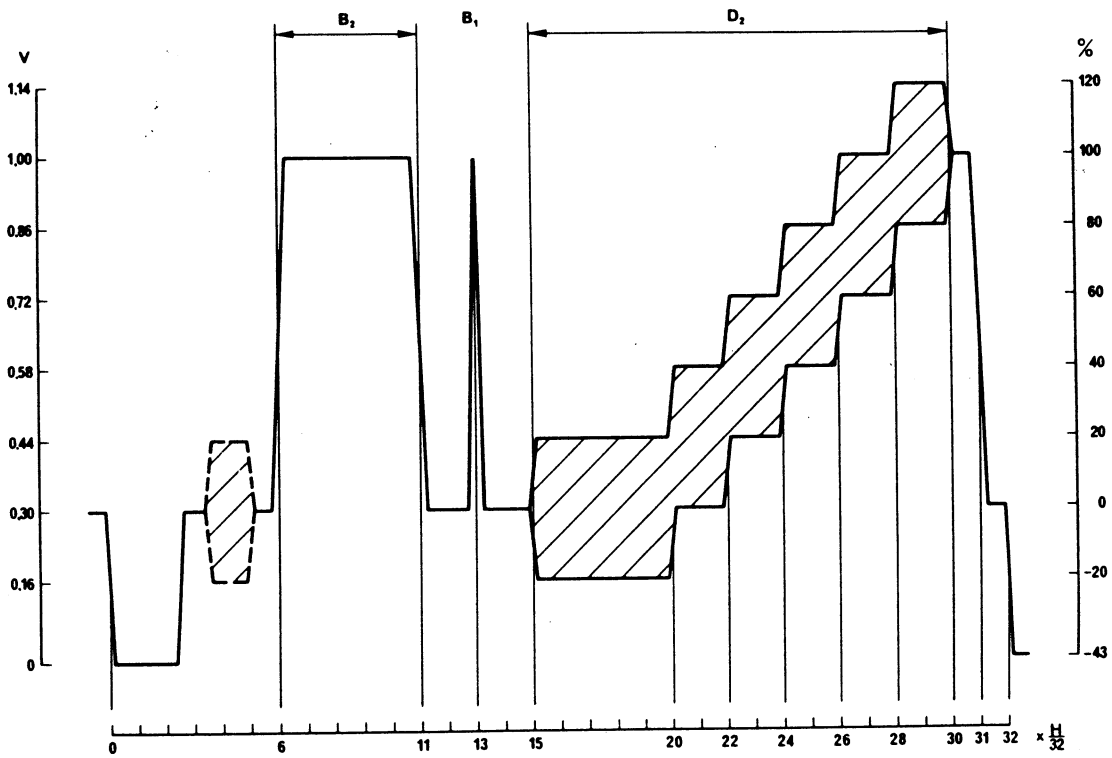


FIGURE 2 - IRS signals recommended by the EBU for insertion in line 330

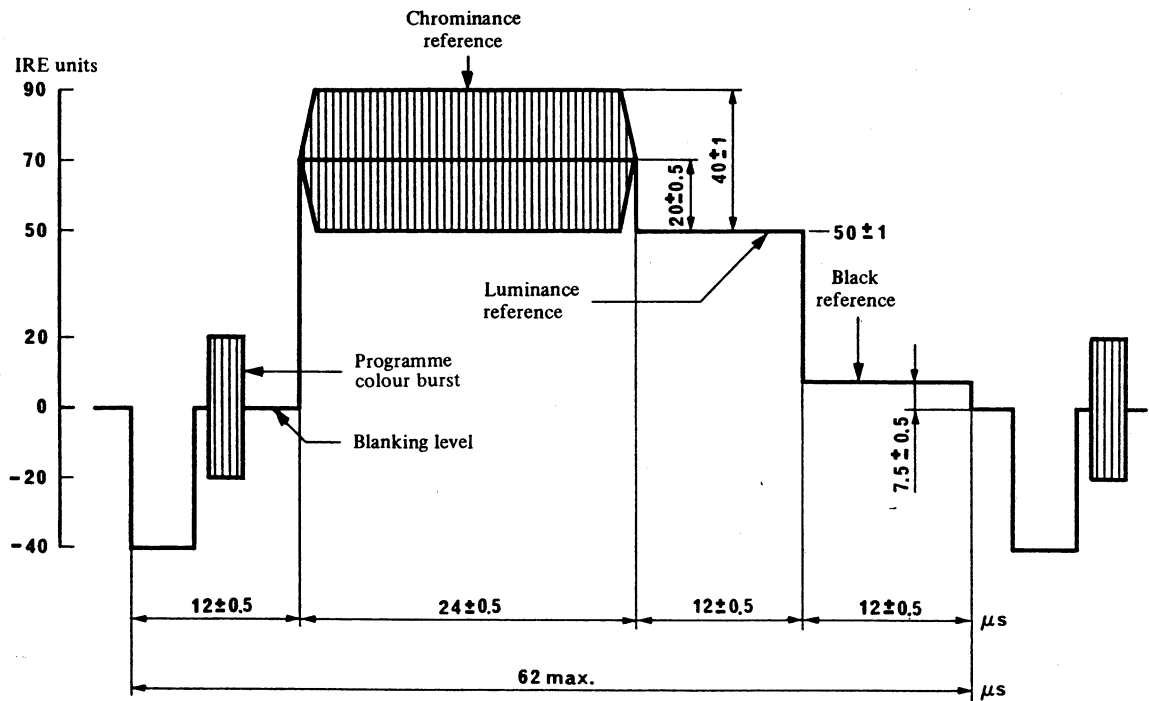


FIGURE 3 – The VIR signal recommended for use in the United States of America

Note 1. – The VIR signal is inserted on line 19 of both television fields.

Note 2. – Peak-to-peak variation of any nominally constant level: 0.5 IRE max.

Note 3. – Luminance transitions rise and fall times (10%-90%): $0.25 \pm 0.05 \mu\text{s}$.

Note 4. – Chrominance reference rise and fall times (10%-90%): $1.0 \pm 0.25 \mu\text{s}$.

Note 5. – Chrominance reference phase: same as programme colour burst $\pm 1^\circ$.

Note 6. – Chrominance reference harmonic distortion: 1% max.

Note 7. – All tolerances are provisional and apply at the point where the VIR is inserted into a programme.

The facilities needed for the automatic monitoring of a network of broadcasting stations may either be located at each of the stations to be monitored, or, in another method, a central master station may employ a more comprehensive system which is able to make measurements by direct reception of the remote stations. While the transmitter is in programme service, it is convenient to monitor the radio-frequency signal by feeding the measuring system from a high quality receiver or demodulator. A similar set of measurements may be needed for the point to point link network which distributes the signal to the main transmitting stations. Both sets of measurements may often be performed by the same operational system which is able therefore to supervise the link networks as well as the transmitters.

The recent emergence of the integrated circuit micro-processor has led to the design of equipment which allows wholly digital measuring techniques to be applied to on-site test line parameter analysis and noise measurement [James and Watson, 1975]. This approach results not only in greater versatility, but affords appreciable economies in both size and cost over comparable analogue measuring equipment capable of taking executive corrective action.

Report 411 discusses automatic methods of measuring and supervising video test signals. The methods described are equally applicable to the monitoring of transmitting stations.

2.2 Systems carrying MAC/PACKET signals

Automatic measurement methods and test signals for MAC/PACKET family signals have been described in [CCIR, 1986-90a] and are being studied by CMTT. Results of these studies are given in Report 1096.

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